THRESHOLD CONCEPTS

From personal practice to Communities of Practice
Contents

Foreword ............................................................................................................................................ 1
Conference Programme .................................................................................................................. 4
Conference Planner Day 1 ........................................................................................................... 9
Conference Planner Day 2 ........................................................................................................ 10
Keynote Speakers ....................................................................................................................... 11
Keynote Addresses .................................................................................................................... 13
Publication Launch ..................................................................................................................... 16
Day 1 Session A - Papers ............................................................................................................. 17
Day 1 Session A - Pecha Kucha ................................................................................................. 31
Day 1 Session B - Papers ............................................................................................................. 37
Day 1 Session B - Pecha Kucha ................................................................................................. 51
Day 1 Session C - Workshops .................................................................................................... 55
Day 1 Session C - Pecha Kucha ................................................................................................. 59
Day 2 Session D - Papers ............................................................................................................. 63
Day 2 Session D - Pecha Kucha ................................................................................................. 75
Day 2 Session E - Papers ............................................................................................................. 78
Day 2 Session E - Pecha Kucha ................................................................................................. 89
Day 2 Session F - Workshops ..................................................................................................... 95
Day 2 Session F - Pecha Kucha ................................................................................................. 98
Posters ........................................................................................................................................... 103
List of Presenters ....................................................................................................................... 134
Foreword

On behalf of the organising committee I would like to welcome you to this joint event marking the 6th Annual Conference of the National Academy for the Integration of Research, Teaching and Learning, and the 4th Biennial Threshold Concepts Conference.

This is truly an international Conference. At the time of writing we have 280 delegates registered from sixteen countries on four continents. You, the delegates, represent twenty-six Irish Higher Education institutions, and 112 additional institutions from around the world.

The idea of Threshold Concepts has been debated for less than a decade but it has become highly significant to a great number of educators. It has made us look at our practice from a new perspective, and adds richness and understanding to already existing concepts and frameworks. Past Conferences have been held in Scotland, Canada, and Australia. We are delighted to be bringing the 4th Conference to Ireland this year. At each conference the ideas are developed and move forward. This year will be no exception as we debate the sub-themes of Engaging Students with Threshold Concepts, Interdisciplinary Threshold Concepts, Threshold Concepts in Professional Development, and New Developments in Threshold Concepts.

As you can see, we have a varied programme for you, to suit both those who are new to the theme of Threshold Concepts, and those who are already researching in this area. There is a dedicated App available to help you make your choices. We hope that you will have some lively and creative debate, and have the opportunity to discuss new ideas and insights and make new connections and collaborations. We’d like you to think of this conference as a kind of liminal space in which to be creative and try out new ideas - though I hope it is only ‘troublesome’ in the best sense of the word!

I’d like to thank the organising committee, in particular Dr Catherine O’Mahony of NAIRTL, and the staff of Trinity College Dublin, in particular Ms Jade Barrett, for all of their work and attention to detail to bring this conference to fruition. Please take this opportunity to connect with colleagues and friends from around the world, and enjoy your time at the conference.

Dr Bettie Higgs

on behalf of the Threshold Concepts Conference Steering Committee

Conference Steering Committee members
Ms Vicky Davies, University of Ulster; Dr Bettie Higgs, University College Cork (Committee Chair); Professor Ray Land, Durham University; Dr Sarah Maguire, University of Ulster; Professor Erik Meyer, University of Queensland; and Dr Catherine O’Mahony, NAIRTL
General Information

Conference Theme: 
*Threshold Concepts - from personal practice to communities of practice*

Some concepts are crucial to a deeper understanding and mastery of a discipline and have been called Threshold Concepts. This conference will examine how the idea of Threshold Concepts is used to advance student learning not only within but between disciplines.

The conference will feature keynote talks, invited papers, Pecha Kucha presentations, workshops and a poster session.

About the Conference organisers
The 2012 Threshold Concepts Conference is the National Academy's 6th Annual Conference and the 4th Biennial Threshold Concepts Symposium.

The National Academy is a collaborative initiative between five Higher Education Institutes in Ireland which proposes to support graduate students, researchers and academic staff to implement and advance effective research-informed teaching and learning practices for diverse audiences. The National Academy’s activities are extended to all Higher Education Institutes in Ireland and include a Grants Initiative and National Awards for Excellence in Teaching.

This is the fourth biennial Threshold Concepts conference and builds on three previous international events held in Sydney, Ontario and Glasgow. The conference attracts a largely international delegation and this year’s conference is no exception with representation from South and North America, Australasia, Africa and Europe.

Abstract Reviewers
Close to 200 abstracts for papers, posters and workshops were submitted for review and we are very grateful to all of those involved in the selection process and to the members of the Abstract Selection committee.

Venue Information
*Trinity College Dublin*

Trinity College is the oldest University in Ireland and was founded in 1592 by Queen Elizabeth I. The College is famed for great treasures such as the Book of Kells, a 9th century illuminated manuscript, the Books of Durrow and Armagh and an early Irish harp. It also numbers several famous figures amongst its alumni including playwright Oscar Wilde, writer Jonathan Swift, Noble prize winning physicist Ernest Walton and philosophers George Berkeley and Edmund Burke.

Registration and Information Desk
Registration will take place from 8h 00 on Thursday 28th of June. The registration desk is located on first floor of the Hamilton Building and will be manned from 8h 00 - 17h 30 on June 28th and from 9h 00 - 16h 30 on June 29th.

Catering
*Mid-morning*

Refreshments and lunch are provided free of charge for the duration of the conference. Both will be served on the ground floor of the Hamilton Building by the Westland Restaurant. Posters will be displayed on the first floor of the Hamilton Building and delegates are invited to spend some of their break time perusing these high quality displays.
**Evening**
The conference dinner will be held on Thursday, 28th June at 19h 00 in the East Wing of the Great Dining Hall of Trinity College. Delegates who have pre-booked to attend the dinner will receive a dinner ticket at registration. The registration desk should be notified of any change in the attendee list for the dinner. Unfortunately, it is not possible to issue a refund for the dinner unless the cancellation has been made prior to June 1st.

Delegates not attending the conference dinner may wish to meet up with fellow delegates in the Church Bar on Jervis Street on the 28th from 9.30pm onwards. An area has been reserved in the main bar for the conference attendees.

**Travel to and from Trinity College Dublin**
A taxi rank is located at the front of Trinity College Dublin. A taxi to Dublin airport costs ~ €40 and should take about 45 minutes depending on traffic. A taxi to Heuston station or Connolly train station costs ~ €15 and should take 20 minutes. Similarly a taxi to Bus Arás costs ~ €15. Local bus services are also available along the front of Trinity College and on Westmoreland Street which travel to the airport and to Connolly station as well as other locations.

**Twitter Updates and Conference App**
Follow updates and comments from the conference on Twitter using the #NAIRTL12 hash tag. Contributions to the conversation are encouraged.

The International Threshold Concepts conference schedule is now available on your smart phone or tablet. Navigate to the following URL on your mobile device to download the app.
http://internationalthresholdconce2012ashed.org/

**Internet Access**
While wifi access is not available, delegates are invited to logon to the wireless Eduroam network in Trinity College, but need to register their mobile devices with their home institution first to avail of this service. Full details on accessing the Eduroam network are available at http://isservices.tcd.ie/network/eduroam_non_tcd_config.php

**Recording**
The keynote presentations will be recorded by HEA net and streamed live. See NAIRTL website for details.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session/Activity</th>
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<tbody>
<tr>
<td>0800</td>
<td>Registration, Ground Floor, Hamilton Building</td>
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<tr>
<td>0915</td>
<td>Opening address and welcome by Professor Patrick Prendergast</td>
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<tr>
<td>0930</td>
<td>Keynote 1: Ray Land, Durham University &quot;A Closer Look at Liminality: incorrigibles and threshold capital&quot; - MacNeill Theatre</td>
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<tr>
<td>1000</td>
<td>Keynote 2: Bettie Higgs, University College Cork &quot;Threshold Concepts: Navigating the Route&quot; - MacNeill Theatre</td>
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<tr>
<td>1050</td>
<td>Publication Launch by Professor Alan Kelly, UCC &quot;Developing an institutional framework for supporting supervisors of research students: a practical guide&quot; - MacNeill Theatre</td>
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<tr>
<td>1130</td>
<td>Tea and coffee, Poster viewing, Ground and First Floor, Hamilton Building</td>
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**PARALLEL SESSION A**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session/Activity</th>
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<tbody>
<tr>
<td>1100</td>
<td>Engaging Students with TCs, Maxwell Theatre</td>
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<tr>
<td>1150</td>
<td>Pecha Kucha, MacNeill Theatre</td>
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<tr>
<td>1200</td>
<td>Interdisciplinary TCs, Joly Theatre</td>
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<tr>
<td>1250</td>
<td>TCS in Professional Development, Lecture Theatre 1</td>
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<tr>
<td>1300</td>
<td>New Developments in TCS, Lecture Theatre 2</td>
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11:30 - 13:00

<table>
<thead>
<tr>
<th>Session/Activity</th>
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<tbody>
<tr>
<td>Foley, Brian (Seeding paper*) Engineering problem solving: uncovering a Threshold experience and triggering a meta-learning response</td>
</tr>
<tr>
<td>Holland, Dónal et al The Role of design projects in assisting Engineering students from liminality to understanding</td>
</tr>
<tr>
<td>Breen, Sinead and O’Shea, Ann Designing tasks to aid understanding of functions</td>
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<tr>
<td>Taylor, Charlotte et al Using a mixed methods approach to explore student understanding of hypotheses in Biology</td>
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<th>Session/Activity</th>
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<tbody>
<tr>
<td>[Engaging Students with TCS] 7 x 7min PK presentation</td>
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<tr>
<td>Pecha Kucha presentations will run in parallel to the thematic presentations and workshops on Thursday and Friday. In this format the presenter shows 20 slides at 20 seconds per slide, before the next presenter takes the stage. Full details of the Pecha Kucha presentations are overleaf.</td>
</tr>
<tr>
<td>Boggs, Katherine Spatial cognition, a multi-disciplinary Threshold Concept</td>
</tr>
<tr>
<td>Ryan, Anne Marie Seeing deeply in space and through time: interdisciplinarity meets Threshold Concepts in Earth and Environmental Science</td>
</tr>
<tr>
<td>Peter, Mira and Harlow, Ann Teaching and grasping Threshold Concepts: four disciplines and one paradigm</td>
</tr>
<tr>
<td>Thompson, Rachel Criticality as a Threshold Concept, defined and limited by disciplinary power</td>
</tr>
<tr>
<td>Hokstad, Leif Martin et al A comparative academic/industrial Professional Development study of Threshold Concepts in project management</td>
</tr>
<tr>
<td>Maguire, Sarah and Curran, Roisin Using Threshold Concepts as a vehicle for academic development</td>
</tr>
<tr>
<td>Barnatt, Joan and McKnight-McKenna, Mary Addressing diversity as asset: using social justice vignettes for transformational change in Teacher preparation</td>
</tr>
<tr>
<td>Ryan, Tony Medical student reflections of Newborn Medicine: looking back for Threshold Concepts</td>
</tr>
<tr>
<td>Quinlan, Kathleen et al (Seeding paper*) A developing methodology to locate curricula thresholds in first year engineering</td>
</tr>
<tr>
<td>Adawi, Tom and Kabo, Jens Exploring Threshold Concepts and liminal spaces using phenomenography: Engineering students' conceptions of technology as an example</td>
</tr>
<tr>
<td>Wuetherick, Brad and Loeffler, Elizabeth Threshold Concepts and Decoding the Humanities: a case study of a Threshold Concept in Art History</td>
</tr>
<tr>
<td>Guerin, Cally and Green, Ian Is voice a Threshold Concept in Doctoral Education?</td>
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13:00 - 14:00

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<tr>
<th>Session/Activity</th>
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<tbody>
<tr>
<td>Lunch and Poster viewing, Ground and First Floor, Hamilton Building</td>
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**PARALLEL SESSION B**

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<tr>
<th>Time</th>
<th>Session/Activity</th>
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<tbody>
<tr>
<td>1400</td>
<td>Engaging Students with TCs, Maxwell Theatre</td>
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<tr>
<td>1450</td>
<td>Pecha Kucha, MacNeill Theatre</td>
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<td>1500</td>
<td>Interdisciplinary TCs, Joly Theatre</td>
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<tr>
<td>1550</td>
<td>TCS in Professional Development, Lecture Theatre 1</td>
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<tr>
<td>1600</td>
<td>New Developments in TCS, Lecture Theatre 2</td>
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14:00 - 15:45

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<thead>
<tr>
<th>Session/Activity</th>
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<tbody>
<tr>
<td>Harlow, Ann et al (Seeding paper*) Students’ perceptions of travel through the liminal space: lessons for teaching</td>
</tr>
<tr>
<td>Carstensen, Anna-Karin Make Links - Overcoming the</td>
</tr>
<tr>
<td>[Engaging Students with TCS] 7 x 7min PK presentation</td>
</tr>
<tr>
<td>Hall, Brendan &quot;How do you know?&quot; The Threshold Concept, multi-disciplinary approaches and the Age of Uncertainty</td>
</tr>
<tr>
<td>Brunetti, Korey et al Interdisciplinarity and information</td>
</tr>
<tr>
<td>Timmermans, Julie (Seeding paper*) Identifying Threshold Concepts in educational development</td>
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<tr>
<td>Gilrane, Coleen Shifting identity in teacher development</td>
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<tr>
<td>Akerlind, Gerlese et al (Seeding paper*) A new model for teaching and learning of Threshold Concepts</td>
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<tr>
<td>Devanas, Monica The “Science Education for New Civic Engagements and</td>
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### PARALLEL SESSION C WORKSHOPS

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<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>14h00</td>
<td>Threshold and entering the portal of understanding</td>
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<td>Davies, Jason</td>
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<td>Locked doors: Threshold Concepts as guardians</td>
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<td>15h45</td>
<td>literacy instruction: a Threshold Concepts approach</td>
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<td></td>
<td>Kabo, Jens and Baillie, Caroline</td>
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<td></td>
<td>Don't fear the Engineer: Social Science students exploring a liminal space with Engineering students</td>
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<tr>
<td>15h45</td>
<td>Embedding Threshold Concepts in a Student Learning Community</td>
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<td>Horn, Jody</td>
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<td>Cooper, Trudi</td>
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<td>Threshold Concepts as a heuristic device in an ill-structured discipline</td>
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<td></td>
<td>Thomas, Lynda et al</td>
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<td>A broader Threshold: including skills as well as concepts in computing education</td>
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<td></td>
<td>Davies, Peter</td>
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<td>Threshold Concepts: a distinctive experience of integration and transformation in conceptual change</td>
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### PARALLEL SESSION D WORKSHOPS

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>16h15</td>
<td>Tea and coffee/ Poster viewing - Ground and First Floor, Hamilton Building</td>
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<tr>
<td></td>
<td>Pecha Kucha - MacNeill Theatre</td>
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<td></td>
<td>Engaging Students with TCs - Maxwell Theatre</td>
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<td>TCs in Professional Development - Lecture Theatre 1</td>
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<td></td>
<td>New Developments in TCs 2 - Lecture Theatre 2</td>
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<tr>
<td>16h15</td>
<td>McCarthy, Marian and Blackshields, Daniel</td>
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<td>&quot;Looking for trouble: encountering the unknown at the National Gallery of Ireland&quot; [Group will depart from Hamilton Building for Gallery]</td>
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<tr>
<td>16h15</td>
<td>[TCs in Doctoral Supervision] 5 x 7min PK Presentation</td>
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<tr>
<td>16h15</td>
<td>Pace, David et al</td>
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<td>Mastering a Threshold Concept through Decoding the Disciplines</td>
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<tr>
<td>16h15</td>
<td>Wisker, Gina</td>
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<td>Vision and voice: Conceptual Threshold crossing in writing for academic publication programmes</td>
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<td>16h15</td>
<td>Getman Eraso, Jordi et al</td>
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<td>Documenting learning while crossing the Threshold: exploring e-Portfolios and Threshold Concepts in multiple contexts</td>
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<tr>
<td>17h20</td>
<td>Close Day One</td>
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<tr>
<td>19h00</td>
<td>Conference Dinner - East Wing, Dining Hall, Trinity College Dublin</td>
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### FRIDAY 29TH JUNE 2012

<table>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>09h00</td>
<td>Tea and coffee/ Poster viewing - Ground and First Floor, Hamilton Building</td>
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<tr>
<td>09h30</td>
<td>Keynote 3: Glynis Cousin, University of Wolverhampton &quot;Threshold Concepts as an Analytical Tool for Researching Higher Education Pedagogy&quot; - MacNeill Theatre</td>
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<tr>
<td>10h15</td>
<td>Engaging Students with TCs 1 - Maxwell Theatre</td>
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<td>Pecha Kucha - MacNeill Theatre</td>
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<td>Interdisciplinary TCs - July Theatre</td>
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<td>TCs in Professional Development - Lecture Theatre 1</td>
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<tr>
<td>10h15</td>
<td>Grogan, Sam</td>
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<td>&quot;Playing&quot; so hard we fall out of our heads: Threshold Concepts and troublesome knowledge in experiences of experiential knowledge acquisition in Higher Education actor training</td>
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<td>10h15</td>
<td>Gilvary, Gerry</td>
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<td></td>
<td>An overview of the application of Enquiry Based Learning and Threshold Concepts in Practice Based Arts</td>
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<td>10h15</td>
<td>Koolie, Marguerite</td>
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<td></td>
<td>Ontological and epistemological Threshold Crossings of doctoral students in networked learning environments: My ontology...what?</td>
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<td>10h15</td>
<td>Wertzler, Lee and Gale, Richard</td>
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<td>Self as a learner as a Threshold Concept: the University journey</td>
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<td>10h15</td>
<td>Quinnell, Rosanne et al</td>
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<td>Academic numeracy: challenging thinking dispositions to enable</td>
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<tr>
<td>10h15</td>
<td>Devitt, Ann et al</td>
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<td>Threshold Concepts and practices in Teacher education: professional, educator and student perspectives</td>
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<tr>
<td>10h15</td>
<td>Atherton, James et al</td>
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<td>Troublesome Thresholds and limiting liminality: issues in teaching in Vocational Education</td>
</tr>
<tr>
<td>10h15</td>
<td>Ó Donnchadh, Brian</td>
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<td></td>
<td>Moving from personal practice to communities of reflective practice: a</td>
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<tr>
<td>10h15</td>
<td>Allen, Belinda</td>
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<td>Creativity as Threshold - learning and teaching in a liminal space</td>
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<tr>
<td>10h15</td>
<td>Barradell, Sarah</td>
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<td>Visible learning of Threshold Concepts - an example of an assessment task using Concept Mapping</td>
</tr>
<tr>
<td>10h15</td>
<td>Whalley, Brian</td>
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<td>Integrating teaching using troublesome knowledge items,</td>
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<td>Time</td>
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<tr>
<td>10h 15 - 11h 20 (cntd)</td>
<td>Fortune, Tracey et al The Hero’s Journey: Uncovering threshold barriers, dispositions and practices among occupational therapy students</td>
</tr>
<tr>
<td>11h 20 - 11h 50</td>
<td>Tea and coffee/ Poster viewing - Ground and First Floor, Hamilton Building</td>
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<tr>
<td>11h 50 - 13h 00</td>
<td>Ciccone, Anthony and Meyers, Renee Accepting ambiguity, enjoying complexity: Threshold Concepts for the Humanities Sentziuk, Paul Helping Students to ‘Think Historically’ by Engaging with Threshold Concepts Cronin, James ‘Doing’ history: what may liminal space and transition time expose during the process of mentoring new graduate tutors in the discipline of history?</td>
</tr>
<tr>
<td>13h 00 - 14h 00</td>
<td>Lunch and poster viewing - Ground and First Floor, Hamilton Building</td>
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<tr>
<td>14h 00 - 15h 00</td>
<td>Barton, Graham ‘Threshold Concept Literacy’: helping learners develop writing skills and acquire Threshold Concept understanding through examining associated transformations in discourse</td>
</tr>
<tr>
<td>15h 00 - 15h 30</td>
<td>Tea and coffee/ Poster viewing - Ground and First Floor, Hamilton Building</td>
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<tr>
<td>16h 10 - 16h 15 Publication Launch by Professor Aine Hyland, NAIRTL “NAIRTL Grants Initiative: Evaluation of Impact” - MacNeill Theatre</td>
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<tr>
<td>16h 15 - 16h 30 Conference summation - MacNeill Theatre</td>
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<tr>
<td>16h 30 Close Day Two</td>
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Pecha Kucha
Thursday June 28th

[Engaging Students with Threshold Concepts]
PARALLEL SESSION A: 11h 30 - 13h 00
Chair: Ray Land, Durham University

1: Fellenz, Martin
Transforming Learning and Learners: The Promise of Process Oriented Threshold Concepts

2: Shopkow, Leah and Diaz, Arlene
Still Lurking in the Background: Bottlenecks, Threshold Concepts, and Epistemology

3: Orsini-Jones, Marina
Towards a Role-Reversal Model of Threshold Concept Pedagogy

4: Osmond, Jane
Threshold Concepts and Research Informed Teaching

5: Sebert, Candy and Archulta-Frush, Kristi
Creating Optimal Distance Education Environments for the Emergence of Threshold Concepts

6: Murray, Shannon
A Shakespeare Threshold: Engaging Students in Understanding Prosody

7: Blair, Lorrie, Fitch, Sebastien, and Barrington, Janette
Art Education and Troublesome Knowledge: Helping Students Form Identities as Artist Teachers

4: Webster, Elaine and McDiarmid, Claire
Contingency in Practice: Applying a Threshold Concept in Law

5: Kennedy, Eileen
Crossing a Threshold Concept in Biology: Variation in Student Learning

[Engaging Students with Threshold Concepts]
PARALLEL SESSION B: 14h 00 - 15h 45
Chair: Sarah Maguire, University of Ulster

1: Northcote, Maria
I Hate Maths and Maths Hate Me! Analysing the Development of Threshold Concepts and Attitudes in Preservice Mathematics Teacher Education

2: Rodger, Sylvia, Turpin, Merrill and Springfield, Liz
Experiences of Academic Staff in Using Threshold Concepts in Occupational Therapy Curricula to Engage Students

3: Kobus, Marta, Kinchin, Ian, Cabot, Lyndon and Woolford, Mark
Exploring the relationship between curriculum, learning process and the theory of threshold concepts in the context of dental education

[Threshold Concepts in Doctoral Supervision]
PARALLEL SESSION C: 16h 15 - 17h 15
Chair: Alan Kelly, University College Cork

1: Kiley, Margaret
Now I Know Why I Have Been Knocking My Head Against a Brick Wall: Doctoral Candidates and Stuck Places

2: Coughlan, Paul and Graham-Cagney, Anne
Doctoral Education at the 'Eye' of the Perfect Storm

3: Wuetherick, Brad and Thompson, John
'Enabling' Graduate Attributes as an Interdisciplinary Threshold

4: Keefer, Jeffrey and Parchoma, Gale
The Experience of Interdisciplinarity in Doctoral Research: Threshold Journeys

5: Wright, Alan and Monette, Marie-Jeanne
"Is there a Doctor in the house?" Pedagogical Portals and the PhD
**Pecha Kucha**

**Friday June 29th**

[Interdisciplinary Threshold Concepts]

PARALLEL SESSION D: 10h 15 - 11h 20

Chair: Bettie Higgs, University College Cork

1: Kautz, Christian

*Threshold Concepts in Introductory Engineering: Useful Metaphor or Empirically Based Construct?*

2: Magdziarz, Sonia, Myers, Paul, and Bellamy, Sheila


3: Johansson, Charity

*Using Language to Transform Judgmental Attitudes*

4: Bernhard, Jonte, Carstensen, Anna-Karin, and Holmberg, Margarita

*Understanding Phase as an Entrance to the Portal of Understanding in Physics and Electrical Engineering*

__________________________________

[New Developments in Threshold Concepts]

PARALLEL SESSION E: 11h 50 - 13h 00

Chair: Brian Foley, Trinity College Dublin

1: Hersey, Corrine

*Integrating Threshold Concepts Pedagogy into a Market-Value Education System to Reduce the “Plagiarism Epidemic”*

2: Scott, Jonathan, Harlow, Ann, and Peter, Mira

*Towards a TCT-Inspired Electronics Concept Inventory*

3: Delany, David

*The Emperor's New Concept: Vague, Postmodern, and Unfalsifiable - Is Threshold Concept Theory a Step too Far?*

4: Parker, Jan

*Scaffolding’ v ‘Digitally-Enabled Co-Construction of Troublesome Knowledge’. The Case of ‘Engaging with Theory in Literary Close Reading’*

5: Shinners-Kennedy, Dermot

*The Geometry of Threshold Concepts*

6: Bedek, Michael, and Albert, Dietrich

*Embedding Threshold Concepts into Hierarchical Concept Structures*

7: Love, Jane

*From Filling Buckets to Lighting Fires: Faculty at the Threshold*

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[Threshold Concepts in Professional Development]

PARALLEL SESSION F: 14h 00 - 15h 00

Chair: Vicky Davies, University of Ulster

1: Pilkington, Ruth

*Playing with Models to Conceptualise, Support and Assess Professional Learning*

2: Kinchin, Ian and Cabot, Lyndon

*Threshold Concepts and the Spiral Curriculum: Complementary or Conflicting Ideas?*

3: Noonan, Sarah

*Threshold Crossings and Concepts in Teaching: An Exploration*

4: Kirwan, Gloria

*Up Close and Personal: Engaging Learners with Service-User Perspectives*

5: McKeon, Jacinta

*Threshold Concepts in the Professional Development of Second Language Teaching: Teaching Grammar Communicatively*

6: Fuzzard, Rhonda and Kiley, Margaret

*What Concepts Underpin Skills Training in Community Services in Vocational Education and Training*
# Conference Planner Day 1

Thursday 28th June, Trinity College Dublin

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>08h 00 - 09h 15</td>
<td>Registration</td>
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<tr>
<td>09h 15 - 09h 30</td>
<td>Opening address: Patrick Prendergast, Provost, Trinity College Dublin</td>
<td>MacNeill Theatre</td>
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<tr>
<td>09h 30 - 10h 20</td>
<td>Keynote 1: Ray Land, Durham University</td>
<td>MacNeill Theatre</td>
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<td>10h 20 - 10h 50</td>
<td>Keynote 2: Bettie Higgs, University College Cork</td>
<td>MacNeill Theatre</td>
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Notes
# Conference Planner Day 2

**Friday 29th June, Trinity College Dublin**

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<td>Keynote 3: Glynis Cousin, University of Wolverhampton</td>
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<td>15h 30 - 16h 10</td>
<td>Keynote 4: Patrick Carmichael, University of Stirling</td>
<td>MacNeill Theatre</td>
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<td>MacNeill Theatre</td>
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<td>16h 15 - 16h 30</td>
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**Notes**
Keynote Speakers

Ray Land, Durham University

Ray Land is Professor of Higher Education at Durham University and Director of Durham’s Centre for Academic Practice. He previously held similar positions at the Universities of Strathclyde, Coventry and Edinburgh. He has been a higher education consultant for the OECD and the European Commission and is currently involved in two EC higher education projects in Europe and Latin America. He has published widely in the field of educational research, including a seminal work on education development, Educational Development: Discourse, Identity and Practice (OUP 2004), and two co-edited books on learning technology - Education in Cyberspace (Routledge Falmer 2005) and Digital Difference: perspectives on online learning (Sense 2011). He has also co-edited several volumes on the theme of threshold concepts and troublesome knowledge, including the most recent Threshold Concepts and Transformational Learning (Sense 2010).

Bettie Higgs, University College Cork

Bettie Higgs is the co-director of the Teaching and Learning Centre at University College Cork and is also a lecturer in the Department of Geology. She is interested in the nature of learning, and the public understanding of science, and since 2002 she has also coordinated activities designed to support staff in their teaching and learning role in University College Cork. She was a 2005 Carnegie Scholar, at the Carnegie Foundation for the Advancement of Teaching and received an MA in Teaching and Learning in Higher Education in 2007. She is also an associate lecturer for The Open University, and she tutors geology to students in the Centre for Adult and Continuing Education, UCC.

Glynis Cousin, University of Wolverhampton

Glynis Cousin is the Director of the Institute of Learning Enhancement in the University of Wolverhampton. She has joined the University from her previous role as Senior Advisor at the Higher Education Academy. She is one of the UK’s foremost educational researchers and has extensive experience working with teachers in many disciplines. Throughout her work as a higher education researcher and developer Glynis has published in the areas of diversity, internationalisation, evaluation and pedagogic research. She is also strongly associated with the field of curriculum inquiry that is centred on threshold concept
theory. Her most recent book Researching Learning in Higher Education has just been published by Routledge.

Patrick Carmichael, University of Stirling

Patrick Carmichael is Professor of Education at the University of Stirling. He has been a Principal Investigator of a number of educational and education technology research projects, including several which have applied and explored the ideas of ‘threshold concepts’ and ‘troublesome knowledge’ in widely divergent educational settings. His recent work has focused particularly on teaching and learning in interdisciplinary settings and on rethinking the nature of ‘design’ as it applies to learning technologies.

Seeding Papers*

Seeding papers will precede similarly themed papers in parallel sessions and will enable focussed discussion on the topic in question.
Keynote Addresses

Thursday 09h 30 - MacNeill Theatre

A Closer Look at Liminality: incorrigibles and threshold capital

Ray Land, Professor of Higher Education and Director of the Centre for Academic Practice, Durham University

Threshold Concepts research has drawn extensively on the notion of liminality, a transformative state in the process of learning in which there is a reformulation of the learner’s meaning frame (Schwartzman 2009) and an accompanying shift in the learner’s ontology. The notion, however, remains largely ill-defined in the manner of a black box. This paper will explore the extent to which certain aspects of the liminal state might be deemed ‘incorrigibles’ (Ayer 1956) which in principle are inaccessible and ‘unverifiable because they are matters of self-knowledge’ (Gomm 204). Alternatively the paper examines whether it might be possible to gain more purchase on why certain learners seem better able to negotiate the liminal space and others to find difficulty in doing so. Is it possible to identify likely determinants of successful liminal transition? Is there an optimal clustering or necessary mix of learner characteristics that might constitute a form of ‘threshold capital’ to sustain the learner through conceptual challenge and difficulty. What discourses or perspectives might be available to help us gain better insights into such a notion? And what would be the implications of such a notion for the development of transformative pedagogies?

Thursday 10h 20 - MacNeill Theatre

Threshold Concepts: Navigating the Route

Bettie Higgs, lecturer in the Department of Geology and co-director of the Teaching and Learning Centre, University College Cork

Teachers in Higher Education are disciplinary experts and are aware of concepts that their students find hard to grasp – the troublesome but crucial concepts. They design the learning opportunities that invite students into the liminal space.

We all have students who willingly expend the energy, engage and move from novice towards expert. But what about the other students? What are they up to? Why do they not make the most of the opportunities on offer? We can invite student to the portal, but if they don’t enter, and struggle to get through, what can we do? We as disciplinarians must be able to answer these questions in order to help our students.

This paper asks what do students do that prevents them from grasping (or even approaching) the threshold concept? It seems it is not always the ability of students that is lacking, but the desire for action. The ability-action gap of Ritchhart (2002) exists. What it looks like and why it is there, will be explored. The paper also asks what do we, as teachers,
do that causes difficulty for students. Is it always the Threshold Concept itself that is so troublesome?

The paper will suggest that we should not need to design opportunities for every key concept? From my own studies over the past five years, I consider what we as teachers can do to help students. The important characteristic of threshold concepts ‘revealing the hidden interrelatedness of things’, will be analysed, and lead to suggestions of how we can help students to build capacity to engage with threshold concepts whenever they meet them in their university studies and beyond.

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Friday 09h 30 - MacNeill Theatre

Threshold Concepts as an Analytical Tool for Researching Higher Education Pedagogy

Glynis Cousin, Director of the Institute of Learning Enhancement, University of Wolverhampton

The field of higher education research has been dominated by what might be broadly called ‘student experience’ research. Some very important findings have come from this emphasis but I want to suggest that it is time to shift our attention to the relationship between students and teachers: how do they together shape what is un/taught and what is learnt (or not?). How can there be more pedagogic conversations between the two? How do we include in our research a concern for the affective dimension to the teacher-student relationship? How do we invite sociology into our analysis? In responding to these questions, I will draw on what I have called ‘transactional curriculum inquiry’ (Cousin, 2009) as a way of bringing students and teachers together in a common exploration into what might be the threshold concepts they confront, the associated ontological issues and pedagogic strategies for mastery. I will draw on practical examples to illustrate ways in which this can be done.

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Friday 15h 30 - MacNeill Theatre

From this Curriculum to That which is to Come: Threshold Concepts, Complexity and Change

Patrick Carmichael, Professor of Education, University of Stirling

If threshold concepts are understood as being “akin to portals”, how can the idea help us understand teaching and learning environments in which the curriculum is rapidly changing or has not yet stabilised to the point that clear paths can be plotted through it? In this keynote, I will discuss my experience of working with the ideas of threshold concepts and troublesome knowledge in the course of a series of research and development projects in higher education.

In some of these settings, the curriculum, learning environments, activities and assessment processes represent stable enactments of well-established disciplinary practices and
discourses, while in others, teachers set out deliberately to 'trouble' the notion of the curriculum as static and stabilised. This leads to different understandings and 'materialisations' of the notion of threshold concepts, and, for that matter, the value of engaging with knowledge that is 'troublesome'.

But what of those learning environments in which the notion of curriculum is even less stable, and in which the teacher and students collaborate to create something new, different and strange? My recent work with teachers and students of Contemporary Dance has offered different views of what teaching and learning in higher education might involve, and one that I personally have found 'troublesome' at times. I reflect on the role of 'thresholds' in courses in which teachers and students innovate and learn together, and in which no-one is quite sure what might be beyond the portals that they approach together.
Publication Launch

Thursday 10h 50 - MacNeill Theatre

Developing an institutional framework for supporting supervisors of research students

Authors: Alan Kelly, UCC (Chair of NAIRTL’s Supervisor Support and Development Working Group), Lucy Byrnes, NUI Galway, Veronica Campbell, TCD, Janet Carton, UCD, Siobhan Harkin, WIT, Anna Marie Leonard, NUI Galway, Pat Morgan, NUI Galway, Ciara O’Farrell, TCD, Catherine O’Mahony, NAIRTL and Niall Smith, CIT

Following the successful pilot of the curriculum framework for the support and development of supervisors of postgraduate research students, the NAIRTL working group has compiled a booklet providing a series of commentaries on approaches to such training and a description of the primary elements of the final framework itself. It is intended that this information may be of use to any institutions interested in developing their own supports for research supervisors, and ultimately thus of benefit to the supervisors themselves and, of course, their students. This publication will be officially launched in the MacNeill Theatre on Thursday, June 28th, at 10h 50.

Friday 16h 20 - MacNeill Theatre

NAIRTL Grants Initiative: Evaluation of Impact

Authors: Jennifer Murphy and Aimie Brennan

NAIRTL’s mission is to ensure that all higher education students are exposed to cutting edge research in their classrooms, and that students at undergraduate and postgraduate levels are actively engaged in relevant and authentic research in their chosen discipline. To this end, NAIRTL has initiated a wide range of events and activities aimed at enhancing student learning and that support stronger links between research and teaching.

This publication focuses on the impact of just one of these creative interventions, namely the NAIRTL grants initiative. More than forty per cent of the National Academy’s total budget to date has been invested in the grants initiative, funding 161 projects that involve 420 researchers in seventeen higher education institutions in Ireland. The impact of projects funded in the period 2007-2010 is presented in this publication as well as case studies of fifteen projects funded through the NAIRTL grants initiative. The publication will be launched in the MacNeill Theatre on Friday, June 29th, at 16h 10.
Day 1 Session A - Papers

ENGAGING STUDENTS WITH THRESHOLD CONCEPTS

Thursday 11h 30 - Maxwell Theatre

Engineering Problem Solving: Uncovering a Threshold Experience and Triggering a Meta-Learning Response

Brian Foley, Trinity College Dublin

Problem solving is core to both the formation and practice of engineering. While students are typically nonplussed by routine textbook problems, when confronted by less straightforward scenarios, such as open-ended problems, multisolution problems, or serious complexity, they can find the experience troublesome, particularly freshman students. Treating engineering problem solving within a threshold experience framework, this paper seeks to investigate both the troublesome and transformative aspects with particular reference to electronic engineering and to investigate the impact of induced metalearning.

Many College-based engineering programmes now incorporate some formal training in generic problem solving skills. While the reaction to such modules is typically positive, the longterm impact is limited, mostly because the training is inadequately grounded in the particular discipline. A similar critique can be made in respect of efforts to make students aware of their own learning in a metalearning sense. Meyer (2010) has suggested that better results might be obtained from metalearning initiatives by making them less generic and embedding them more in the target discipline. This, he further suggests, can be given effect within a threshold concepts framework.

The author currently has a study of this type in progress in which the problem solving practices of a group of engineering students are under investigation over a period of time. The design of the study is such that not only are the troublesome and empowering dimensions of electronic circuit problem solving under scrutiny, but the participants are required to consciously and critically reflect on the approaches they adopt. Because the study is distributed over an extended period of time, it is also envisaged that it will yield information on how the sustained metalearning has impacted on their problem solving capacity.


Thursday 11h 50 - Maxwell Theatre

The Role of Design Projects in Assisting Engineering Students from Liminality to Understanding
Perkins (1999) defines inert knowledge as that which is ‘unpacked only when specifically called for by a quiz or direct prompt’, and is not connected to everyday applications in the minds of students. This is related to the state of liminality, in which students have encountered threshold concepts but have not yet integrated and been transformed by them (Meyer and Land, 2003). This paper will explore the potential for practical design projects to allow engineering students to use and integrate such inert knowledge.

In many engineering programs, students must spend the early years studying lecture-based courses focused on scientific theories and mathematical techniques before they can begin applying them. Without sufficient opportunity to experiment with and integrate this knowledge there is a risk that it remains inert and the students are stuck in a state of liminality. Recent initiatives such as CDIO (Conceive-Design-Implement-Operate) can be seen as attempts to address this by introducing more project-based learning into the engineering curriculum.

The aim of this study is to investigate whether CDIO-style project-based courses assist students in integrating inert knowledge they have learnt in previous courses. Identifying threshold concepts is a challenging task in general, and is especially so in this case as the concepts being applied are not directly part of the subject matter of the course. The study focuses on designing a data-collection instrument to identify potential threshold concepts and explore the effect that coursework has on students’ understanding. This will be used in two settings: a medical device design course in Harvard University and a mechanical engineering design course in Trinity College Dublin. Both courses involve students working in small teams on ‘real-world’ design projects. This study is part of a larger research project which aims to develop project-based coursework to be implemented in both settings.

Thursday 12h 10 - Maxwell Theatre

Designing Tasks to Aid Understanding of Functions

Sinead Breen and Ann O’Shea, NUI Maynooth

The concept of a ‘function’ can be viewed as a threshold concept in Mathematics. To properly understand functions and to work with them in diverse areas of mathematics, students should be able to conceive of a function as an action, as a process and as an object in its own right. In fact, some authors have claimed that successful mathematical thinking lies in moving flexibly from one interpretation to another. However, most students find the transition of thought involved in progressing to view a function as an object troublesome. Once such ‘reification’ has taken place, it is unlikely to be forgotten, previously inaccessible means of thinking about many different mathematical concepts are opened up, and students’ conceptual understanding is transformed. The key role played by functions in
Mathematics justifies paying significant attention to the teaching of functions and to the types of tasks assigned to students to support their learning.

Traditionally undergraduate courses in Mathematics tend to be described in terms of the mathematical content and techniques students should master and theorems they should be able to prove. Moreover, recent studies have shown that many sets of mathematical tasks produced for third-level students emphasize lower level skills, such as memorization and the routine application of algorithms or procedures, rather than endeavouring to develop students’ understanding of the underlying concepts. In this talk, we will describe a set of tasks designed by the authors to help students develop a comprehensive understanding of functions and to move flexibly between different interpretations and representations of functions. The design of tasks drew on a number of frameworks, such as those of Swan and Mason, adapted for use with undergraduate students.

This work formed part of a project funded by a NAIRTL grant.

Thursday 12h 30 - Maxwell Theatre

Using a Mixed Methods Approach to Explore Student Understanding of Hypotheses in Biology

Charlotte Taylor, Vicky Tzioumis, University of Sydney; JHF Meyer, University of Queensland; and Pauline Ross, University of Western Sydney

Our investigations of conceptual understanding of biology have led to the formulation of a matrix of threshold concepts for the discipline (Ross et al, 2010), of which the creation and testing of a hypothesis is a key component. Previous studies of this threshold concept (Taylor, 2009; Taylor and Meyer, 2010) confirm that it is fundamental to thinking and reasoning across the sciences, and that the complexity of the concept requires detailed elucidation if we are to design teaching experiences which track students in this extended liminal space (Lawson, 2000; Oh, 2010; Pederson, 2011).

We employed two approaches to identifying the dimensions of thinking about hypotheses and their testing: 1) a generic question “what is a hypothesis”, and 2) a scenario question requiring students to write a relevant hypothesis for a field investigation. Both questions were given to 900 incoming undergraduate science students in an introductory biology course. Responses to the first question yielded 72 item stems, which covered a broad range of conceptions of a hypothesis, and could be further categorized into 13 groupings. The responses to the scenario question were analysed phenomenographically and provided 7 categories of understanding which were broadly hierarchical.

Despite this concept being a fundamental area for study throughout the high school science syllabus, a significant proportion of the cohort demonstrated unsophisticated conceptions of the structure of the hypothesis. There were distinct commonalities in the dimensions of problem areas, namely the conception and delineation of variables, relationships between
variables, the construction of a testable statement, and the language used to describe the hypothesis.

Further refinement of our approaches has led to the development of a diagnostic psychometric instrument about hypotheses, and the creation of a range of scenario questions, currently in use in high school investigations and in longitudinal surveys of students in biology-related degree programs.
Spatial Cognition, a Multi-Disciplinary Threshold Concept

Katherine Boggs, Mount Royal University

Spatial ability is the mental reconstruction and manipulation of visual forms and the perception and retention of visual shapes. High-level spatial cognitive skills are critical for novice students to acquire during their journey towards becoming professionals in multiple disciplines such as the geosciences, biology, chemistry, engineering, interior design and theatre. The individual student experience in acquiring these spatial abilities is varied, but frequently transformative, irreversible and troublesome. Therefore it is proposed that spatial ability represents a Threshold Concept.

Different strategies have been employed in different disciplines at Mount Royal University for demonstrating these spatial visualizations. For example, in theatre students use lego and plasticine to build representative models while attempting to translate orthogonal drawings to theatre sets. In cell microbiology gelatin moulds with pasta are used to illustrate the 3D nature of plant cell organs. In the geosciences Google Earth Sciences (GES) models guide students towards visualizing what topographic contours represent and the 3D relationship between 2D drawings. Theatre and Engineering professors collaborated in the development of a website that contains a self-correcting questionnaire for spatial visualization. While intuitively these professors believe that these approaches work for guiding students towards developing the necessary spatial abilities, the student voice is just starting to be examined.

The stereonet represents one method for depicting 3D geological structures on a 2D piece of paper. Over a four year period, quantitative (midterm/final exam marks and responses to Likert scale questions) and qualitative (responses to open-ended questions) data was collected, that supports a simple model for everyone to use to either instruct or learn challenging concepts such as spatial cognitive skills. The five steps include: (i) Introduce concepts, (ii) Use accretive steps, (iii) Use stereonet to solve multiple problems (practice, practice, practice), (iv) Collaborate with peers, and (v) Build schematic models to solve geological problems.
concepts such as change in space through time, or the recognition of patterns and anomalies in complexity.

Earth and environmental science (growing out of geology) integrates aspects of all other sciences in attempting to understand our world. With EES’s long history of integrating disparate disciplines, it offers insights into the development of overarching threshold concepts in interdisciplinary fields. It is proposed here that the overarching threshold concepts in the EES include: (1) change through space and time; (2) recognizing patterns in variability; (3) living with complexity and uncertainty; (4) contextualizing space; (5) the interplay between equilibrium and disequilibrium, and (5) the integration of complex physical, biological, (with social, economic, psychological) and technological components.

Identifying and mastering these more complex overarching threshold concepts is key to students’ development of a true interdisciplinary understanding. This also poses new challenges for us to create learning environments in which students cross these more complex thresholds rather than simply side-step through the already-difficult troublesome concepts in the sub-disciplines involved. It is possible, though not desirable for example, that students develop understanding of geologic time and of 3-dimensional space, but never cross the threshold where the linkage between these is mastered. True interdisciplinarity approaches in EES require the latter, and our task is to pave the way for such integration. In other words, there are threshold concepts which are “inter-integrative” superimposed on those which are intra-integrative.

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_Thursday 12h 10 - Joly Theatre_

**Teaching and Grasping Threshold Concepts: Four Disciplines and One Paradigm**

*Mira Peter and Ann Harlow, University of Waikato*

This paper describes a two-year research project designed to investigate and apply threshold concept theory in New Zealand tertiary setting. Through the investigation and application of threshold concept theory, the project aims to enhance student achievement and participation, and contribute to a deeper understanding of the development and dynamics of cognitive expertise. Two researchers and four university lecturers are using a collaborative action-research paradigm to examine threshold concepts in tertiary curriculum and pedagogy.

The project involves iterative refinement of teaching methods and curriculum in four disciplines: electronics engineering, doctoral writing, English, and management communication. This paper shows how lecturers and researchers can work together to identify threshold concepts in and across the four disciplines, and how one can learn to recognise undergraduate and doctoral students’ knowledge gaps, misconceptions, and places where they become stuck in their learning. We describe possible ways of examining changes in student understanding of threshold concepts, how they learn them, and their experiences with threshold concepts over time. The paper presents our explorations of
lecturers’ emergent knowledge of threshold concepts and associated pedagogies, and how such pedagogies, distributed across lecturers, learners, and teaching method, can afford opportunities for learning. The paper outlines how we will endeavour to address the following:

- How does a lecturer’s awareness of threshold concepts impact teaching and supervision at the tertiary level?
- How does the introduction of threshold concepts into teacher-student discourse and teaching practice impact student learning at the tertiary level?
- Are there generalised threshold concepts that span disciplines?
- What value is there for the design of tertiary curriculum and pedagogy when lecturers from several disciplines interact to undertake action research?

Data sources, possible methods of data analysis, and emerging findings from the initial six months of the project will be discussed.

*Thursday 12h 30 - Joly Theatre*

**Criticality as a Threshold Concept, Defined and Limited by Disciplinary Power**

*Rachel Thompson, University of New South Wales*

Critical thinking is an inherent element of the troublesome and metacognitive nature of the threshold concept as defined by Meyer and Land (2003; 2005) and also has been examined as a threshold concept in its own right, for instance within information research. Furthermore, research on the interdisciplinary nature of critical thinking highlights the importance of learning these skills within a specific discipline area in order to enable later transference to other disciplines (Entwistle, 2008; Perkins and Salamon, 1992). Thus, criticality appears to be key to academic disciplinary development and existence. Barnett (1997) takes this further and champions a more holistic view, namely that graduates should aim to become critical practitioners; a state of being he believes is necessary for students and indeed academics to achieve their full potential within the world.

However, various social-cultural pressures (such as accrediting professional bodies) exert a strong influence on how students learn criticality in higher education. In this paper, I will argue that critical thinking is a major interdisciplinary threshold concept in its own right and hence can be defined as and at the same time be defining of a threshold concept. Furthermore, using a sociological perspective, I will explore the dynamics that influence a graduate’s learning path to becoming a critical practitioner and in particular, analyse the relationship between critical thinking and power within the higher education system. Consequently, I will show how this system creates and frames threshold concepts that in turn define the substance and boundaries of the disciplines, which, in their turn act to restrict the extent to which students control and extend their mastery of criticality, thus inhibiting the very skill that education claims to value above all others.
A Comparative Academic/Industrial Professional Development Study of Threshold Concepts in Project Management

Leif Martin Hokstad, Norwegian University of Science and Technology (NTNU); Mick Flanagan, University College London; Leif Martin Hokstad, Norwegian University of Science and Technology (NTNU); Matthias Zimmermann and Gerhard Ackermann, Siemens; Manuel Fradinho and Bjørn Andersen, Norwegian Foundation for Scientific and Industrial Research (SINTEF)

The threshold concept framework was chosen as one of the underpinning pedagogic approaches in an eleven nation European Union joint industry-academe project developing serious games within a virtual world environment for the training of project managers within industry. Such an aim takes the threshold concept out of its traditional milieu at two levels. Excellent studies exist on liminality and entering a virtual world but no studies have been reported on the use of the threshold concept framework as an analytical tool in the design of serious games for such an environment. Secondly, the few threshold concepts studies in project management are all situated in traditional university courses. No matching studies have been reported from industrial professional development programmes where an emphasis on competency profiling often marks them apart from most of their university counterparts. Traditional competency profiling is often structured around a mechanistic approach, ‘knowledge management’, rooted in monist epistemology, and does not sit comfortably with the threshold concept framework. However, Robinson, Sparrow, Clegg and Birdi’s radical reworking of competency profiling with a recognition that the interdependency of competences might explain the proliferation of competencies within tables whose generation was predicated on relatively few competences begins to resonate with the integrative characteristic of a threshold concept.

This paper will report on a comparative study between a university management course and an innovative industrial professional development programme. Both common and non-overlapping troublesome concepts have been identified and will be discussed in terms of the above dichotomy with an emphasis on the differing forms of tacit knowledge in the two communities. The discussion will centre on the teaching of negotiation within management where the complexity of project management appears to be reflected as a web of concepts similar in structure to that suggested by Davies and Mangan in economics.
This interactive paper will explore Threshold Concepts within the context of a Postgraduate Certificate in Higher Education and how they serve a dual role in shaping the curriculum. In the initial module, Student-Centred Learning, participants are introduced to the fundamentals of Threshold Concepts. They are asked to explore the notion and to discuss with colleagues, within a multi-disciplinary context, how this relates to their own practice at this early stage of their career. The authors have noted that both within these discussions and in subsequent assignments, a significant number of participants have used Threshold Concepts to inform and structure their own curriculum/teaching. Some follow-up research has been conducted with these participants, one year hence and this will be presented for discussion. Participants have been asked for their views on issues including initial reactions to the notion of Threshold Concepts, its relevance for their discipline and student learning, and areas of troublesome knowledge that students struggle with.

In addition, it has been apparent that the notion of Threshold Concepts has resonated with participants, providing them with a positive perception of the usefulness of pedagogic theory in explaining and supporting their emergent understanding of the sometimes opaque area of student learning. This links to another interesting aspect of the duality of Threshold Concepts, as the participants, in their own role as learners have identified Threshold Concepts and areas of troublesome knowledge around the study of higher education practice/academic development. It would appear that learning about Threshold Concepts has enabled our learners to access and address their own Threshold Concepts.

Thursday 12h 10 - Lecture Theatre 1

Addressing Diversity as Asset: Using Social Justice Vignettes for Transformational Change in Teacher Preparation

Joan Barnatt and Mary Knight-McKenna, Elon University

This presentation describes a study utilizing social justice vignettes designed to challenge prospective teachers in identifying troublesome knowledge concerning diverse learners, consider beliefs and dispositions, and acknowledge the dissonance between their own life experience and that of their students. Teacher candidates are also asked to consider adjustments to practice based on independent examination of these issues and small group discussions fostered by the scenarios. Through the experience, participants are pressed toward transformational change in adopting an asset perspective in their interactions with diverse learners.

United States teacher preparation programs are being challenged to provide opportunities to address beliefs and conceptions of practice that limit effective instruction in increasingly diverse classrooms (Darling-Hammond and Bransford, 2005), considered broadly here as including differences in ethnicity, race, culture, social and linguistic background, learning modalities, and academic abilities. This requires the generally homogenous pool of teacher candidates in US schools – largely made up of white, middle class women - to see beyond
their own life experience in developing an asset perspective to diversity as they form positive interpersonal connections with families, deepen and broaden cultural understandings, develop high expectations for all students, and effectively differentiate in support of student learning. Further, there is an increasing expectation that teacher candidates move beyond reflection on beliefs to transformation of practice, though few promising formats have been identified to facilitate transformative experiences (Gay, 2010). The vignettes utilized here offer a means for teacher candidates to identify and struggle with real life situations, toward this end. The format also provides potential for other disciplines in addressing these sorts of sensitive issues.

The presentation will describe the vignettes, as well as findings from use with teacher candidates from a US teacher preparation program.

Thursday 12h 30 - Lecture Theatre 1

Medical Student Reflections of Newborn Medicine: Looking Back for Threshold Concepts

Tony Ryan, University College Cork

Setting: Almost 9000 babies are born annually at CUMH where 4th-year Medical students spend a week of their Paediatric clerkship.

Learning Environment: The focus is on Situational learning and a Cognitive Apprenticeship model in a Family Centered Care Unit. Students are immersed into the interdisciplinary team. Potential learning opportunities occur in the NICU, Delivery-Suite, Postnatal Wards and Outpatients.

Objective: At the end of the rotation, students are asked to write a reflection: “one thing that struck you during your rotation”. I decided to examine a selection of student reflections for evidence of transformative insights and integrative learning that might show what new or troublesome knowledge the students are grappling with, and perhaps unlock potential T.C’s of clinical practice.

Emerging Threshold Concepts: Student perceptions of transformative observations (epiphanies) and new understandings included: Empathy (for parents and their sick baby), Admiration and respect for the Interprofessional Partnership of Care and multi-layered Communication, including the breaking of bad news. They are seeing real-life difficult Ethical challenges. They are excited about the Privilege of Medicine and the Challenges of Clinical practice, but worried about dealing with Uncertainty, concerning certain babies’ prognoses, but also about their own potential to progress from Novice doctors to Wise Practitioners (Praxis). Insights into their own learning styles included the importance of a sound knowledge base and learning through role-modelling and the potential to Transfer of their learning to other Medical specialties.

Conclusions: As they tentatively approach the Portal of Medical Practice, these students are becoming aware of what they don’t know, and realise that the answers to many of these
essential knowledge gaps are not in the books. They are battling between often misleading and incorrect intuitive knowledge (common sense) and newly-observed uncertainties. They may leave the rotation unsettled, but perhaps excited, curious, and eager to pursue their journey.
NEW DEVELOPMENTS IN THRESHOLD CONCEPTS

Thursday 11h 30 - Lecture Theatre 2

A Developing Methodology to Locate Curricula Thresholds in First Year Engineering

Kathleen Quinlan, University of Oxford; Caroline Baillie and Sally Male, University of Western Australia; and Artemis Stamboulis, University of Birmingham

This paper describes the development of a methodology to identify and investigate first year engineering threshold concepts. The project emerged from an Australian ALTC (Australian Learning and Teaching) project, and developed nationally and then internationally into a global study incorporating UK HESTEM projects at Birmingham and Oxford Universities. It was inspired by and incorporated lessons from the important precedent of economics and computer science communities. The methodology involves three major phases: 1) identification of potential threshold; 2) negotiation across unit, disciplinary, institutional, and eventually international boundaries and 3) data processing and analysis.

UWA initially developed phases one and two – approaches to identify threshold concepts and to negotiate these. In the Diverging Phase, students, tutors, and academics identify and discuss potential threshold concepts based on their teaching and learning experiences in one unit or engineering discipline. In the Integrating Phase, students and academics interact, facilitating discussion of concepts between people with diverse perspectives. The Diverging Phase necessarily begins first as data from this phase provide a starting point for discussion in the Integrating Phase. However, the two phases continue thereafter iteratively.

At Oxford, a concept clustering and mapping technique was developed to draw out the connections between and the hierarchies within the concepts. At Birmingham knowledge based concept maps were then developed. We are currently exploring the factors influencing different data interpretations and analysis.

This paper shows how the diverse approaches to data collection and analysis were shared and developed, so that the whole was greater than the sum of the parts, drawing on the expertise of participants’ backgrounds in education, engineering and engineering education.

Thursday 11h 50 - Lecture Theatre 2

Exploring Threshold Concepts and Liminal Spaces Using Phenomenography: Engineering Students’ Conceptions of Technology as an Example

Tom Adawi and Jens Kabo, Chalmers University of Technology

The idea of threshold concepts (TCs) has proven to resonate well with practitioners in higher education (e.g., Cousin, 2008) and it is emerging as a promising framework for curriculum development (e.g., Male and Baillie, 2011; Åkerlind et al, 2011). In this way, TCs have provided a new and attractive focal point for fostering a culture of Scholarship of Teaching
and Learning (SoTL) at many universities across the world (e.g., McLean, 2009). Echoing the work by Åkerlind et al (2011), we see TC-based curriculum development as a process comprising three stages: 1) identifying threshold concepts; 2) investigating students’ understandings of the concepts using phenomenography (Marton and Booth, 1997); and 3) designing instructional interventions using variation theory (Marton and Tsui, 2004).

Phenomenography is a well-established research methodology in education (Case and Light, 2011) and a large number of studies have investigated how students understand key concepts in most disciplines. However, very few of these studies have focused on threshold concepts and liminality (e.g., Cope and Staehr, 2008; Kabo and Baillie, 2009). Therefore, in this paper we illustrate the second stage of the curriculum development process described above – the phenomenographic approach – by drawing on a study that investigated how engineering students conceptualize the notion of technology (Kabo and Adawi, 2011). We link the qualitatively different conceptions that emerged to potential “stuck points” or states in the liminal space (Meyer and Land, 2005) and the critical aspects identified shed light on what is required to make progress from one conception to another in the liminal space.

As a consequence of undertaking this work, we have come to see how much the three academic communities of TCs, phenomenography and SoTL can benefit from closer integration and collaboration, and in that way more effectively support student learning.

Thursday 12h 10 - Lecture Theatre 2

Threshold Concepts and Decoding the Humanities: A Case Study of a Threshold Concept in Art History

Brad Wuetherick and Elizabeth Loeffler, University of Saskatchewan

Considering the volume of recent scholarship on threshold concepts, including the volumes produced out of the previous three biennial threshold concept conferences, there has been relatively little exploration of threshold concepts in the humanities (Meyer and Land, 2006; Land, Meyer and Smith, 2008; Meyer, Land and Baillie, 2010). Perhaps, considering the label as ‘low consensus’ disciplines, this should not be surprising. Because of the variability in how individual academic staff in the humanities conceptualize their disciplines, and the preferred manner in which their disciplines are organized and taught over the course of a degree program, the ability to come to consensus (if such was required) on what is or is not a threshold concept can be difficult, if not impossible.

This paper explores some of the issues related to identifying threshold concepts in the humanities. We propose using the process of ‘decoding the disciplines,’ articulated by Middendorf and Pace (2004), to engage academic staff in the humanities in a conversation about bottlenecks experienced by students, how those bottlenecks are overcome by discipline specialists, and how we provide students opportunities to learn, practice and get feedback on the operations used by those disciplinary specialists to overcome those
bottlenecks. In so doing, one particular case study, that of students’ difficulty understanding the ‘language’ of art in art history, is used to examine the ways in which decoding the disciplines can inform the identification of threshold concepts in the humanities, and the means by which we might adjust our curriculum development practices and pedagogical approaches to more effectively facilitate students’ passing of these thresholds.

Thursday 12h 30 - Lecture Theatre 2

Is Voice a Threshold Concept in Doctoral Education?

Cally Guerin and Ian Green, University of Adelaide

Originally developed as a factor in teaching and learning in undergraduate education (Meyer and Land, 2003; Land et al, 2005; Cousin, 2006), the notion of threshold concepts has more recently begun to be applied to doctoral education (see, for example, Wisker et al, 2006; Trafford and Lesham, 2009; Kiley, 2009; Kiley and Wisker, 2009; Dowling et al, forthcoming). For the vast majority of doctoral candidates, the writing of the thesis poses serious challenges; often it is not only the longest piece of writing they have attempted, but also the first experience of writing for an audience outside their own institution (i.e., the external examiners). Central to this is the capacity to speak in appropriate authorial voices. This can be amplified for students from non-western education systems for whom the question of authorial voice becomes linked with concerns about plagiarism (Picard and Guerin, forthcoming).

We aim here to explore what happens if we view the struggle to understand voice in research writing through the lens of threshold concept theory. By this we mean ‘the construction of an authorial voice which projects an image of the authors themselves and of their relation to their arguments, community, and readers’ (Sanz, 2011:1). We characterise voice as a threshold concept in that it is troubling, potentially stalls progress, and is ultimately transformative, requiring students to assume ‘researcher’ identities that authoritatively contribute to disciplinary discussions. Our interviews with PhD students provide insights into their experiences of learning to think about different audiences and the adoption of appropriate authorial voices. We argue that this requires direct attention in doctoral education. Two doctoral education pedagogical strategies can be mobilised to this end: postgraduate writing groups and the thesis by publication, both of which help to focus attention on a broader, external audience for the student’s writing.
ENGAGING STUDENTS WITH THRESHOLD CONCEPTS

Thursday 11h 30 - MacNeill Theatre

1: Transforming Learning and Learners: The Promise of Process Oriented Threshold Concepts

Martin Fellenz, Trinity College Dublin

The majority of conceptual and empirical research as well as of discussions and reflections on threshold concepts has focused on relevant concepts that are part of the content of particular disciplines and topic areas. I argue that there may be significant value for increasing student engagement and enabling higher level student learning in considering and using threshold concepts that are focused on the process rather than the content of learning.

Specifically, I consider students’ epistemic assumptions about the process of learning in higher education and their role as learners as, for example, exemplified by Kember’s (2001) distinction between didactic/reproductive and facilitative/transformative belief sets. I report on classroom approaches to challenge the former beliefs in order to help students recognise their implicit and explicit views on the process of learning and their important and active role in it. These approaches have clear linkages to the notion of deep-learning (e.g. Entwistle, 2000), and their main aspect discussed here is the capacity to support students’ ability to recognise and ultimately to take responsibility for independent thinking and learning. In this context a core issue that arises is the successful creation and maintenance of a safe yet challenging learning environment.

I reframe the objective of these classroom approaches in terms of threshold concepts with the distinction that the ideas of independent and self-responsible learning are not content oriented threshold concepts relevant to specific disciplines or content areas, but rather process-oriented threshold concepts that apply generally to learning and development processes. Such process-oriented threshold concepts have the potential to transform the learning process of HE students. Ultimately, this approach aims at increasing students’ recognition of their agentic role as learners, to help re-locate the responsibility for achieving learning outcomes to them, and to help transform the students’ learning process, their learning experience, and ultimately the learners themselves.

2: Still Lurking in the Background: Bottlenecks, Threshold Concepts, and Epistemology

Leah Shophow and Arlene Díaz, Indiana University

Scholars working within the context of Threshold Concepts are largely agreed that to fulfil the criteria defining a threshold concept, the concepts must be transformative, irreversible, integrative, bounded and troublesome. In other words, threshold concepts are entryways
into the “program of truth” or epistemology of the disciplines. The ‘Decoding the Disciplines’ (DtD) methodology, which has been compared to Threshold Concepts, did not originate in such claims. “Bottlenecks,” the markers of troublesome knowledge in DtD, are simply the “stuck places” that annoy a given instructor most. Our recent work has shown, however, that these bottlenecks are not random. Like threshold concepts, bottlenecks are linked to the epistemology of the disciplines. If some student difficulties move individual instructors more than other difficulties, it is because of the way the instructor’s own disciplinary work and positionality have influenced his or her perceptions of what is meaningful in the discipline.

However, as many scholars have noted, epistemology is seldom taught. This is in part because it post-dates the development of the disciplines and in part because it has been deemed the terrain of philosophers. It operates at a tacit level. Folk pedagogies in the disciplines generally permit it to remain tacit, which means that students in the discipline (and even some practitioners) may never construct a program of truth and may never understand why they should deploy certain practices to create truth at certain times and the nature of the truth that the practices create.

The only way we can break out of this cycle is to move away from traditional teaching practices, which work against integration and explicit instruction in disciplinary epistemologies. DTD provides a powerful strategy for determining how to begin that process.

3: Towards a Role-Reversal Model of Threshold Concept Pedagogy

Marina Orsini-Jones, Coventry University

This paper will discuss how a previously designed e-learning role-reversal model (Orsini-Jones and Davidson 1999) was merged with threshold concept pedagogy to create a new model of action-research supported threshold concept pedagogy that originated as ‘student-centred’ (Orsini-Jones 2008) but subsequently became ‘student-driven’ (Orsini-Jones et. al. 2010).

The distinguishing feature of the methodological choice illustrated here is that action research is used in conjunction with threshold concept pedagogy to develop student-centred and student-initiated cycles of pedagogical inquiry. Land, Meyer and Smith (2008: ix-xxi) suggest that the identification of threshold concepts allows tutors to put in place targeted curricular interventions aiming at transforming the students’ learning experience, identifying troublesome knowledge and making such ‘troublesome knowledge’ less troublesome. The joint use of action research with threshold concept pedagogy provides a unique opportunity for a constructivist staff/student exploration of the transformational challenges learners face when they encounter troublesome knowledge.

The initial encounter of the author with threshold concept pedagogy was motivated by a drive towards helping first and second year undergraduate students reading English and
Languages at Coventry University with their transformational learning journey across the challenging terrain of difficult or alien knowledge. However, working closely with students on troublesome linguistic knowledge brought into view the realisation that their insights would benefit other students more than the lecturer. This resulted in the development of a new approach, where ‘expert’ undergraduate students are taking the reins of the curricular research interventions to better understand why some of the peers struggle with the threshold concepts identified previously in the field of linguistics (Lund 2010) or even to explore new ones (Lee 2011). The lecturers therefore learn from their students’ research into threshold concepts, in a role-reversal pedagogical model.


4: Threshold Concepts and Research-Informed Teaching

Jane Osmond, Coventry University

This paper discusses the impact of identifying a threshold concept in design on the industrial design curriculum at Coventry University.

Using community of practice theory (Wenger, 2007) and the threshold concept framework (Meyer and Land, 2003), qualitative data from eighty industrial design students was gathered between 2005-2010, underpinned by twice yearly interviews with six students, from entry (2005) to graduation (2009).

This complemented data gathered from industrial design staff and the identification of a specific threshold concept in design was achieved:

…the moment when a student recognises that the uncertainty present when approaching a design brief is an essential, but at the same time routine, part of the design process.

Presented at a staff professional development day, the threshold concept triggered a complete curriculum redesign which now privileges the notion of a ‘safe space’ for students
in which they experiment and experience intense uncertainty within a supportive environment.

Preliminary research to assess the curriculum redesign is to be followed up with interviews with the current (2011) intake of first year students. In addition, several staff members have inculcated the threshold concept theory and are using it to frame further research into their teaching and learning practice. This includes focusing on the concept of ‘empathy’ and also the ‘trade-offs’ facing design students – the acceptance that there are no ‘perfect’ designs.

This paper will present the findings from student interviews, but will primarily focus on the experiences of key members of staff using the threshold concept framework to inform their research-informed teaching.


**5: Creating Optimal Distance Education Environments for the Emergence of Threshold Concepts**

*Candy Sebert and Kristi Archulta-Frush, University of Central Oklahoma*

This highly interactive workshop is focused on strategies to create optimal distance learning environments for threshold concepts to emerge. In recent years, technology has brought about numerous changes in the design and delivery of educational programs (Bishop and White, 2007). Administrators and instructors are challenged with communication at a distance and potential barriers of the intersection of culture and technology.

As global interaction and cultural diversity became more prominent, the issue of cultural competence received more attention, and how to treat people from different backgrounds considerately and equally has become a pivotal issue (Chang, 2007). Online courses can be an ideal environment for rich dialogue exchange between learners as well as between learners and instructors of many varied backgrounds. Yet, according to McCoy and Garten (2008), the issues of diversity and multiculturalism are present in distance education. Thus, in order for the setting to be constructive for all learners, course designers and instructors will need to create the conditions for respectful communication to occur.

Questions that will be addressed include: What are the conditions that need to occur for threshold concepts to emerge; How can the necessary communication occur for threshold concepts to transpire a distance; How can culture difference impact the creation of the optimal conditions for threshold concepts; What is the link between respect, trust and threshold concepts.


6: A Shakespeare Threshold: Engaging Students in Understanding Prosody

Shannon Murray, University of Prince Edward Island

I don’t remember when I learned to scan verse; there was a time when I couldn’t identify patterns of stress: and then I could. Some of my students have that same easy experience, but for more, coming to prosody is painful, slow, and full of suspicion. Though it is a more local issue than many disciplinary threshold concepts are, once I thought of prosody as a threshold, designed my course to address it as such, and talked to my students in those terms, more were successful, as evidenced by their midterm and then final exams. Moreover, enlisting a small team of “Course Leaders” in a large Shakespeare class allowed me to engage students in that process. These were not students who understood prosody immediately; but because they were struggling themselves, they hit on a number of fascinating analogies, strategies and resources that I, as someone who had come to the concept quickly, would have overlooked: from skipping and pounding to “Transylvania talk.” This presentation will examine prosody as a threshold concept in literary studies, suggest the ways my teaching changed as a result of that reframing, and finally demonstrate the variety of inventive ways that students themselves arrived at to help each other over that threshold.

7: Art Education and Troublesome Knowledge: Helping Students Form Identities as Artist Teachers

Lorrie Blair, Sebastien Fitch, and Janette Barrington, Concordia University

Meyer and Land’s (2010) metaphor of progressively mastering a discipline by passing through portals aptly illustrates the paradoxical nature of becoming an art educator. Students have difficulty navigating between two portals, which are literally on opposite ends of the campus. Troublesome knowledge begins with the awareness that, in order to be successful in their chosen career, they must learn to play contradictory roles of artist and classroom teacher. Students are initiated into these roles through courses in studio arts and through courses offered by the faculty of education.

In this presentation, we will discuss findings from our research, which is intended to foster greater interconnection between art education and studio art courses, and ensure pre-
service teachers receive adequate training in studio courses. We will present data gleaned from interviews with instructors of first year studio courses and focus group discussions with students in art education. Here we found that some studio instructors regarded art education students as bothersome amateurs, and not as serious contenders for the role of artist. At the same time, students believed their education instructors dismissed them as unsuitable for the teaching profession. One student summed up this problem by saying, “You’re not artsy enough to be in the fine arts and you’re not education enough to be in the education classes.” Students intuitively understood the condition of liminality, saying, “You’re stuck in this ravine with cliffs on both sides and you’re trying to reach up there...but you can’t cause nobody is going to throw you a ladder...”

In order to help students develop a deeper understanding about the arts and move beyond mimicry of being an artist and a teacher, we initiated discussion about troublesome knowledge about fine arts. We found that these discussions encouraged students to critique their learning and develop a community of practice.
Day 1 Session B - Papers

**ENGAGING STUDENTS WITH THRESHOLD CONCEPTS**

*Thursday 14h 00 - Maxwell Theatre*

**Students’ Perceptions of Travel Through the Liminal Space: Lessons for Teaching**

*Ann Harlow, Mira Peter, Jonathan Scott, and Bronwen Cowie, University of Waikato*

This paper presents findings from a study in which educational researchers followed the progress of analogue electronics students over their first two years at university.

In this study, the lecturer’s main motivation was to examine how a teaching-focus on threshold concepts might help students grasp troublesome ideas and if those students who grasped the threshold concepts achieved higher scores in the end-of-course examination. The lecturer identified two concepts in the first-year course which students repeatedly found hard to grasp. He focused his teaching on these concepts in the first year, and revisited them, albeit indirectly, throughout the second-year course.

Over the two years, the lecturer utilised a variety of teaching strategies to facilitate students’ learning of the troublesome concepts. In order to evaluate the effects of these strategies on student learning, an educational researcher, in collaboration with the lecturer, explored students’ perceptions about where they ‘got stuck’ and what helped them understand the selected threshold concepts. Data from student surveys, individual interviews, and focus groups contributed to insights about their experience of transition through the liminal space. The lecturer and researcher reflected on and analysed the lecturer’s teaching strategies using video-stimulated reflective dialogue.

Findings revealed that many students did not fully grasp the two identified threshold concepts in their first year, however, repeated experiences with threshold concepts through varied teaching strategies, and a diversity of learning contexts contributed to students’ understanding. In the second year, the continuing students felt that they took the threshold concepts for granted and had ceased to regard them as troublesome. They reported that grasping these threshold concepts was necessary to progress in analogue electronics. Findings of this study indicate that travel through the liminal space can be supported by an explicit and sustained focus on threshold concepts.

*Thursday 14h 20 - Maxwell Theatre*

**Make Links - Overcoming the Threshold and Entering the Portal of Understanding**

*Anna-Karin Carstensen, Jönköping University*

In engineering the student is often “faced with contrasting representations or models” (Entwistle et al, 2005, p. 9), which Entwistle explores as “ways of thinking and practising” (ibid). These so called “contrasting representations” are in electric circuits for example:
graphs, mathematical models, drawings of circuits and the real circuits. In our research we have found that exploring the relationships - links - between these different representations, as well in the theory/model domain as in the object/event domain (Tiberghien, 2002) is of uttermost importance. We have developed a tool for investigation of “the learning of a complex concept” (Carstensen and Bernhard, 2008) which we have used in order to find critical aspects, which we call “key concepts” (Carstensen, Bernhard, 2008), which open up the portal of understanding threshold concepts.

In this paper we will explore these links further. As we have continued our work on how students make links between the different islands of single concepts, in order to make a whole of the complex concept, we have noted that the links between these islands are of different kinds. We will here discuss what kinds of relationships these links consist of, and how they differ in ways of coping with them for students, and how the teachers may notice and highlight these relationships in their instructions.

We have video recorded students’ interactions during lab-work, and analysed these tapes according to the Theory of variation (Marton and Tsui, 2004). Now we are taking this further, and make a more detailed analysis of what the links are, and by that we contribute to the understanding of the nature of a threshold concept.

Entwistle, N. (2005) Teaching and learning analogue electronics in undergraduate courses: Preliminary findings from the ETL project. International Journal of Electronical Engineering Education 42/1


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**Thursday 14h 40 - Maxwell Theatre**

**Locked Doors: Threshold Concepts as Guardians**

*Jason Davies, University College London*

Threshold concepts are typically treated as doors into the understanding of a discipline yet, just as doors can be open or closed, so too threshold concepts can be important as guardians of a discipline's character and workings. It might be said that what is distinctive about any discipline is precisely its threshold concepts. Thus many attempts to explain what a particular discipline 'is' -- such as subject centre formulations -- depend on its practitioners articulating some (but disguising others) of their threshold concepts.

Teaching a particular discipline is therefore not just about initiating students into critical threshold concepts but also about equipping them to defend the discipline from threshold concepts that might re-construct and re-describe those concepts. At times this is obvious (so
obvious that they are hard to describe, such as 'deity' and science) and at others, invisible from a distance and requiring specialist knowledge to explain (indeed, the threshold concepts themselves).

Teaching in a multidisciplinary and interdisciplinary setting requires some dexterity in this regard: the teaching of threshold concepts can be accompanied by an explicit discussion of how and why one set should be privileged over another. This can be tantamount to advocating (even evangelising) the deployment of a particular discipline for particular questions -- a difficult and even politically sensitive task for many disciplines in the current climate.

This talk will explore some examples taken from a range of specialist fields (classics, history, anthropology) as well as considering broader brush examples (e.g. Chemistry, Chemical Engineering). Addressing these issues deliberately as part of teaching can inculcate a more reflective type of teaching and learning and potentially create a different set of relationships between disciplines which in turn can be a driver and facilitator for interdisciplinary work within the university.
INTERDISCIPLINARY THRESHOLD CONCEPTS

Thursday 14h 00 - Joly Theatre

“How Do You Know?” The Threshold Concept, Multi-Disciplinary Approaches and the Age of Uncertainty

Brendan Hall, University of the Highlands and Islands

The ‘Age of Uncertainty’ in the 21st Century necessitates teachers developing or adapting pedagogies that allow them to teach uncertainty and prepare their students for life in an uncertain world. Treating uncertainty as a threshold concept facilitates the understanding of uncertainty in the context of teaching.

This paper presents research into uncertainty as a concept in the context of climate change. In this subject area uncertainty plays a fundamental role and has features which identify it as a threshold concept. It can be characterised as a troublesome concept epistemologically, in that it is a difficult concept for students to grasp and it also possesses an ontological dimension. Uncertainty is also conceptualised in a wide variety of qualitatively different ways, many of which remain tacit in nature and there is also considerable liminal variation in how students come to understand the concept or not.

Uncertainty demonstrates enormous potential as a concept that can profoundly change how learners comprehend complex issues such as climate change and can play a major part in students’ intellectual and personal development. The variation identified in relation to uncertainty also shows promise as a starting point for the integration of conceptions of uncertainty that have their origins in different disciplinary contexts – this may lead to new realisations on the nature of uncertainty.

Indeed, a multidisciplinary approach may be necessary in order to teach the concept of uncertainty, particularly in subject areas such as climate change, which act as interfaces between many academic disciplines.

This paper aims to explore the role of multi-disciplinary approaches in teaching uncertainty and the potential of uncertainty as an inter-disciplinary threshold concept. The identification of uncertainty as a threshold concept in disciplines as diverse as surgical education and physics suggests that this could be a fruitful ground for discussion.

Thursday 14h 20 - Joly Theatre

Interdisciplinarity and Information Literacy Instruction: A Threshold Concepts Approach

Korey Brunetti, California State University; Amy R. Hofer, Portland State University; and Lori Townsend, University of New Mexico

In this presentation, we discuss data collected in the different stages of our research to reflect on the interdisciplinary nature of information literacy instruction. Information
literacy, generally defined as the ability to find, evaluate, and use information, originates in the broader field of information science. While it is difficult to make a case for information literacy as a standalone discipline, information professionals share a common way of thinking and practicing that constitutes a body of knowledge for which there are learning thresholds.

Our experiences as teaching librarians, especially our observations of where students struggle to grasp information-related ideas, initially led us to develop threshold concepts for information literacy. In 2010 we conducted a qualitative survey of instruction librarians in which we asked them to identify troublesome information literacy content. The results of this survey bolstered our proposed threshold concepts and suggested several new concepts. Our current research involves a series of in-depth interviews with expert practitioners about information literacy threshold concepts and pedagogical strategy.

The initial goal of our research was to identify and generate practitioner consensus about information literacy threshold concepts. Unexpectedly, the interdisciplinary nature of information literacy emerged as a central theme in our findings. Librarians are uniquely positioned to identify shifts in the information landscape that occur across and between disciplines. We work with radically shifting models of scholarly communication and information formats, and, further, explain to students and faculty how these changes vary in different disciplinary contexts. The identification of threshold concepts within such mutable territory raises questions about disciplinary boundaries and teaching in the interstices.

Thursday 14h 40 - Joly Theatre

Don't Fear the Engineer: Social Science Students Exploring a Liminal Space with Engineering Students

Jens Kabo, Chalmers University of Technology; and Caroline Baillie, University of Western Australia

Engineering students learning, in interdisciplinary courses, to consider the social context of their work, need to learn how to think in ways more familiar to social scientists. In our previous work we have shown that this can cause concern and potential trouble as they traverse a liminal space (Kabo and Baillie, 2010). However, we have found that there are just as many, albeit different, thresholds to cross for social science students taking the same class.

During two iterations of the course we conducted interviews with students and analysed their critical self-reflections. During this analysis it became apparent to us that most of the social scientists in the class had no or little actual understanding of what engineering really entails and often had quite negative perceptions of it. For these students, the course offered an opportunity to work with engineering students in a constructive manner that in many cases resulted in the breaking down of (negative) stereotypes of engineers and engineering. This is an important first step toward grasping any positive potential engineering has to
Some social science students moved beyond the breaking down of negative stereotypes to the realisation that engineering can play a positive role in the creation of viable alternatives to current practices and that engineers possess skills and ways of thinking that complement those of social scientists in a potentially beneficial way. Our findings indicate that understanding engineering and engineers can serve as a threshold that social scientists working in an interdisciplinary context with engineering students need to cross for the possibility of true interdisciplinary, rather than multidisciplinary, collaboration to take place. A central aspect of this crossing is to negotiate together with engineers what engineering means and can mean.

Thursday 15h 00 - Joly Theatre

Embedding Threshold Concepts in a Student Learning Community

Jody Horn, Oklahoma City University

Threshold concepts are embedded in a Student Learning Community (SLC) as an entryway to the discipline and for student engagement. This paper presents data from assessment of these threshold concepts. The SLC (created and realized based on best practices for learning communities) is required for first semester students in three majors (Sociology, Justice Studies-Criminology, and Justice Studies-Peace & Conflict) in one department (Sociology and Justice Studies). Students are introduced to the four threshold concepts (i.e., restorative justice, victim-offender dyad, sociological imagination, and self-authorship) through interesting autobiographies, films, and discussions. Data reveal 80% of the students experience transformative learning upon completion of the SLC. They are able to reconstruct and integrate these threshold concepts in the real world. The evidence is made visible through written narratives on these concepts -- moving from the concrete recognition in books and films to the more abstract and deeper understanding of threshold concepts and their connection to everyday life.

These four threshold concepts open the door and interdisciplinary connection among all three majors. The first two concepts: restorative justice and victim-offender dyad are particularly troublesome for the students, as well as essential to the Justice Studies students. Since Justice Studies is in a sense a critical outgrowth of criminal justice many of the students enter the major with preconceived retributive and law and order mind sets. However, Justice Studies critiques the criminal justice system, focusing on social justice and potentials for justice. Thus, the first two threshold concepts; one, centering on harm not punishment and the other questioning whether the offender is really the victim, disrupt students preconceptions and facilitates their critical thinking in the disciplines.
THRESHOLD CONCEPTS IN PROFESSIONAL DEVELOPMENT

Thursday 14h 00 - Lecture Theatre 1

Identifying Threshold Concepts in Educational Development

Julie Timmermans, University of Waterloo; and Cynthia Weston, McGill University

A collective endeavour is currently underway in the field of educational development to conceptualise “who we are and what we do” (Stockley et al., 2008). Given the mission of educational development to influence the quality and culture of teaching and learning at multiple levels of the university, establishing firm grounding for our work and identities is crucial and will help establish the credibility of our field (Sorcinelli, Austin, Eddy, and Beach, 2006). Meyer and Land (2003) describe threshold concepts as providing insight into the ways people know within a discipline, and Davies (2006) remarks that, once understood, these concepts enable people to be identified as members of a disciplinary community. The notion that there exist threshold concepts that result in conceptual, epistemological, and ontological transformations (Meyer and Land, 2005, 2006) reveals their great developmental potential (Timmermans, 2010). Consequently, threshold concepts provide a powerful perspective from which to examine the ways of knowing and being of educational developers.

A multiple case study was designed to investigate what experienced educational developers identify as threshold concepts in their careers. The study sought to determine threshold concepts identified as common across participants to gain a portrait of the ways of knowing and being that unite educational developers across the profession. Semi-structured interviews were conducted with four experienced educational developers from Canadian universities. Cross-case analysis revealed three categories of common threshold concepts: Ways of knowing and being (1) that facilitate change in individuals and in groups, (2) that facilitate systemic change, and (3) of professionals. Study findings suggest that the ways of knowing and being of experienced educational developers are closely intertwined with the work they intend to accomplish and therefore begin to elucidate the “development” work of educational development. Study findings also provide novel insights into the nature and characteristics of threshold concepts.


Thursday 14h 20 - Lecture Theatre 1

**Shifting Identity in Teacher Development**

*Colleen Gilrane, University of Tennessee*

In our work with educators at every level - from preschool through university, preservice and inservice - one of our greatest challenges is that of helping them see themselves as capable of orchestrating their knowledge of their discipline with their knowledge of their students in order to make informed instructional decisions and to act on them. This proactive disposition runs counter to their own experiences in highly structured, test-and-right-answer-oriented schooling (Carmichael, 2010) which influence how they work with their own students, whether P-12 or university. For those who successfully navigate this course, the excursion (Cousin, 2006) is nothing short of transformative (Land, Cousin, Meyer and Davies, 2005). Their language about themselves and about teaching (Meyer and Land, 2005) becomes more active, confident, and authoritative as they reconstitute their identity (Land, Meyer and Baillie, 2010) as “teacher”. For many, this rite of passage is troublesome (Perkins, 1999) and very messy, especially when the more compliant, other-directed role is reinforced by social or political context. The anxiety (Cousin, 2006) attached to this new “way of thinking and practicing” (Meyer and Land, 2003, p. 9) as an educator is often most distressing for our strongest students, who have been the most successful over the years in figuring out what their teachers consider “the right answer”, and in producing it. Whether we label it a threshold concept or a threshold conception (Land et al, 2005) or something else, the disposition to see oneself as an informed decision maker, and to act on that, is a crucial one in the professional development of educators. We will share data from our own work as we have grappled with this phenomenon.

Thursday 14h 40 - Lecture Theatre 1

**Threshold Concepts as a heuristic device in an ill-structured discipline**

*Trudi Cooper, Edith Cowan University*

In 2010, the Australian Learning and Teaching Council funded a national project to renew the Australian university curriculum for youth work education. Youth work is a new discipline
within Australian higher education, and university courses have been developed autonomously by each institution. The project brought together teams from five universities to build a shared Australian youth work curriculum. The project was complex for several reasons, including: geographical distance; diversity of contexts and institutional frameworks in different states and institutions; the need to establish professional standards without external reference points at degree level; the requirement to meet local needs whilst considering international standards; the position of youth work as a niche profession; the competitive political environment for universities, and the isolation of staff within each institution.

This presentation discusses the efficacy of Threshold Concepts as a heuristic device (Perkins 2010) to facilitate discourse between staff teams, within an approach informed by the work of Barnett and Coate (2005). The primarily purpose was to differentiate between material that needed to be explicitly taught, and material that students could learn independently through practicum, independent study, or self-organised or collaborative projects. Thus, a key intention was to ‘prune’ an over-full curriculum, and to ensure that proper attention was given to aspects where students required most support. An important goal of the curriculum renewal process was to strengthen learner autonomy, and support learners to develop and fully integrate personal attributes, intellectual capabilities and practice skills. Intended outcomes were graduates with broader horizons who will be able to lead and transform the youth work profession in response to social change. Threshold Concepts were used to begin conversations about how to prioritise and sequence content to achieve these goals.

**Thursday 15h 00 - Lecture Theatre 1**

**A Broader Threshold: Including Skills as well as Concepts in Computing Education**

Lynda Thomas, Aberystwyth University; Jonas Boustedt, University of Gävle; Anna Eckerdal, Uppsala University; Robert McCartney, University of Connecticut; Kate Sanders, Rhode Island College, and Carol Zander, University of Washington

In this paper, we propose “Threshold Skills” as a complement to Threshold Concepts. The definition of Threshold Concepts assumes that knowledge is paramount: gaining the understanding of particular concepts irreversibly transforms the learners. Most investigations of threshold concepts in computing to date (for example, (Flanagan and Smith 2008) have identified aspects of learning to program. We (Zander et al, 2008) identified pointers as a potential threshold concept in computing. Before learning this concept, students could not write code involving pointers, afterwards they could, and they exhibited the characteristics of being in a liminal state as they acquired the concept. (McCartney et al, 2009)

There is an alternative explanation, however, that the ability to write code rather than understanding the concept was the threshold. Analysis of computing students’ quotes supports this view: they report that their difficulties were related not to their understanding
of the concepts, but rather to writing the code that implements these concepts. Some thresholds may involve both concept and skills, while some thresholds may involve just skills, not concepts at all.

This suggests that sometimes being able to perform the related activities is the threshold rather than understanding the underlying concept. Pointers are not inherently difficult to understand, but successfully writing code using pointers is. This is consistent with Eckerdal’s work (2009) which discusses critical aspects related to both concepts and practice of programming. Similarly, while the concepts in a mathematical analysis course may be difficult, it might be argued that the skill in writing proofs that is gained there is a threshold to higher mathematics.

In the paper we provide examples from computing education where skills in conjunction with concepts - or skills alone - act as thresholds, thus generalizing the notion of thresholds to include skills as well as concepts.
NEW DEVELOPMENTS IN THRESHOLD CONCEPTS

Thursday 14h 00 - Lecture Theatre 2

A New Model for Teaching and Learning of Threshold Concepts

Gerlese Akerlind, University of Canberra; Jo McKenzie, University of Technology, Sydney; and Anna Wilson, Australian National University

This paper describes a large-scale project conducted in Australia that aimed to develop a model of curriculum design for teaching disciplinary Threshold Concepts. The model was trialled across two disciplines in four universities and three states of Australia, and funded by the Australian Learning and Teaching Council.

Whilst the significance of Threshold Concepts for students’ disciplinary learning is becoming increasingly recognised, best practice ways of teaching these concepts are still not clear. This project addresses this issue by developing and trialling a model for teaching Threshold Concepts, drawing on Phenomenography and the associated Variation Theory of Learning (Marton and Booth 1997; Marton and Tsui 2004).

Two contrasting disciplines (Physics and Law) and university-types (research-intensive and universities of technology) were selected for the project, to ensure broad applicability of the model. The project involved a team of four educational researchers working with two groups of disciplinary academics, 11 from Law and 9 from Physics - a total team of 24.

The project involved four primary stages spread over two years (2008-2010):
1. Identification by each disciplinary group of an appropriate Threshold Concept for the project – ‘measurement uncertainty’ in Physics and ‘legal reasoning’ in Law;
2. Conduct by each group of phenomenographic action research investigating variation in their students’ understandings of that concept;
3. Group design of a set of learning activities to address the misunderstandings identified in step 2, using Variation Theory as a guiding framework; and
4. Implementation of the new curriculum design, followed by assessment of student learning outcomes.

The paper will present some outcomes of the project. Academics’ reports of the impact were profound, with substantial changes to their understanding of student difficulties in learning the concepts, and to their sense of how best to teach the concepts.

Thursday 14h 20 - Lecture Theatre 2


Monica Devanas, Rutgers University
The idea of Threshold Concepts was a foundational element incorporated into many of the courses that are “models” in the United States-based, large-scale science education program, “Science Education for New Civic Engagements and Responsibilities” (SENCER), supported by the National Science Foundation. Faculty participants found that focusing on the threshold concepts of a subject, minimizing the disciplinary jargon and making connections of theory to real-world applications, i.e. the “troublesome” complex questions of public consequence, produced improved learning in disciplinary and general education courses. These challenging and rigorous courses connect scientific knowledge to public decision-making, policy development, and the effective "work" of citizenship. The consequence of mastery of threshold concepts encourages students to engage in research, to produce knowledge, to develop answers, as well as to appreciate the uncertainty of the knowledge and answers produced.

Faculty participating in SENCER Summer Institutes develop curriculum design elements, clear learning outcomes linked to essential threshold concepts and aligned transparently with classroom and related activities to support the learning that is desired. Outcomes are assessed continuously. SENCER models reflect the intellectual curiosity of the faculty who developed them. At the same time, they respond to students’ interests, including personal interests, as well as public or civic foci.

SENCER model courses demonstrate success, showcase effective strategies, and evidence potential for broader implementation and adaptation across academe. The models also advance institutional aspirations to connect the learning of threshold concepts learning including scientific reasoning, inquiry, observation, and measurement as well as fostering interdisciplinary understanding and helping students develop an awareness of ethical issues leading to improved personal choices and behavior.

The SENCER Program and allied activities of the National Center for Science and Civic Engagement will be presented to support the value of threshold concepts and links to civic issues as successful tools for curriculum development and design.

Thursday 14h 40 - Lecture Theatre 2

Student Understanding of the Critical Features of an Hypothesis: Variation Across Epistemic and Heuristic Dimensions

Kirsten Zimbardi, JHF Meyer, Prasad Chunduri and Lesley Lluka, University of Queensland; Charlotte Taylor, Pauline Ross, and Vicky Tzioumis, University of Sydney

The higher education sector is now focussed on the task of creating graduates who are able to deal with the novel, complex, unstructured problems they will encounter in the 21st century workforce (Brew, 2010). Within science, the central role of hypothetico-deductive reasoning in ‘thinking like a scientist’ is well established (Dunbar and Fugelsang, 2005), and in bioscience education, understanding ‘testable hypotheses’ has become a threshold concept (Taylor and Meyer, 2010) and a key driver of curriculum transformation (Elliot et al,
2010). From a large database of responses provided by undergraduate biology students to the question “What is a hypothesis?” Taylor et al (2011) developed a 48 item psychometric instrument capturing variation in student understanding of this threshold concept. A version of this instrument has now been trialled with eight hundred undergraduate science students enrolled in a first year, second semester biology course. Exploratory factor analysis of their responses has revealed five factors which vary along dimensions of epistemic maturity and understanding of disciplinary heuristics. These factors are interpreted as representing the initial 'critical features' of the threshold concept as it 'comes into view'. Specifically, students were found to conceptualise hypotheses most simplistically as based on facts, or hold more advanced conceptions about the predictive utility of hypotheses (indicating an awareness of hypothetico-predictive reasoning) and to hypotheses as testable statements (indicating an awareness of hypothetico-deductive reasoning) used in the development of new scientific knowledge. Further, student conceptions varied on the role of observations, experiments and controlling variables in judging the validity of hypotheses. This snapshot characterises the conceptions about hypothesis held by early stage undergraduate science students, providing insights into the ways students are beginning to understand the heuristics used to judge the evidence that builds scientific knowledge in their discipline, as they embark on the journey toward thinking like a scientist.

Thursday 15h 00 - Lecture Theatre 2

Threshold Concepts: A Distinctive Experience of Integration and Transformation in Conceptual Change

Peter Davies, University of Birmingham

This paper aims to build a theoretical basis for ‘threshold concepts’ by locating the idea in the literature on conceptual change. In so doing it addresses a couple of challenges set out by Rowbottom (2007). His critique concentrates on the claim by Meyer and Land (2005) that threshold concepts are ‘integrative’ and ‘transformational’. He argues that ‘acquiring’ any concept necessarily involves integration and transformation. He concludes that the claim for the existence of distinctive ‘threshold’ concepts is refuted by this observation.

This argument illustrates the contribution which philosophers are well placed to make in the development of new ideas in teaching and learning. By posing the question ‘What is distinctive about the integration and transformation achieved when a threshold concept becomes embedded in a student’s thinking?’ Rowbottom contributes to the development of a relatively new idea in the field of teaching and learning. However, his conclusion that he has demonstrated that a ‘threshold concept’ is not a meaningful category is premature. His conclusion presumes that it is not meaningful to distinguish between categorically different types of integration and transformation.

This paper reviews and extends literature (e.g. Chi et al, 1994) on categorical differences between types of conceptual change. In particular, it suggests some qualitatively different
types of integration on the basis of an analysis of conceptual change from the perspective of Variation Theory. The analysis draws on evidence collected through in-depth interviews with undergraduate economics students.


ENGAGING STUDENTS WITH THRESHOLD CONCEPTS

Thursday 14h 00 - MacNeill Theatre

1: I Hate Maths and Maths Hate Me! Analysing the Development of Threshold Concepts and Attitudes in Preservice Mathematics Teacher Education

Maria Northcote, Avondale College of Higher Education

The process of learning to become effective mathematics teachers of young children can be impeded by preservice teachers’ anxiety about mathematics or phobia of mathematics (Kargar, Tarmizia and Bayat, 2010; Johnson, Smith and Carinci, 2010). Ingrained attitudes to mathematics, often reinforced by stereotypical societal and popular values, must be acknowledged before the preservice teacher can begin the journey to becoming a skilful mathematics teacher. Although some research has been conducted on the mathematical threshold concepts developed during the study of tertiary level mathematics (Jooganah, 2010) and the attitudes of preservice teachers' attitudes to mathematics (White, Way, Perry, and Southwell, 2005, 2006; Prescott and Cavanagh, 2006; Perry, 1996), the area of how threshold concepts and attitudes are connected in primary mathematics education is an under-researched field.

This paper reports on the first stage of a longitudinal study, designed to investigate the development of both attitudes and troublesome threshold concepts of mathematics education in a cohort of preservice teachers. In order to gain access to the student voice, narrative methodologies have been used to gather and analyse data gathered during this study. Narrative analyses of these stories have been employed to: 1) determine how students' attitudes to teaching mathematics develop; and 2) to identify the threshold concepts that students develop about mathematics education. To triangulate the data gathered from the students’ stories, the cohort was also invited to complete an attitudinal questionnaire which will provide quantitative evidence of their attitudes to mathematics at the beginning and the end of the semester.

As well as contributing to the reasonably new study of threshold concepts, began in 2005 by Land and Meyer (2003), the findings of this study adds to the growing research on the importance of analysing the threshold concepts developed by preservice teachers, especially in association with attitudinal and emotional issues.

2: Experiences of Academic Staff in Using Threshold Concepts in Occupational Therapy Curricula to Engage Students

Sylvia Rodger, Merrill Turpin, and Liz Springfield, University of Queensland

Several years ago the staff team in the Division of Occupational Therapy, School of Health and Rehabilitation Sciences at The University of Queensland embarked on reforming two
curricula that graduated registrable occupational therapists. Threshold concepts were major concepts used to underpin our reformed undergraduate and graduate entry occupational therapy curricula (Rodger and Turpin, 2011). After rigorous interrogation of troublesome knowledge and ensuring that the emergent concepts complied with the five characteristics of threshold concepts identified by Meyer and Land (2005) we identified five threshold concepts. Subsequently, these threshold concepts were integrated within each occupational therapy course within the two programs and explained to students by way of information guides, course outlines and introduced with each new course undertaken.

Two years into the roll out of the new curricula, academic staff members were interviewed individually or in a focus group by an independent interviewer with a background in higher education and curriculum design. Data collection aimed to gather the staff members’ perspectives regarding (1) the usefulness of the five threshold concepts in designing their new courses, (2) how they used the threshold concepts in their courses, (3) how they assessed the threshold concepts, and (4) how they ensured that students engaged with the threshold concepts in learning tasks and assessment activities. The interviews were transcribed verbatim and analysed by the first two authors using standard qualitative analysis techniques (Patton, 2002). Peer and member checking were used to ensure the accuracy of interpretations. The key findings emanating from these interviews will be described and implications for further use and embedding of the threshold concepts in curricula generally and particular courses more specifically will be discussed.

3: Exploring the relationship between curriculum, learning process and the theory of threshold concepts in the context of dental education

Marta Kobus, Ian Kinchin, Lyndon Cabot, and Mark Woolford, King’s College London

This paper presents preliminary findings of PhD study of the dental curriculum, which is twofold as it investigates the dental curriculum through students’ and teachers’ perceptions, and it looks at the relationship between the curriculum and the theory of threshold concepts. The research aims to find out whether the structure of teaching and learning within the curriculum corresponds with conceptual struggles experienced by the students in the process of becoming a dentist. Recognition of the qualitatively different ways of understanding the curriculum may provide a mechanism to identify threshold concepts in dentistry.

Dental curricula are organised around two types of knowledge: theoretical and practical. The theory is represented by ‘networks of understanding’, which form a hierarchical structure of interrelated concepts, whilst practical knowledge forms a linear sequence of isolated pieces of information, also described as ‘chains of practice’. Application of theoretical knowledge in the practical context is of a central importance in dentistry. It is hypothesised that dental students learn how to link theory to the clinical context through the acquisition of threshold concepts, which are transformative and integrative in their nature.
Analysis of the collected pilot data demonstrates that teachers and students identified issues within the curriculum. Students perceive the curriculum as overloaded with content, whilst teachers focus on the content when they define curriculum. Students’ conceptual struggles relate to the application of theory in the clinical context, which teachers perceive as one of the most crucial issues in dental education. Pilot study gave some indications to how the dental students and teachers perceive, understand and experience the curriculum. Issues highlighted in the preliminary research will be further investigated in the second phase of this PhD study.

4: Contingency in Practice: Applying a Threshold Concept in Law

Elaine Webster and Claire McDiarmid, University of Strathclyde

Our work to date has led us to identify, and seek to define, a threshold concept as it arises in Law. In common with other disciplines, one of the key constituent elements of law is its malleability, but this is inseparable from certainty, which is desirable and actually required in law. Thereby a fundamental characteristic of law is its contingency, which encapsulates the existence of predictability alongside indeterminacy and contextual dependence in legal interpretation. This is a potentially disquieting discovery and one which may well constitute “troublesome” knowledge for students. In our view, a threshold is crossed when students recognise that the meaning of apparently fixed legal statements, or principles, is, in fact, indeterminate; that law is characterised by a combination of certainty and uncertainty. In this paper we will discuss the ways in which two practical, extra-curricular activities in which law students engage may help us to refine our understanding of how the threshold is crossed – an understanding which we hope subsequently to be able to apply to teaching and assessment. We will consider how practicing in the Law Clinic at the University of Strathclyde, providing pro bono legal advice to those who cannot otherwise obtain this, and mooting, taking part in mock legal debate, may facilitate, or lay bare the crossing of the threshold.

5. Crossing a Threshold Concept in Biology: Variation in Student Learning

Eileen Kennedy, University of New South Wales

A threshold concept has been described as troublesome knowledge negotiated through a conceptual gateway that transforms the learners understanding and develops the ability to integrate it with related areas of learning (Meyer and Land 2006). Many areas of Biology are troublesome and also more complex than expected [Taylor in Land et al (eds) 2008].

A threshold concept in Biology involving chromosome strands (within chromosomes) and chromosome pairs (between chromosomes) has previously been identified (Kennedy 2010). Subsequent investigation, described here, supports this identification. The use of hands-on
models together with facilitator discussion was found to be helpful in promoting transformation and integration within this troublesome area of knowledge (Kennedy 2010).

Meyer and Land suggest that once a conceptual gateway has been successfully negotiated, the understandings that have been achieved are irreversible (unlikely to be forgotten). They also suggest that transformation may be sudden or may be protracted over a considerable period of time (Meyer and Land 2003). Research (using analysis of exam questions and surveys) following the use of models has supported this in revealing variation between students. Those who have mastered the concept clearly show their new understandings whereas others may still have not travelled “through the portal (gateway)”. The latter group, once identified, may benefit from further co-inquiry via the model/discussion learning scheme. The frequently overlooked factor of discursiveness (linguistic skill or absence of it) was also identified.


NEW DEVELOPMENTS IN THRESHOLD CONCEPTS 1

Thursday 16h 15 - National Gallery of Ireland

Looking for Trouble: Encountering the Unknown at the National Gallery of Ireland

Marian McCarthy and Daniel Blackshields, University College Cork

This workshop addresses the question of how encountering some intriguing works of art can help teachers in higher education “venture into new and strange places” (Barnett, 2007: 147), constructing what might constitute ‘troublesome knowledge’ for them, when out of the comfort zone of their own disciplines. It is hoped that such a venturing forth, will help chart ‘the unknown’, enabling teachers to identify with their students’ experience of liminality.

Within accredited programmes in teaching and learning in higher education, a fundamental threshold concept is that teaching is about learning, rather than about the delivery of disciplinary knowledge. If all scholarship is concerned with encountering the unknown (Schwartzman, 2010, in Land, 2011), then lecturers on these programmes find themselves in liminal spaces grappling with the troublesome knowledge of realising that content knowledge and pedagogical content knowledge (Shulman, 1994) are substantively different. The former is focused on the disciplinary knowledge in which the lecturer is expert; the latter is concerned with the dilemmas of how the discipline might be taught. Teaching the discipline constitutes another way of knowing for the lecturer and another way of being. Teaching the students how to learn in the discipline is all about listening to them, rather than talking at them, and realising that the discipline does not exist in splendid isolation, but is nestled in the four scholarships of discovery, integration, application and teaching (Boyer, 1990). It is difficult for lecturers to realise that there is another discipline that is part of the DNA of disciplinary understanding - that of teaching as learning and as research. Lecturers need to take a risk, to let go of their transmission of the discipline, in the interest of transformation and student learning. This workshop sets out to meet this need in foregrounding and encountering ‘troublesome knowledge’.

[This workshop will take place in the National Gallery with the group departing from the Hamilton Building]

ENGAGING STUDENTS WITH THRESHOLD CONCEPTS

Thursday 16h 15 - Maxwell Theatre

Mastering a Threshold Concept through Decoding the Disciplines

David Pace, Arlene Diaz, Joan Middendorf, and Leah Shopkow, Indiana University
Threshold Concepts and Decoding the Disciplines developed simultaneously, but independently in the late 1990s and early 2000s to help instructors become more aware of tacit knowledge in their disciplines. We believe that Decoding can be useful to those teaching Threshold Concepts because it provides a concrete steps to help students master this troublesome knowledge. In this session we wish to begin a dialogue between the two approaches and to explore the ways in which each may aid the other. Specifically, we will show how the Decoding methodology can be used to help students master Threshold Concepts and assess their success. An example from history will be explored in depth, showing how tacit knowledge was defined and modelled and how practice and feedback was provided to students. Then we will show briefly the process applied to geology and biology.

In the latter part of the workshop participants will apply the Decoding methodology to a Threshold Concept in their own field or in a field in which they consult. At the end of the presentation there will be a general discussion about how Threshold Concepts and Decoding the Disciplines can benefit one another. We expect participants to emerge from the workshop with a clearer understanding of their own tacit knowledge or that of those with whom they consult and with concrete, practical steps for sharing this knowledge.

To adequately initiate this dialogue we would like to request a full 90-minute session. Sections of the session will be presented by each of the four directors of the History Learning Project (Arlene Diaz, Joan Middendorf, David Pace, and Leah Shopkow). We have shared the Decoding process in presentations and workshops on four continents, and we look forward to exchanging ideas with the participants in this workshop.

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**THRESHOLD CONCEPTS IN PROFESSIONAL DEVELOPMENT**

*Thursday 16h 15 - Lecture Theatre 1*

**Vision and Voice: Conceptual Threshold Crossing in Writing for Academic Publication Programmes**

*Gina Wisker, University of Brighton*

Most research into the development and acquisition of threshold concepts concentrates on development among undergraduate students. More recent work has focused on conceptual threshold crossing among postgraduates suggesting that at various stages in their doctoral work postgraduates begin to work at or settle into working at levels which can enable them to produce conceptual critical and creative work in their own projects, in their own discipline. Recent work (Wisker and Savin Baden, 2009) has concentrated on overcoming stuck places in the writing process and using liminal spaces to move writing practices forward, another example of conceptual threshold crossing. Research and practice shared here explores how academics and researchers on writing courses for professional development cross conceptual thresholds in the development of voice, ownership of their writing projects, authenticity in their argument and expression, confidence in their writing and writing practices.
Respondents on the programmes have constructed metaphors and other creative ways of expressing the moments of enlightenment, breakthrough, learning leaps or conceptual threshold crossing when they find they can achieve confident expression in their own writing, voice, and a sense of a repertoire of good writing habits. These metaphors I describe as vision/visions while the confident managed diversity of expression dependent on project, discipline, context and the sense of knowing what to say and how to say it I am describing as ‘voice’.

The workshop shares small scale research with colleague on a writing for academic publication module and other short courses and support practices of writing for academic publication and exploration of the ways in which support and development practices in the longer module are perceived to move colleagues forward in their writing so that they cross conceptual thresholds and achieve voice, good habits, confidence and articulation of their work.

NEW DEVELOPMENTS IN THRESHOLD CONCEPTS 2

Thursday 16h 15 - Lecture Theatre 2

Documenting Learning while Crossing the Threshold: Exploring e-Portfolios and Threshold Concepts in Multiple Contexts

Jordi Getman Eraso and Howard Wach, Bronx Community College-CUNY; and Tracy Penny Light, St Jerome’s University

Meyer and Land’s theory of “threshold concepts” has multiple and intriguing implications for electronic portfolios (e-Portfolios) and documenting learning. Inherent in e-Portfolio practice is the act of making connections between and among learning that happens in different contexts through reflection. This process allows learners to document not only what they know, but also how they know it (Penny Light, Chen and Ittelson, 2011). When paired with threshold concepts, students are able to practice the “ways of knowing” characteristic of a discipline or between disciplines while also documenting the ways that they are able to apply and transfer that knowledge. E-Portfolios allow learners to document their learning in explicit ways while sharing how crossing the threshold has been transformative – they are able to document how and when the transformation in their thinking occurred; how their perspective has been irreversibly changed; the ways that they have integrated their knowledge of the threshold with other learning; the ways that the concepts learned are bounded or border on thresholds either in the discipline or beyond; and the ways that the concepts continue to be troublesome for them (Meyer and Land, 2003). This presentation explores ways in which e-Portfolio practice and threshold concepts can be paired in specific disciplines (such as history), between disciplines (such as in interdisciplinary programs) and in faculty development initiatives to promote transformative, irreversible, and integrative learning that is bounded and troublesome (Meyer and Land, 2003). The identification of critical learning outcomes to allow learners to
engage in this documentation while reflecting on crossing the threshold is also examined. We present case studies and learner examples from each of these contexts and engage participants in exercises to explore how e-Portfolios can be used to document the learning of threshold concepts in their own institutional contexts.
The research reported here was motivated by a doctoral candidate comment. I had asked her as a Research Assistant, not as a candidate working with me, to check a manuscript on threshold concepts in doctoral education in preparation for publication. Her main comment on having read the paper was: ‘If only I’d known that I was just in a stuck place state it would have made it so much easier’.

Hence, began work with doctoral candidates to help them understand doctoral study as:
* an extended period of learning where the candidate might be in a liminal state until crossing the threshold of completion and ‘graduation’, and
* a period made up of a number of threshold crossings as candidates understand the various concepts that challenge them (Kiley, 2009), each preceded by a state of liminality and being in a ‘stuck place’.

The study entailed working with 10 doctoral candidates in Education. Candidates were invited to attend a workshop where the doctoral experience was examined as a series of intellectual, personal and emotional challenges, some which could result in candidates feeling they were in a stuck place (Kiley and Wisker, 2009). Following the workshop the candidates, all mature-age (average age 50) and almost all working full-time in professional roles, were invited to keep a note of their experiences of being ‘stuck’ and then discuss these at monthly group meetings.

With their agreement, the discussions were noted and then analysed and reported back to the group where there was on-going discussion of being in a ‘stuck place’ as a doctoral candidate. The outcomes of this activity provide a useful approach for other doctoral supervisors in helping students through some of the challenges and difficult periods of candidature.


2: Doctoral Education at the ‘Eye’ of the Perfect Storm

Paul Coughlan, Trinity College Dublin; and Anne Graham Cagney, Waterford Institute of Technology

There is evidence of change in the context in which doctoral education is developing; in the need for research-based responses to the grand challenges facing society; and in the employability of the PhD. Key features of these changes identified by the EUA and the IUA, include quality research training, inter-disciplinarity, partnerships with industry, and a mentality of innovation. Researchers need to develop cross-disciplinary thinking in order to work with someone else within the discipline, outside the discipline or in practice. Therefore, PhD research has to contribute in different ways, and the researcher must develop new and different skills and perspectives. In particular, the researcher must come to see that to explore and exploit the value latent in their thesis research, it may be necessary to interact directly with researchers from other disciplines and, together, to progress from multidisciplinary interaction to interdisciplinary outcomes.

The overall objective of the study was to explore how distinctive learning spaces can be built into doctoral teaching-learning environments (TLEs) in order to create opportunities for cross-disciplinary transformative learning to occur. More precisely, the aim was to identify how to create doctoral learning spaces that enable one to think beyond one’s own discipline, to communicate across traditional disciplinary divides, in order to exploit the potential in the thesis research while not diluting the (disciplinary) core of the research.

Literatures that inform this study include EUA, IUA and other universities discussion papers and monographs; Entwistle (2009, 2008), Donald (2002), Land (2004, 2005), King (2005, 2009) and Graham (2011).

The TCD/UCD Innovation Academy is the context for this case study. Methods used included a student questionnaire, interviews, an end-of-programme 360° evaluation, and document analysis.

The research results identify aspects of the learning space that impact on student’s ability to communicate across the disciplines, and to move from ‘intra-disciplinary’, to ‘multi-disciplinary’ to ‘inter-disciplinary’ ways of thinking and practicing.

Further steps are identified for developing Academy programme TLE and also suggestions for initiatives within and between faculties in both universities. The need for more research into creating cross-disciplinary doctoral learning spaces in general is identified.

3: ‘Enabling’ Graduate Attributes as an Interdisciplinary Threshold

Brad Wuetherick and John Thompson, University of Saskatchewan

Embedding professional skills or graduate attributes (including leadership, ethical understanding, communication, and many others defined at the disciplinary, institutional
Barrie (2004, 2006) argues that one reason such initiatives have not had the impact that they might have had is that academic staff’s conceptions of these attributes varies greatly. They range from an understanding of attributes as something that should have been learned prior to coming to higher education (‘precursory’) to something that is the skeleton upon which all disciplinary and interdisciplinary learning is built during students’ higher education experiences and beyond as lifelong learners (‘enabling’). By examining these graduate attributes as ‘enabling’ attributes, we highlight the complexity with which we must grapple in order to begin to embed them meaningfully and authentically into curricula. With an enabling conception of these skills or attributes, we argue that each skill or attribute can be viewed and organized as a threshold concept involving both reflection and practice that students must engage and be engaged by – concepts that are transformational, irreversible, integrative, bounded, and troublesome (Meyer and Land, 2003).

This paper, based on an exploration of ‘enabling’ graduate attributes in the context of an integrative, interdisciplinary graduate seminar on Critical Thinking and Professional Skills taught at the University of Saskatchewan, will explore how (at least some) professional skills or graduate attributes are instances of interdisciplinary threshold concepts. Such an approach to a pedagogy of graduate skills that complement disciplinary knowledge and practice has significant implications for professional reflection, practice and lifelong learning.

4: The Experience of Interdisciplinarity in Doctoral Research: Threshold Journey

Jeffrey Keefer and Gale Parchoma, Lancaster University

There is a rather widely held perception that doctoral students begin their formal studies in a foundational discipline and then continue in it throughout their academic careers. It would then follow that their doctoral supervisors would share their supervisees’ home discipline. Supervisor-supervisee pairs would research and teach in the same discipline, would share an interest in specialized topic area, and perhaps even engage in a preferred methodological approach. However, evidence from applied research fields, including educational research, suggests this pattern may not consistently be the case, with the effect of traditional disciplinary blurring leading to unanticipated doctoral research and supervisory challenges. An extended literature review was conducted, after which a research design was developed to explore the central question, “How can supervisors support their postgraduate students to work through threshold crossings if they come from different foundational disciplines, even if they are working within a clearly delimited field of study?”

This paper reports findings from a resultant qualitative, small scale study of fourteen applied research doctoral supervisors from ten universities in five countries. Using a grounded theory-informed strategy, interview transcripts were individually coded and then discussed between both researchers to develop and agree upon shared themes. A series of disciplinary
challenges, opportunities, and questions surfaced. Questions around disciplinarity were found to be especially pronounced when influenced by a need for methodological pluralism to investigate complex, contextualised problems, which most often occurred when divergent academic backgrounds introduced tensions between supervisors and supervisees. This paper discusses a broad set of challenges, opportunities, and questions around transdisciplinary integration and problematises threshold concepts and crossings in applied doctoral studies.

5: “Is there a Doctor in the House?” Pedagogical Portals and the PhD

W. Alan Wright and Marie-Jeanne Monette, University of Windsor

This workshop examines the training and development, both formal and informal, of university professors beyond the discipline-specific knowledge they acquire through postgraduate studies en route to a PhD.

“Is there a Doctor in the house?” is the traditional call for a physician’s expertise after a sudden, unexpected medical emergency in a public setting. To what extent are traditionally-educated PhDs able to handle calls for help when expertise in university pedagogy is required? What pedagogical portals should these doctors pass through to ensure their preparedness? The workshop leaders collaborated, over a period of several months, with a network of Canadian university lecturers and educational developers to explore how threshold concepts apply to the professional development of university professors in their roles as teachers. As the dialogue evolved, it began to delineate some key ways in which the notion of threshold concepts applies to the growth, development, and even the transformation, of the individuals’ capacities, expertise, and world views, potentially resulting in a re-working of their existing bodies of knowledge, as they become university teachers.

Using insights and illustrations from this network as a foundation, this workshop will stimulate a dialogue among academic staff and academic developers concerning the application of threshold concepts to the process of growth and transformation necessary for success as a university professor. The workshop format will address the professional development process per se and will also attempt to further define specific threshold concepts to be incorporated, ideally, into a university teaching certificate curriculum. Possible distinctions between threshold concepts, fundamental concepts, and key concepts will be explored. Workshop participants will grapple with a ‘short list’ of threshold concepts for the field of university teaching across the disciplines.
'Playing' So Hard We Fall Out of Our Heads: Threshold Concepts and Troublesome Knowledge in Experiences of Experiential Knowledge Acquisition in Higher Education Actor Training

Sam Grogan, Liverpool Institute for Performing Arts

This paper discusses and reflects upon the writer's experience of delivering key aspects of Level 4 (year 1) undergraduate actor training at Bath Spa University during 2009-2011. Adopting the position of a 'tutor-guide' with the students through the training the student actors are asked to revisit territory previously felt to be familiar. The nature of the interaction with this territory during the experience of training causes them to necessarily adopt a fundamentally altered perspective in relation to their view and embodied understanding of this knowledge and territory. In attempting to attain this perspective and also in attempting to maintain and implement the embodied knowledge the perspective contains, the student necessarily encounters these aspects of training as a Threshold Concepts and as Troublesome Knowledge.

Within this experiential setting this paper focuses particularly on the idea of 'play' as espoused by Winnicot and Huizinga amongst others, as a paradigm for engaging in the act of acting. The paper also uses Csikszentmihalyi's notion of 'flow' as an 'optimal' psychological state linked by Csikszsentmihalyi to notions of creativity and discovery. As embodied in studio and performance practice this playful state is commonly referred to by the students as 'letting go'.

This paper positions Meyer and Land's Troublesome Knowledge and Threshold Concepts firstly as 'embodied knowledge-as-experience', and secondly as a playful state of being involving interaction with an altered state of consciousness on the part of the student actor similar to those states associated with 'flow'.

This paper examines the practical strategies of the particular training undertaken by students at Bath Spa University during this time in order to facilitate a habitual implementation of transformation and change within the work of the student actor. In doing so I reference the work and thinking of Gunduz Kalic, from whose practice these particular processes and approaches stem.

An Overview of the Application of Enquiry Based Learning and Threshold Concepts in Practice Based Arts
Gerry Gilvary, Institute of Technology, Tallaght

In 2008, I introduced Enquiry Based Learning (EBL) approaches across a number of Media Studies/Production subjects, in response to a feeling that graduates were still lacking the essential practical and transferable skills required for the creative industries. Most students behaved as polished mimics rather than potential thinkers and doers of the profession. They could often demonstrate in a simulated environment what was approximately required, yet show little evidence of deep structure learning (synthesis of theory and practice, critical reflection and evaluation, time management, team-working, communication skills and so on). In SOLO taxonomy terms, (Biggs, 2002), a significant student cohort would stay at a multistructural level while some would reach the relational level.

EBL placed the responsibility of learning onto the student as an essential part of their passage into a community of practice. The philosophy moved from Teaching and Learning to Ways of Thinking and Practicing (Entwisle 2004). The EBL approach has proved successful across a number of areas (Learning Outcomes, grades, better standard of work, higher student and personal satisfaction). EBL introduced new challenges into the way I work and think about what I do, it especially highlighted “Troublesome Knowledge” (Perkins, 1999).

In December 2010, I was introduced to “Threshold Concepts” (Meyer and Land, 2006). Indeed, it proved to be a portal into a “liminal space” (Meyer and Land, 2006), that allowed me to further develop EBL methods to support students with the demands of the Threshold Concepts of Media Production (the fundamental shift from a passive media consumer to an active media producer).

My presentation will concentrate on my own personal experiences and on-going qualitative research into the complex issues of Threshold Concepts foregrounded within an EBL structure. It will be delivered pseudo-Pecha-Kucha style with video material.

Friday 10h 55 - Maxwell Theatre

The Hero’s Journey: Uncovering threshold barriers, dispositions and practices among occupational therapy students

Tracey Fortune, Priscilla Ennals, and Mary Kennedy-Jones, La Trobe University

This presentation reports the findings of a study of final year La Trobe University occupational therapy students’ and their journey through their program. The study aimed to ascertain what learning concepts and elements of professional practice they identified as troublesome or challenging along the way. Reflective narratives tracing the student’s journey into and through the course were collected and thematically analysed. A subsequent focus group served a member-checking function. Students were prompted to structure a written narrative using an adaptation of the American mythologist and writer, Joseph Campbell’s Hero’s Journey phases. The students utilised these phases to identify key thresholds and troublesome concepts, in addition to reflecting on their ‘ah-ha” moments.
where they felt they had emerged transformed. The study was set within the final academic subject for the course, a capstone subject which aims to build upon a range of professional competencies for imminent practice. Higher education research has described troublesome ideas as threshold concepts and sees the crossing of these thresholds as critical to successful educational journeys (Meyer and Land, 2006). It is proposed that students’ reflection on their (we hope, transformational) journeys from learner to practitioner can provide critical information to raise staff awareness of troublesome knowledge in the curriculum. Improved understanding about students’ perceptions of troublesome knowledge should inform curriculum modification and/or a need for enhanced support to students at points identified as troublesome. The ultimate aim is to be better informed about threshold concepts and troublesome knowledge in the curriculum. The Hero’s Journey structure provided a novel framework enabling increasingly ‘feedback jaded’ students to enthusiastically plot out their story, to be kept as an educational, personal and professional record as they approached the student - practitioner threshold of their journey.
In this presentation, the researcher will describe the preliminary results of a study of doctoral students’ experiences of threshold crossing. The phenomenographic study was designed to explore how doctoral-level learners view and position themselves personally, professionally, and academically. The study took place at a university in Canada. Because the doctoral students study at a distance, they use networking technologies to connect with people and resources located in different parts of the world. Although enrolled on Education and Business courses, the 19 interviewees hold master’s degrees from a variety of fields including education, theology, nursing, health care, and business. Whilst discussing their doctoral experiences during the semi-structured interviews, several of the participants compared their doctoral experiences with their master’s experiences. The researcher will discuss the differences in developmental and conceptual shifts at the master and doctoral levels as noted by the learners. In accordance with the intent of the study, particular emphasis will be placed upon the participants’ sense of identity (-ies). Preliminary results suggest that many of the participants find themselves in an ontologically liminal space—that is, many of the doctoral students are unsure of where they fit within social, professional, and academic settings. Many participants recount feeling that as their understanding in their doctoral work deepens so does the identity-crossroad at which they find themselves. As such, the researcher will focus on the variety of ways in which the participants described having experienced ontological (sense of self and the world) and epistemological (deepening of knowledge, understanding of their work) threshold crossings, and how these results compare to that found in the current literature on threshold crossings at the doctoral level. The study introduces the phrase ‘identity positioning thresholds’ which is based on the ideas of social positioning, threshold concepts and threshold crossings.

Friday 10h 35 - Joly Theatre

Self as a Learner as a Threshold Concept: The University Journey

Lee Wertzler and Richard Gale, Mount Royal University

Mount Royal University has committed resources and attention to creating an Assessment Seminar modelled after the long-standing approach used by Harvard University. Students are interviewed concerning topics about which the university is prepared to take action. Both Richard and Lee have been members of the MRU Assessment Seminar since its inception in the fall of 2009. In the 2011 interviews of approximately 70 third year students in new degree programs, comfort with sense of self as learner has emerged as one central
theme. In contrast, and as might be expected, when interviews of approximately 100 first year students were conducted in 2010, responses to various interview items indicated that they had less understanding and more discomfort around self as a learner. Since 2010, Mount Royal has offered Effective Learning in the Undergraduate Context, a credit course open as an elective to any MRU student. In one of her classes, Lee conducted a research project in which students made a record (for themselves) of change they noted in themselves as learners throughout one semester. Our presentation will consider the following questions. What reconstitutive thoughts, feelings, and behaviours might comprise a student’s knowing self as a learner, and to what extent is this process both troublesome and irreversible? What impact might knowing self as learner have for the student’s integrative capacities? How can a student be facilitated to develop a solid sense of self as a learner early in their university experience and of what benefit might that be to the university and the student's discipline of study. Time for dialogue is included in the presentation.

Friday 10h 55 - Joly Theatre

Academic Numeracy: Challenging Thinking Dispositions to Enable Students to Enter and Cross the Liminal Space

Rosanne Quinnell, University of Sydney; and Rebecca LeBard and Rachel Thompson, University of New South Wales

The thresholds concepts framework was used to identify the underlying dysfunctional attitudes and stances students may adopt that can preclude them from engaging in our discipline practices. In the sciences numeracy skills are integral to the professional practice of data handling, data presentation and interpretation. We have found that students lacking in numerical confidence are more hesitant to engage in these activities, which impacts of their learning of the discipline by directly inhibiting how well the students tackle threshold concepts with numeracy elements.

While mathematics can be enabling, we postulate that the transfer of numeracy skills can be inhibited by a transfer in “maths anxiety”, a “transferable anxiety”, that doesn’t appear unique to a particular discipline. In the classroom, this often translates to a hierarchical standoff: “I can’t do maths” versus “they can’t do maths”. Students who default to this position are at risk of not engaging in our practice as they have adopted a thinking disposition where a lack of depth in understanding has been previously legitimised i.e. if they retain the static position long enough, the educator will eventually offer a worked solution.

We have identified and compared inclinations and assessed students’ abilities across three disciplines within science. We have been able to map these onto the Perkins et al (1993) framework of “triadic thinking dispositions” and offer descriptions of the sensitivities, inclinations and abilities that place students “at risk” of not engaging in numeric activities. We have designed a diagnostic tool to help students understand and self-challenge their
level of confidence in numeracy. We postulate from the tool’s evaluation, on the success of this learning activity in helping students cross the liminal space and also posit how this might improve our students’ ability to transfer their numeracy skills and confidence more readily across disciplines.
**Threshold Concepts in Professional Development**

*Friday 10h 15 - Lecture Theatre 1*

**Threshold Concepts and Practices in Teacher Education: Professional, Educator and Student Perspectives**

*Ann Devitt, Marita Kerin, and Helen O'Sullivan, Trinity College Dublin*

The metaphor of a programme of professional education as a portal or threshold to a profession is a very apt and powerful one. Professional education programmes are both the gatekeepers of a profession and its door stewards facilitating entry and initiation. The concepts and practices, or ways of thinking and acting, of a profession provide the structure and path for the passageway from novice to initiate within the profession. In this process there are a number of actors who must negotiate the portal: its dimensions; its accessibility and its boundaries. In most professions, these actors are the student professionals, the profession educators, members of the profession and often leaders within the profession. This paper aims to explore the concepts and practices encountered, developed and integrated through the portal of pre-service teacher education from these four perspectives: the student teacher, the teacher educator, the experienced teacher and the school leader. A key focus of this paper is on the operationalisation, integration and maintenance of threshold concepts of education in and through practice. Through analysis of interviews with the four groups, the aim is to explore the troublesome and transformative nature of this integration process which is at the heart of student teachers’ developing identity as teachers. In addition, the paper addresses the depth, duration and fossilisation points of the process in order to inform a greater understanding of the scope of initial teacher education within the continuum of continued professional development for teachers. This work has emerged from previous research on transformative experiences during initial teacher education which pointed at a number of threshold concepts in teaching, for example, learner empathy that seem to be part of a hidden curriculum of teacher education and not explicitly articulated in programme descriptors.

*Friday 10h 35 - Lecture Theatre 1*

**Troublesome Thresholds and Limiting Liminality: Issues in Teaching in Vocational Education**

*James Atherton, Peter Hadfield, and Peter Wolstencroft, University of Bedfordshire*

In the UK, much vocational education outside the university sector is undertaken according to curricula prescribed by national awarding bodies. This paper will use the discourse of threshold concepts and liminality (and communities of practice) to explore the epistemological and pedagogic assumptions and values contained in several such curricula and the ways in which they contribute to (or hinder) the formation of a sense of practitioner identity and ways of thinking and practising within an occupation.
Building on research undertaken for a previous presentation (Atherton, Hadfield and Meyers, 2008) with in-service students teaching within this area, we shall show how external influences, from funding mechanisms to assessment regimes, conspire to militate against effective engagement with threshold concepts on such courses, and particularly shy away from allowing learners to experience liminality. We also recognise the difficulty of prescribing how the transformation inherent in crossing the threshold might or even should be managed.

Against this background, we shall discuss strategies for enabling teachers to recognise threshold opportunities within their disciplines and to capitalise on them within the constraints of their curricula, and evaluate our own efforts in this field, with particular reference to Perkins’ (2010) framework of moving concepts from “object” to “tool” to “frame”.

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**Friday 10h 55 - Lecture Theatre 1**

**Moving from Personal Practice to Communities of Reflective Practice: A Model for Professional Development**

*Brian Ó Donnchadha, National University of Ireland, Galway*

Facilitating irreversible changes in perspective – changes which show the interconnectedness of phenomena and reveal troublesome knowledge - involve affective and cognitive change (Cousin, 2006). Yet, how can students be invited into liminal space to grasp threshold concepts unless those teaching them have lived in such a space? With the emphasis on life-long learning and continued professional development, are not academics expected to learn as they teach and research? Can it be assumed that only students experience a state of liminality, and if not how are academics assisted in a systematic manner through the oscillation of understanding towards an ‘aha moment’?

In this presentation, Ó Donnchadha outlines how the use of pedagogies of engagement (such as community based learning) resembles threshold concepts insofar as they are transformative, irreversible, bounded and can lead to troublesome knowledge (Meyer and Land, 2003). Based on his recently completed doctoral thesis on the reflective practice of academics who use community-based learning, Ó Donnchadha discusses the relevance of his model of the Community of Reflective Practice to the examination of threshold concepts.

A Community of Reflective Practice (CoRP) is a structured model of reflection which facilitates academics to critically reflect with their peers in a safe and nurturing environment on their academic, civic and personal development. The CoRP model examines the need for time, structure, communication skills and a knowledge of how to reflect deeply, in a safe space to address issues of discourse, space and criticality. The aim of such a forum is to contribute to and transform the personal, academic and civic development of the academic so as to support them in the role as facilitators of learning. Ó Donnchadha suggests that because the Community of Reflective Practice can address some of the practical and
philosophical needs of civically engaged academics, it can have a broader application for those who use other forms of transformative learning, by providing a forum in which academics can move from personal practice to professional development.


Creativity as Threshold Learning and Teaching in a Liminal Space

Belinda Allen, University of New South Wales

Creativity is increasingly represented in higher education aspiration statements as an attribute that graduates in all disciplines require to successfully engage in contemporary and future professional life, but it is not clearly conceptualised in HE learning and teaching (Jackson et al., 2006). Understandings of creativity are contextualised within the discipline, and usually tacit in the curriculum. Teachers know when the learner has ‘got it’, but find ‘it’ difficult to define explicitly. So can creativity be conceived of as a threshold concept, or disposition? Some of the characteristics of threshold concept (Meyer and Land, 2003) - transformative, probably irreversible, integrative, possibly bounded, potentially troublesome – seem quite applicable to conceptions of creativity as a learned capability.

Particularly apposite is the idea of liminal space, defined by Land, Meyer and Baillie (2010) as a ‘stuck place’, where understanding lacks authenticity because it has not been fully internalised. This seems to parallel the “disorienting dilemma” inherent to transformative learning (Mezirow, 1991), but also the liminality of creative activity – where chaos rules, unexpected connections are made and outcomes are uncertain. Entering liminal space is a prerequisite for the creative process, and development of creative identity requires being able to operate in this condition of “being-for-uncertainty” (Barnett, 2004, p.258).

This paper re-visions liminality as an authentic creative space for learners and teachers, a space for unknowing and unlearning, a disorienting and productive space. It explores creativity as a threshold in higher education, and the notion that inhabiting liminal space is intrinsic to learning and teaching creativity.


Visible Learning of Threshold Concepts - An Example of an Assessment Task Using Concept Mapping

Sarah Barradell, La Trobe University
Concept maps are visual representations of information. Most importantly concept maps show relationships between information. They are tools that explicitly make learning visible. How knowledge is constructed is key to the underlying theory of concept maps (Novak, 1990). How though do we decide what concepts are important for our students to map?

Threshold concepts would seem to have much to offer. The essence of threshold concepts is concerned with how students learn (Meyer and Land, 2003; 2005). These concerns would seem consistent with the aims of concept maps. The characteristics of threshold concepts also align well with the aim of concept maps. It may therefore be of value to set concept mapping tasks around such concepts. This may help to facilitate meaningful learning at important places in the curriculum.

The use of concept mapping as an assessment tool in a newly designed subject of the Department of Physiotherapy, La Trobe University will be discussed. This subject’s curriculum was designed around identified threshold concepts. One of its assessment tasks required the students to develop a concept map in response to the topic ‘Key concepts that influence the ways of thinking and practicing by the physiotherapist who works with the person with neurological dysfunction’. This topic required students to demonstrate their learning of the threshold (and potentially other) concepts.

It was possible for some students to identify threshold concepts, but others did not. It was also possible for some students to demonstrate significant grasp of relationships between concepts, but others did not. These differences will be explored using examples of students’ maps.

Furthermore, completion of concept mapping tasks may be a way to involve students in the threshold concepts dialogue whilst overcoming the barriers associated with threshold concept and pedagogical terminology and theory.


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**Friday 10h 55 - Lecture Theatre 2**

Integrating Teaching using Troublesome Knowledge Items, "Sticking Points" and Just-in-Time Teaching

Brian Whalley, University of Sheffield

In geology, physical geography and biology, students are expected to deal with scientific concepts as well as think scientifically. The factual basis of these areas frequently includes quite specific terminology and associated concepts. The latter includes, for example, units
and equations used as part of the educational process where understanding is required for lectures, practicals, and reading the appropriate literature. Frequently, students do not have a good prior knowledge of the subject matter and sometimes scientific knowledge is poor or non-existent. Thus, identifying and dealing with threshold concepts, which may be quite simple, as in definitions, can play a significant part of teaching these students and increase their confidence and understanding. Not only is it important to identifying certain troublesome concepts and principles, but 'sticking points' (individual items, often tacit knowledge, that can be 'taught' in seconds) may arise. These need to be recognised in advance, usually from the tutor’s prior experience. Both the troublesome knowledge and sticking points can be incorporated into teaching via the Just-in-Time Teaching concept of 'preflights'. There are various ways preflights can be used for a variety of Troublesome Knowledge Items (TKIs). This paper shows how this can be done effectively for both students and tutor by incorporating TKIs into assessment and feedback in a module. In some cases the identification of TKIs can be used directly as 'criteria-referenced' assessment. The paper also suggests ways of using TKIs as a means of 'feed-forward', as well as in feedback, to promote and integrate effective education and teaching. These include wiki creation and the use of Wikipedia as well as sticking points. The importance of planning student activities and recognition of tacit knowledge problems will be illustrated with examples and illustrations from the 'student voice.'
Day 2 Session D - Pecha Kucha

INTERDISCIPLINARY THRESHOLD CONCEPTS

Friday 10h 15 - MacNeill Theatre

1: Threshold Concepts in Introductory Engineering: Useful Metaphor or Empirically Based Construct?

Christian Kautz and Andrea Brose, Hamburg University of Technology

Introduced by Meyer and Land in 2003, threshold concepts have since become a useful figure of speech for describing and explaining typical difficulties. Because of their reference to individual learning biographies of novices and experts, threshold concepts appeal to many instructors in the technical disciplines. However, in spite of this success, an unambiguous operational definition of threshold concepts in those fields has never been given. In this presentation we will show empirical data from introductory engineering education for which threshold concepts serve as a plausible theoretical model and suggest possible criteria for their identification. We also identify threshold concepts that are common to introductory courses in several engineering disciplines.


Sonia Magdziarz, Paul Myers, and Sheila Bellamy, RMIT University

The notion of threshold concepts developed by Meyer and Land (2006) has been explored in the area of Introductory Accounting but not in Financial Accounting. In financial accounting, my experience has shown that many students have difficulty being able to understand and apply accounting principles and techniques and resort to rote learning and leave the course with a superficial understanding of accounting. Semi-structured interviews with accounting academics were used to explore the identification of threshold concepts in financial accounting in higher education. One of the threshold concepts identified was the duality of transactions. It is a troublesome concept that requires students to integrate knowledge about the business world and society; features of the economy a business operates in and/or trades with; the impact legal regulation has in the form of taxes and laws as well as accounting regulation in the form of accounting standards and the conceptual framework; and the impact of different business structures and operations on the accounting function in an entity in profit and non-profit sectors. This threshold concept goes beyond the content of the accounting discipline as it requires a student to adapt knowledge and thinking from different disciplines and relate this to the accounting discipline. The interdisciplinary nature of duality is normally covered very superficially early in a business program but its identification as a threshold concept and a more detailed understanding of its importance can help inform the context of learning and frame how financial accounting is taught in
higher education. This paper explores the views of accounting academics on the interdisciplinary nature of accounting threshold concepts.


3: Using Language to Transform Judgemental Attitudes

Charity Johansson, Elon University

Two Threshold Concepts are identified in the initial course of a physical therapy doctoral program:

- The clinician’s role is not to judge patients, simply to inform and assist them.
- Language is a professional tool that both reveals and shapes a clinician’s attitudes toward patients.

Patients who feel respected rather than judged have better clinical outcomes. Judgment is often unconscious, however, and difficult to examine. Language can be purposefully used to bring hidden judgments to light.

Course activities are designed to:

- increase awareness of judgemental attitudes and communications
- allow students to suspend judgment, creating space for reflection and choice
- facilitate on going self-awareness and growth

In particular, activities interweaving the two Threshold Concepts are designed to disrupt students’ habits of thinking and speaking and push them to create new ways of communicating. For example, students must go 24 hours without saying “should,” stripping their statements of implied judgment and restating their thoughts in purely informational terms. Similarly, students are directed to change judgment-laden “why” questions to factual “what” questions during patient interviews.

The concept of non-judgment and the revelatory nature of language are inherently troublesome. Although students initially agree that judging patients is inappropriate, knowing and being able to tell patients what they “should” do often represents the culmination of their educational goals. When their own everyday communications are challenged, students often fail to see judgments inherent in them. The idea that they may be expressing unconscious judgmental attitudes that are partially responsible for patients’ poor clinical outcomes is difficult to accept.

These Threshold Concepts are not unique to healthcare. Any professional education program must wrestle with the shift from a practitioner-centered to a client-centered approach and with the fundamental influence of language on their clients, all within the time constraints of mandatory content mastery.
In electrical engineering as well as in physics it is crucial to understand that the phase, and not only magnitudes, of signals such as AC-currents and voltages or light matters. In a preliminary study (Bernhard and Carstensen, 2002) we found difficulties in understanding phase relationships (cf Kautz, 2011) and in modelling (cf Carstensen and Bernhard, 2008; Foley, 2010). In electrical engineering and in physics complex numbers open up for “new and previously inaccessible way of thinking” and representing phase relationships and in an earlier work we have shown that understanding complex numbers opens up for "seeing things in a new way" (Bernhard, Carstensen, and Holmberg, 2008). In this paper we will present a study using questionnaires and interviews with second and third year electrical engineering that shows that for most students phase relationships and the use of complex numbers (phasors) in representing signals still are troublesome knowledge and that most students are in a liminal space. Without understanding the concept of phase students would face immense problems in understanding for example electric circuits or optics.


Day 2 Session E - Papers

ENGAGING STUDENTS WITH THRESHOLD CONCEPTS 1

Friday 11h 50 - Maxwell Theatre

Accepting Ambiguity, Enjoying Complexity: Threshold Concepts for the Humanities

Anthony Ciccone and Renee Meyers, University of Wisconsin-Milwaukee

Threshold Concepts (TC) are ideas/concepts/perspectives central to learning in a given subject area. In some disciplines, threshold ‘concepts’ are indeed concepts that need to be grasped before further progress in understanding can be made. Hence a primary goal in these disciplines may well be to clarify difficult concepts by making them more transparent and less ambiguous for students. In the Humanities, however, we often want students first to embrace ambiguity and complexity and eschew obvious and misleading “transparency” as a first move toward acceptance of the discipline’s ‘ways of thinking or practicing (WTP)’ (Foley, 2011).

Our project investigates freshman students’ abilities to engage ‘complexity’ as a way of thinking and practicing (WTP) in a Humanities class on comedy. At first glance, most students view comedy and laughter as deceptively simple and transparent. As the complexity of the topic becomes apparent, as the familiar becomes unfamiliar, students may retreat by resorting to relativism (any interpretation is valid) or confusion (what else could there be?). Would expressing their own process of confronting complexity, and in so doing, learning to ‘think like’ (WTP) a Humanist, help them move through this threshold?

The instructor chose guided reflective papers to explore students’ struggles with complexity and ambiguity, to determine if there might be ways to describe these struggles, and ultimately to find ways to make these struggles more productive. The overall teaching-learning goal was to encourage students to value the complexity (WTP) of comedy by reflecting on how their thinking about it changed over the semester. An analysis of student reflections on their confrontation with complexity will be provided, as will an exploration of the relationship between these reflections and the students’ deeper understanding as evidenced in final projects. Lessons learned and recommendations for further study will also be provided.

Friday 12h 10 - Maxwell Theatre

Helping Students to ‘Think Historically’ by Engaging with Threshold Concepts

Paul Sendziuk, University of Adelaide

In 2005 Lee Shulman urged scholars to conceptualise and define what he called “signature pedagogies” rooted in the theory and practice of individual disciplines. These were skills and concepts that were unique to, or at least uniquely applied by, scholars of specific disciplines,
which set them apart from other disciplines. Teacher historians took up the challenge with relative gusto. Lévesque (2008) and Andrews and Burke (2007) have posited that ‘thinking historically’ involves an appreciation of change over time, context, empathy, and the recognition that the ‘past is a foreign country’ (to borrow a phrase from Hartley) and that the people who live there are not like us. Others such as Wineburg (2001), Pace (2004), Pace et al (2008) and Calder (2006) applied cognitive science to identify the mental tasks that practicing historians routinely perform, tasks such as drawing connections, corroborating, and (often unconsciously) applying a sceptical interrogation of sources of evidence. But while the appreciation of these concepts, and performance of these tasks, is second nature to practicing historians, this is rarely the case for students, especially those new to the study of history. Yet without grasping their significance, it is nigh impossible for students to unlock the secrets of the past. In effect, they constitute the primary “threshold concepts” (Meyer and Land 2003) of the discipline that teachers must help students navigate. A case can be made that too much time is spent in academic history courses on teaching content (i.e. about people and events of the past) rather than facilitating the acquisition of the skills and conceptual understandings required for students to make sense of the past (Calder 2006). This paper explains why concepts such as empathy and viewing the past as a foreign country constitute “threshold” understandings, and how History courses can be redesigned to focus on student engagement with threshold concepts (and thus promote life-long learning skills) rather than just the mastery of historical narratives and facts.

Friday 12h 30 - Maxwell Theatre

‘Doing’ history: what may liminal space and transition time expose during the process of mentoring new graduate tutors in the discipline of history?

James Cronin, University College Cork

Meyer and Land (2006) liken the crossing of learning thresholds to a ‘rite of passage’ in which a transitional or liminal space has to be traversed. Tutors, in early formation, may get stuck in a liminal space between crossing from students to disciplinarians or ‘stewards of the discipline’ (Golde and Walker, 2006). This paper, prepared in collaboration with postgraduate tutors in the School of History, University College Cork, focuses on challenges involved in mentoring graduates newly come to teaching an academic discipline. It employs a ‘decoding the discipline’ approach, following the work of Díaz et al in 2008, to make explicit some of the liminal tensions affecting tutors’ shifting notions of selfhood and identity over time.

Over the duration of an academic year, through mentored face-to-face seminars and online peer-to-peer discussions, ten history tutors were asked to interrogate their own teaching: (i) to reflect on their own learning by examining the ‘bottlenecks’ (Díaz et al, 2008) to understanding they encountered in learning the discipline of history. This allowed tutors to better understand what it is to be a novice being inducted into a discipline, why their own
students get stuck, and how best to help them. Reflecting on experiences of learning provides insights about their own encounters with disciplinary concepts and how they did - or did not - come to understand them (see McLean, 2009).

(ii) to chart their own processes in teaching history by examining disciplinary thresholds through dialogue with their peers. This was to encourage a collaborative examination of the process of disciplinary learning, and to reveal some of their tacit beliefs and to manifest assumptions they may make about the ways their students learn.

The resulting narrative exposed contradictions showing that ‘mastery of a threshold concept often involves messy journeys back, forth and across conceptual terrain’ (Cousin, 2006).


Threshold Concepts in Liberal Education

Bruce MacKay, University of Lethbridge

This paper presents findings on Threshold Concepts in an integrative liberal education program at the University of Lethbridge, Canada. Liberal education involves the acquisition of a broad range of interdisciplinary and integrative knowledge and skills, the exposure to a diverse range of perspectives, and the development of abilities in critical and creative thinking and expression. A liberal education, in the words of Martha Nussbaum, “liberates the mind from the bondage of habit and custom, producing people who can function with sensitivity and alertness as citizens of the whole world.” Student transformation from rote learners, holding positions of what William Perry has termed “basic duality,” to independent critical thinkers and writers, holding positions of “committed relativism”, involves crossing a number of troublesome thresholds. This paper will discuss and reflect on the results of interviews with selected students who identified thresholds which proved to be troublesome and transformative in their acquisition of the skills and integrative interdisciplinary perspectives of a liberal education.

Interdisciplinary Threshold Concepts: An Ontological and Epistemological Analysis

Monica Cowart, Merrimack University

Multiple examples of disciplinary-specific threshold concepts already exist within the academic literature and additional disciplinary-specific threshold concepts continue to be added to this growing list. However, less attention has been devoted to both the identification and understanding of those key threshold concepts that hold such a level of importance that they cross over into multiple disciplines. I maintain that these discipline-crossing threshold concepts require a more complex analysis. Specifically, one must ask: how are interdisciplinary threshold concepts able to retain their core nature while seemingly transforming to conform to the demands of distinctly different disciplines? This paper will be devoted to answering this question by offering a preliminary analysis of the epistemological and ontological nature of interdisciplinary threshold concepts. To further illustrate this emerging theoretical analysis, an interdisciplinary threshold concept is isolated and discussed in relation to the three disciplines that claim it. Finally, I discuss how the lessons learned from this examination will aid in the identification and understanding of other interdisciplinary threshold concepts.
“Growth Mindset: An Interdisciplinary Threshold Concept in Course Design” is an interactive workshop that combines qualitative research about course design threshold concepts with participants’ hands-on application of these concepts and behaviours in their own work.

The qualitative research presented (interviews, surveys) is culled from data collected during a curriculum shift at Furman University, a private, liberal arts college in Greenville, South Carolina, USA. In Fall 2008, Furman launched writing intensive first-year seminars. These interdisciplinary “passion courses” are built upon faculty members’ keen academic interests; the learning outcomes require faculty to create dynamic environments in which students become ardent learners as well as develop proficiency in academic writing. Faculty from across the disciplines - Chemistry to Music to Health Science - teach these courses which have replaced Furman’s freshman composition requirement.

Since 2007 I have worked with 70 of the 240 full-time faculty in 8 four-day course development workshops. The following threshold concepts in interdisciplinary course design, corroborated in related literature, emerged:

1. Active cultivation of a growth mindset catalyzes deep learning in faculty course designers and the students they teach (Dweck, 2006).
2. The course design and the class itself are more cohesive when process, not content, is the focus (Fink, 2003).
3. Student learning and faculty teaching satisfaction maximize when student investment intensifies over time (Bean, 2001).
4. Learning excitement amplifies when faculty teach courses outside their area of specialization (Hutson, 2009).

Furthermore, cultivating a growth mindset is the crucial interdisciplinary threshold concept upon which discipline-specific concepts build.

Workshop participants will become familiar with interdisciplinary threshold concepts and growth mindset, identify appropriate threshold concepts in their professional situations, and practice creative ways to qualitatively enhance their support to faculty as they make their “messy journeys back and forth across (the) conceptual terrain” of interdisciplinary course design (Cousin, 2006).
The Trouble with Responsibility: Exploring the Interaction of Tacit Knowledge and Ritualized Practices in Giving Students Responsibility on Placement

Lynn Clouder and Arinola Adefila, Coventry University

The ability to accept responsibility defines all professionals. Responsibility is a core concept in physiotherapy education, deeply embedded in ways of thinking and practicing. However, it is under researched possibly because we all think we know what we mean by it; it is a given. This presentation will use the findings of an in-depth qualitative study of the experiences of physiotherapy students and their placement mentors to highlight responsibility as a threshold concept that is troublesome for both students and mentors.

The importance of being ‘given’ responsibility from a student perspective provides the context for discussing the mentors’ perceptions of the dynamics of ‘giving’ responsibility. This dynamic involves a complex interplay of factors including trust, risk, confidence, the task and the environment. Findings suggest that decision-making processes when a mentor is faced with, for example, whether or not to send a student off alone to assess a new patient, involves tacit and ritualized knowledge that is both reassuring, yet limiting, at one level and problematic at another.

Data suggest that mentors use tacit knowledge at a personal and implicit level of practical consciousness and this is combined with the knowledge that is ritualized in community and individual rituals. For example, the ritual of completion of assessment forms and the use of rules of thumb used to progressively bestow responsibility. While tacit knowledge is implicit its understandings appear to be shared by other experienced mentors at a community level. This creates problems for new mentors as well as for students eager to achieve understanding to develop their practice. However, despite using words such as ‘intuition’ and ‘instinct’, mentors did not rate them as being as influential as doing a risk assessment or seeking others’ opinions on the students’ ability. This finding might reflect the evidence based practice culture in which they operate and the framing of responsibility as ‘just another transferrable skill’ rather than a complex threshold concept.
skills is seen as a crucial step in students' development. Despite the level of importance often claimed for labs, in Australia first year labs in particular are typically staffed by PhD students with limited teaching experience or training, employed on a casual basis. The ways in which these casual teaching staff conceptualise learning and teaching will inevitably have significant impact on how they view the undergraduate lab environment, and what opportunities for learning they are aware of and facilitate.

We report on a study investigating the ideas that physics demonstrators have about teaching, learning and the purpose of undergraduate laboratories at three Australian universities. Analysis of interviews with twenty demonstrators revealed two potentially critical threshold concepts with respect to their professional development and approaches to teaching, one connected with perceptions of lab goals and the other with perceptions of student capacity. Demonstrators who clung to a conception of labs in which students were striving to achieve a preconceived correct result were found to undermine the increasingly enquiry-based approach of many lab designs. Demonstrators who believed that students have an inherent and unchangeable capacity to be experimental physicists tended not to value their professional development, and varied their teaching strategies mostly in line with their assessment of a student's pre-existing ability. In contrast, demonstrators who believed students could learn were more likely to value professional development and changed their teaching style as they learnt more about how students learn.

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**Friday 12h 30 - Lecture Theatre 1**

**Threshold Concepts and the Expert Student: A Knowledge Structures Perspective on Teaching, Learning and Academic Development**

*Ian Kinchin, King's College London*

A considerable body of research has suggested that one of the key attributes of the professional expert is the ability to manipulate multiple representations of knowledge. This includes experiential knowledge and conceptual knowledge which may each develop along qualitatively different pathways and through different learning mechanisms. Studies of student learning that have employed concept mapping, have demonstrated that experiential learning develops as "chains of practice" whilst conceptual learning develops as "networks of understanding". These qualitatively different knowledge structures need to communicate with each other if the student is to progress from novice to expert.

A recognition of key elements of these knowledge structures provides a possible locus for threshold concepts in acting as a bridge to integrate the conceptual and the experiential and so transform the significance of both. Such bridges may be tacit in nature for the expert, and so may not feature explicitly within curriculum documentation.

Supporting university academics’ focus on knowledge structures in their own disciplines may provide an entry point for the discussion of academic development. An appreciation of the structure of the discipline may help develop an understanding of the importance of
appropriate curriculum structures to support student learning. This also allows the consideration of the ‘expert student’ as one who recognises the existence and complementary purposes of different knowledge structures, and seeks to integrate them in the application of disciplinary practice.

This model can be applied to the development of university teachers and their integration of the linear chains that represent teaching and/or professional practice, alongside the network of understanding that represents pedagogy (including underlying beliefs, assumptions, values and theories). Consideration of the possible bridges to unite these two knowledge structures can provide a basis for discussion of the possible threshold concept(s) that academics need to uncover for themselves to become expert teachers.
Engaging Students with Threshold Concepts 2

Friday 11h 50 - Lecture Theatre 2

Threshold Concepts in First Year Business

Leigh Wood and Susan Hoadley, Macquarie University

This paper reports on an investigation of staff perceptions of threshold concepts in an integrated first year university business program. Over 2,000 students and 50 teaching staff are involved in the program. The results were used to design professional development of new teaching staff.

According to Land et al (2005, p.53), a threshold concept “can be considered as akin to a portal, opening up a new and previously inaccessible way of thinking about something. A threshold concept represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress."

Clarity around the transition to university and the importance of student engagement with learning in business is seen from the perspective of the academics teaching key first year units. What do they perceive to be the threshold concepts? How do senior academics communicate these concepts to their army of tutors and to students?

This paper reports on professional development designed to engage junior academics and students with threshold concepts in business. The professional development is designed using the Professional Development Framework (Brown et al, 2010) and derives from the UK standards framework.


Friday 12h 10 - Lecture Theatre 2

Assessment of Learning in the Clinical Practice Environment: Using an On-Line Tool to Help Students Understand the Abstract Nature of Steinaker and Bell’s (1979) Experiential Taxonomy

John Sweeney, Josephine Hegarty, Carol Condon, Maria O’Shea, Angela Flynn, Lynne Marsh, Agnes Phelan, Ann Cummins, Silé Creedon, and Kay O’Mahony, University College Cork

Assessment of clinical competence is an essential component of any health related professional programme. Clinical assessment in our school currently comprises of: 1) Each student being assigned a registered nurse/midwife clinical preceptor 2) Preceptor and
student working together in clinical practice 3) Student and preceptor agreeing the number of competencies and level of attainment for each placement and 4) the first 4 stages of Steinaker and Bell's (1979) experiential taxonomy (exposure, participation, identification and internalization) being used to assist in identifying the level of competency attainment appropriate for each year of their programme. However, students and preceptors have articulated difficulty in comprehending the abstract nature of such threshold concepts.

To create a profile of clinically pertinent cases which could be used to explain what is required of students at the various levels of the taxonomy. Translate this information into an easily accessible online intervention.

A series of qualitative, descriptive semi-structured interviews (created around the framework of Steinaker and Bells (1979) Taxonomy) were conducted with students (n=10) and preceptors (n=10). Data was analysed using qualitative, thematic, content analysis. Key exemplars, which best explain the clinical assessment process were identified. An online package using a mixture of text, audio, providing clinically relevant interesting explanations of abstract terminology was created.

The complex nature of each of the concepts within the taxonomy were unravelled using the exemplars provided by students and their preceptors, each participant bringing a unique and discipline specific perspective. This paper provides an overview of the process used to develop and validate the online learning resource.

The interviews provided an insight into the clinical assessment process and brought clarity to abstract terms used in the taxonomy. The online intervention provides an easily accessible tool which can be used as a learning resource.

Acknowledgement: NAIRTL grant funding.

Friday 12h 30 - Lecture Theatre 2

Serious Play: Threshold Concepts, Information Engagement and Game Design

Margaret Blackmore and Pam Freeland, University of New South Wales

In 2010, librarians at the UNSW Library worked together to identify places where students commonly encounter problems whilst attempting to engage with information at university. Based on their many years of experience, the librarians identified a number of different “troublesome” areas where students regularly get stuck, then analysed these to uncover the “ways of thinking” that help students to transcend such problems. These “ways of thinking” were then employed to identify particular threshold concepts that need to be understood if students are to most effectively engage with information at university.

The impetus for this work came from our reading of the research literature on threshold concepts, in particular Meyers and Land, (2006), Land, Meyer and Smith (2008) and Meyer, Land and Baillie, (2010).
Since 2010, consideration of the identified threshold concepts has opened opportunities for innovating library support for university learning and teaching. We are now looking beyond traditional competency based approaches to focus more on the inherent understandings enabling skill acquisition. This has led to a re-imagining of the ways these understandings might be experientially enabled, for example, through the use of interactive games.

This paper will report on an on-going Library and faculty collaboration with a game development course in which students respond to a library creative brief to create game designs to promote understanding of the threshold concepts. Learning outcomes from this collaboration are greater than the sum of any games produced. Librarians have learned about the difficulties involved in presenting abstract ideas through creative briefs, game design students are learning about threshold concepts and sometimes overcoming unhelpful beliefs about information engagement. Both Library and faculty are learning more about students’ incidental learning (learning about content when designing games to teach it). It is perhaps proof for that old adage, “to better understand something, teach it!”


Day 2 Session E - Pecha Kucha

NEW DEVELOPMENTS IN THRESHOLD CONCEPTS

Friday 11h 50 - MacNeill Theatre

1: Integrating Threshold Concepts Pedagogy into a Market-Value Education System to Reduce the “Plagiarism Epidemic"

Corrine Hersey, St Thomas University

This paper argues that: 1) the current market-value model of education reduces real learning and the student’s connection with knowledge thereby encouraging plagiarism, and 2) that the implementation of a Threshold Concepts pedagogy increases real learning and the student’s connection with knowledge thereby decreasing plagiarism. Plagiarism is fundamentally associated with market-influenced education that operates in terms of supply and demand, profitability and a means to an end. Knowledge becomes commodified in terms of human capital (Giroux, 1997) and universities engage in “academic capitalism” (Slaughter and Rhoades, 2004). The plagiarism industry thrives under policies and practices that consider “knowledge and education a commodity, students consumers, faculty entrepreneurs and university managers corporate executives” (Calvert and Kuehn, 1993, p. 116). This framework begins early in the school years and encourages the acquisition of minimal amounts of bits of information – enough to pass to the next level. Students come to post-secondary education on a career path, and ill-prepared for in-depth learning and understanding complex concepts. Student dependence on online information has exploded under these conditions and with anonymous, immediate and cheap access to the Internet. The Threshold Concept model stresses “a transformed way of understanding” (Meyer and Land, 2003, 2006), making meaning of knowledge (Meyer, Land and Baillie, 2010) and participation rather than acquisition (Irvine and Carmichael, 2011). Expanding their first theory of a more discipline-specific model, Meyer, Land and Baillie move to an integrative model of Threshold Concepts. It is not only the discipline-specific model that can move students into that area of transformational learning, but the integrative model of moving them into a transformational way of understanding, using knowledge and “being in the world” (O’Sullivan et al, 2001, p. 11). This paper proposes that under this model, plagiarism and learning cannot coexist.

2: Towards a TCT-Inspired Electronics Concept Inventory

Jonathan Scott, Ann Harlow, and Mira Peter, University of Waikato

This manuscript reports on an initial investigation of the use of Threshold Concept Theory (TCT) to develop a threshold-concept inventory and assessment tool in electronics and electrical engineering. Historically, a host of concept inventories preceded Meyer and Land’s (2003) Threshold Concept Theory. The Force Concept Inventory (FCI) contains a set of
concepts with an accompanying multiple-choice questionnaire (assessment tool) designed to
gauge the depth of student understanding of Newtonian mechanics (Hestenes, Wells, and
Swackhamer, 1991). The following years saw the development of a multitude of other
inventories especially within engineering (Evans and Hestenes, 2001), for example covering
electronics (Simoni, Herniter, and Ferguson, 2004), kinematics (Beichner 1994), materials
(Richardson and Morgan 2001), thermodynamics (Midkiff, Litzinger, and Evans, 2001),
signals and systems (Wage and Buck 2001), waves (Roedel, El-Ghazaly, Rhoads, and El-
Sharawy, 1998), (Rhoads and Roedel, 1998), statics (Steif, 2004), and statistics (Allen, Stone,
Rhoads, and Murphy 2004). Some of these tools are more rigorously researched than others.
For example, the SSCI has been described and verified at some length (Buck et al, 2007,
A number of the concepts in these inventories were discovered to be neither indispensible
to the discipline nor conceptually challenging to learners. Our recent research (Scott and
Harlow, 2011) revealed that some assessment questions evaluated only students' recall of
facts, not deep understanding. In this study we identify the threshold concepts that underlie
electronic circuits, propose a matching series of questions and report on their effectiveness
in assessing the depth of students' understanding. This is both challenging and important as
there is a known issue with student retention (Tsividis 1998, 2009) and the discipline is
relatively hard for students to master because it concerns invisible phenomena and deep
understanding from the very start (Scott, Harlow, Peter, and Cowie 2010, Foley 2010).

3: The Emperor's New Concept: Vague, Postmodern, and Unfalsifiable - Is Threshold
Concept Theory a Step Too Far?

David Delany, Trinity College Dublin

The threshold concept approach (Meyer and Land, 2005) attempts to characterise the
development of students' understanding of a subject in terms of their mastery of critical
‘gateway’ concepts.

Unfortunately, beyond re-labelling concepts previously informally termed ‘fundamental’ or
‘difficult’, it is far from clear that the threshold concept theory usefully extends our
understanding of the learning process.

Whilst the threshold concept notion helpfully focuses attention upon the key role of
conceptual structures, or schemata, in the development of understanding, its
underdeveloped theoretical rationale inexplicably ignores extensive empirical discoveries in
cognitive psychology concerning the development of expertise (Chi et al, 1981; Murphy and
Wright, 1984).

Moreover, proposed characteristics of threshold concepts, such as transformative,
troublesome, irreversible, etc. are vague and poorly specified. Beyond constituting a weak
epistemological foundation, this characterisation also unhelpfully confuses the subjective
and objective levels of pedagogical analysis.
A lack of theoretical depth and clarity, an unsound epistemology, and logical confusion implies that the weaknesses of the threshold concept theory outweigh its potential strengths.

Pedagogical theories, rooted in cognitive science, offer considerably greater promise of a radical transformation and enhancement of performance in learning, teaching, and research (Ericsson et al., 2007).


Jan Parker, Open University

‘Scaffolding’ v ‘Digitally-enabled co-construction of ‘troublesome knowledge’. The case of ‘engaging with theory in literary close reading’.

The metaphor of scaffolding (or as many prefer, trellising!) student learning has been as seminal to Threshold Concepts as Ray Land’s Canongate threshold and Alhambra and Lindisfarne beckoningly lit portals. Yet, that metaphor gained currency when that supporting structure was provided by the teaching and assessing institution, through reading lists, assessment rubrics, academic citation practices etc. These were both concrete - books, lists, photocopied or journal articles etc. - and laid down by the institution.

However, research in Digital Literacy practices has shown that today’s students are engaging with digital texts (texting, online chat, web browsing, social-networking and -referencing sites) in far from traditional ways. Simultaneously, web-based learning environments, notions of connectivity, the potential of social networking, digital and mobile technologies are permeating the academy, through student practice and dominant institutional drivers and government-led technology funding. Recent digital literacies research shows students as highly adept at drawing on technologically-mediated, hybrid textual genres in the process of meaning making.

Where does this leave ‘Threshold Concepts in the context of research-informed teaching’? Lea and Jones’ study across 5 subjects in 3 HE and FE institutions suggests that ‘the complex interrelationship between literacies and technologies [has] the potential to disrupt conventional academic literacy practices’. So how in this ‘scaffolded otherwise’ and peer
socially-networked and referenced learning environment can and do students approach the thresholds and come, and dare, to cross them? What kind of co-constructed meaning do they make? Troublesome, or not?

In a small but hopefully illuminative case study, this paper will report on answers from English Literature students about what is proposed as a Threshold Concept in Literary Studies: engaging with theory in the close reading of texts.

5: The Geometry of Threshold Concepts

Dermot Shinners-Kennedy, University of Limerick

This paper proposes a graphical representation for Threshold Concepts that attempts to capture the features and outcomes attributed to them.

Typically, conceptual structure is represented as a hierarchy or taxonomy. Hierarchical diagrams emphasise separation. As one examines the structure each path partitions the entries and highlights their differences.

As an alternative consider the style used by Garner for the representation of sets and subsets. The same type of relationship is represented but the emphasis is drawn to the integrated nature of the sets.

One drawback is that it is flat or two-dimensional. Moving to a three-dimensional style increases the representative power. In this representation we can continue to represent individual concepts in hierarchical form. We draw them as the sides of a three-dimensional pyramidal structure.

Extending this representation, inside the walls of the pyramid, unseen, is the threshold concept that integrates the concepts on the pyramid sides. The representation is viewed as a prism and it’s behaviour is interpreted to be consistent with that of a prism. Such a metaphor supports the notion that different views of the same structure may yield different outcomes. For example, say a person looks at the structure with a particular background or disposition. Metaphorically that person’s view enters the prism at a particular ‘angle’ or from a particular ‘angle.’ The ‘light’ emitted by the prism will be dependent on that angle.

The presence of an incomplete hierarchy on one or more sides is a ‘defect’ on the surface of that side (e.g. the prism is chipped) but otherwise the prism is still intact. This is interpreted as a section or portion of the conceptual structure that is currently unknown, incomplete or inaccessible. However, the structure is still ‘useable’ albeit not as reliably as if it were well-formed. The prism may have more serious defects. Consider the case of a hole cored right through it or a series of craters on the surfaces. A view entering the prism will be distorted and its passage through the prism and the light emitting from the prism will also be a distortion.
6: Embedding Threshold Concepts into Hierarchical Concept Structures

Michael Bedek and Albert Dietrich, Graz University of Technology

The meaning of a concept is constituted by its extension, which is defined as the set of objects or instantiations belonging to the concept, and its intention, the set of attributes or characteristics those objects possess. The meaning can be enriched by embedding the concept into a web or hierarchical structure, whereby the sub-supra concept-relation plays a prominent role. There are several definitions of concepts which share the same or similar attributes of Threshold Concepts (e.g. Anchor Concepts). We apply the Formal Concept Analysis (Wille, 1982) to establish a hierarchical structure which delivers sub-supra concept-relations and attribute-implications. The Formal Concept Analysis focuses on the Formal Context which is defined by the set structure \( K := (G, M, I) \) with \( G \) as the set of objects, \( M \) as the set of attributes and \( I \) as a binary relation, connecting objects with attributes. We consider Threshold-, Anchor-, Foundational-, Central-, Core- and Key Concepts as well as Fundamental Ideas as objects and their characteristics established from literature as attributes. The formal context provides all information necessary to establish a concept lattice \( B(K) \), which can be visualized by a structured graph. Such a graph is a readable visualization of sub-supra concept-relations and attribute-implications. As an example, Anchor Concepts are defined as being transformative and integrative (Mead et al., 2006). These attributes are a subset of Threshold Concepts attributes, and thus, Anchor Concepts are supra-concepts of Threshold Concepts. With respect to attribute-implications, the attribute transformative implies that the concept is also irreversible. Such attribute-implications provide the opportunity of adaptive procedures to examine which attributes a concept possess. In addition, a concept hierarchy with well described sub-supra concept-relations delivers the foundation for pedagogically sound recommendations by means of deductive and inductive reasoning.


7: From Filling Buckets to Lighting Fires: Faculty at the Threshold

Jane Love, Furman University

Faculty expertise and knowledge qualify them to teach, yet- as the concept of threshold concepts makes clear-, the urge to transfer that knowledge to students (“filling buckets”) often brings with it intractable difficulties. As John Dewey pointed out, “No thought, no idea, can possibly be conveyed as an idea from one person to another”, but ideas can be disseminated as the illumination shed by carefully designed experiences that invite students to discover these ideas for themselves (“lighting fires”). While faculty may embrace this
constructivist theory in theory, as it were, they often resist implementing it in their classrooms, even as they complain of student passivity and failure to take responsibility for their learning. Why is this? What holds faculty back from traversing the threshold of threshold concepts?

This presentation will describe a week-long workshop held for a small group of liberal-arts faculty from across the disciplines to examine the concept of “teaching with your mouth shut”, or of teaching through structured experiences and deliberate refusal of classroom authority. Group reading and discussions of Donald Finkel’s Teaching With Your Mouth Shut provoked examination of deeply held and revealing assumptions about both students and teaching. A judicious recounting of this extended conversation will highlight the epistemological and experiential challenges faced by faculty, as well as development efforts to support them as they traverse the threshold between filling buckets and lighting fires.

Day 2 Session F - Workshops

ENGLISH STUDENTS WITH THRESHOLD CONCEPTS 1

Friday 14h 00 - Maxwell Theatre

'Threshold Concept Literacy': Helping Learners Develop Writing Skills and Acquire Threshold Concept Understanding Through Examining Associated Transformations in Discourse

Graham Barton, London South Bank University

The workshop will first report and comment on the outcomes of preliminary explorations into the application of threshold concepts theory undertaken in collaboration with learners and subject lecturers at a large central London university. In particular, the outcomes of one pilot case study will be used to illustrate how these collaborations might inform approaches to developing student writing, as well as engaging learners with threshold concepts in potentially generative ways.

Participants in the workshop will then be encouraged to undertake a number of activities that mirror these explorations. At various points in the workshop, I will describe approaches that seek to encourage learners and subject lecturers to use text analysis to investigate not only the language features of threshold concepts and ways of thinking in their disciplines, but also the associated transformations in discourse that arise from threshold concept understanding (Land and Meyer, 2003; 2005). The purpose of this approach is threefold: to facilitate conceptual, paradigmatic change in learners; to develop their ability to engage with, and participate in, disciplinary discourses; and to inform Threshold Concept research and practice.

The language features of discourse shifts associated with threshold concepts acquisition appear under-researched outside of the discourse analysis proposed in Land and Meyer’s 2003 paper (p.4). Similarly, the undertaking of literacy development practices through the lens of threshold concepts is under-reported. Threshold Concepts as a field of enquiry and practice might therefore be successfully informed by text and discourse analysis methods developed in the fields of Applied Linguistics, Academic Literacies and Academic Writing. Importantly, the possibility that learners might acquire threshold concept understanding through certain methods of discourse or text analysis (as vehicles for learning) remains under-researched. The implications for pedagogic practice and perspectives on developing student writing will be concurrent themes of the workshop.


Novel Threshold Concepts in the Mathematical Sciences

David Easdown, University of Sydney; and Leigh Wood, Macquarie University

Threshold concepts appear to be pivotal in formative processes that lead to positive or negative dispositions towards mathematics, especially from early childhood. In this workshop we offer examples and anecdotes suggested by colleagues that are novel in nature and invite reactions from the audience. This models our practice in university classrooms where we invite tertiary students to confront their prior learning in mathematics.

We invite workshop participants to brainstorm and

- suggest their own examples where they were switched on or turned off mathematics by some pivotal incident that behaved like a threshold or impenetrable barrier
- explore underlying reasons and how such incidents relate to threshold concepts, especially means by which learners pass through liminal spaces or become stuck or repelled
- make suggestions about how these inform practice towards improving the teaching and learning of mathematics.

To seed discussion, consider the following:

Incident from early childhood: “Think of a number between one and ten. Keep it secret. Double it. Add four. Halve what you now have. Subtract the secret number you started with. You are now thinking of the number two.”

This is astonishing to a small child and illustrates a key concept in algebra. Do you think the dynamics, and its long term effects, can be understood succinctly in terms of “x” being a threshold concept?

Another incident (Ross FitzGerald): “Miss, I have three oranges in my right hand. In my other hand I have none. If I multiply the no oranges by the three oranges, where do they go?”

The teacher could not explain where they went and destroyed a small boy’s confidence in mathematics. Is the child’s question sensible? How would you explain where the oranges go? What are the underlying threshold concepts and how does a thoughtful teacher navigate the child through liminal space?
The creative teacher is one ‘ris[es] to the needs of the situation’ (Dewey 1997; p. 174). Meyer and Land’s (2003, 2005, 2006) seminal work on Threshold Concepts gives educators an important lens on the transformation of students’ disciplinary understanding. One key characteristic of a Threshold Concept is that it is likely to be ‘bounded’; a conceptual space with ‘terminal frontiers’ (2006, p.6). Meyer and Land recognise the danger of this being perceived as essentialist. In response they advocate a research-minded pedagogical design so as to avoid what Gardner calls ‘hyper-disciplinarity’. We pose the question as to how disciplinarians might embed integrative learning principles into a Threshold Concept curriculum design. Disciplinary thinking, offering different ways of conceiving phenomena, in themselves ‘reflect characteristics of the phenomenon itself and ...characteristics of the social construction of that phenomenon’ (Davies, 2003; p 7-8). Therefore, the mental capacity of learners to communicate not only within but inter and trans-disciplines requires pedagogical strategies to i) take account of the ways with which different communities of thought conceive of phenomena and; ii) scaffold the ability to think across and merge disciplinary understandings. We propose that the characteristics of integrative learning such as acknowledging authentic, responsible learning experiences and authentic assessment both to the learner and to the world around them is crucial for building such mental capacity. The embedding of such principles into pedagogies may provide ‘a larger canvas from which to view the interconnectedness of our lives’ (Kegan, 1994) and the design of complex and creative solutions to complex and competing individual, institutional and social problems. Drawing on a series of studies across the Sciences, Arts and Humanities, this research offers a series of case studies as a portal into the ‘liminal space’ of integrative learning in the context of threshold concept curriculum design.
Day 2 Session F - Pecha Kucha

THRESHOLD CONCEPTS IN PROFESSIONAL DEVELOPMENT

Friday 14th 00 - MacNeill Theatre

1: Playing with Models to Conceptualise, Support and Assess Professional Learning

Ruth Pilkington, University of Central Lancashire

This concept paper is a work in progress. It provides a preliminary model for how threshold concepts for HE lecturers can be unpacked for analysis and discussion, and for assessment. Utilising the dimensions of self, knowledge and action in the curriculum model of Barnett and Coate (2005) as a starting point, this paper explores threshold concepts for academics engaging with professional learning as HE educators. The separate dimensions can be unpacked for assessment and curriculum design purposes across a range of levels from novice to mastery. In particular, the paper suggests that recent writings synthesising aspects of academic work are providing valuable mechanisms for discussing in more detail how professional learning progresses in the HE context. For example, notions of ‘self’ can be discussed as development from technis through to profis (Kemmis 2010) within which threshold concepts such as ‘critical professionalism’ and ‘reflexivity’ play a significant role as the learning of the HE academic progresses. ‘Action’ can be examined from the perspective of work by Kreber (2004), Brew (2010) and Larrivee (2008) to discuss how the skills and activity horizon of the academic grows as artistry develops. The challenge may be how to focus attention on this within assessment. ‘Knowledge’ is simple and complex as the UK PSF recognises. It embraces pedagogy, roles, responsibilities, the subject perspective, and context (Schulman 1987). In proposing this paper, the author builds upon work and research over a number of years as course leader of a suite of professional education awards - PG Certificate, MEd, EdD - and also having worked closely with UK National Professional Standards for Teaching and Learning. It proposes the idea of ‘facilitated learning space’ which can be structured formally within programmes or informally through dialogue allowing academics to progressively engage with and traverse key thresholds in learning and development.

2: Threshold Concepts and the Spiral Curriculum: Complementary or Conflicting Ideas?

Ian Kinchin and Lyndon Cabot, King’s College London

Within professional education (and in dental education particularly) the notion of the spiral curriculum still has considerable influence on curriculum design. The spiral is conceived as consisting of two parallel strands (theory and practice) which develop hand in hand as the student progresses through the curriculum. However, Illeris (1999: 151) has pointed out that "spiral models have the disadvantage that they indicate a 'smooth', evenly progressive sequence - in contrast to the uneven sequence of reality with jumps in learning". An
an additional problem in dental education is that the two strands of the spiral develop in very
different ways: the conceptual development of the clinical science has the potential to be
ordered to support a systematic development in student understanding, but the experiential
development is much less predictable as students have to tackle the issues presented by
patients in a much less structured fashion. There is, therefore the potential for the two
strands of the spiral curriculum to be disengaged from each other.

It has been suggested by Kinchin et al (2011) that one of the functions of threshold concepts
in dental education may be to integrate the conceptual and experiential strands of the
curriculum. However, this is made much more difficult if the two strands are developing
independently of each other. This then raises a question about the distribution of threshold
concepts in the dental curriculum and whether they can be delivered in a planned sequence
at all.

Discussion is offered of the possible positioning of thresholds within a spiral curriculum, and
the consequences for teaching and professional learning.


3: Threshold Crossings and Concepts in Teaching: An Exploration

Sarah Noonan, University of St Thomas

Threshold concepts (Meyer and Land, 2003) reside undetected in the background until
learners, attempting to accomplish the work of the discipline, soon find their knowledge or
experience inadequate. When seismic shifts cause an examination of the known, due to a
critical experience or powerful episode of learning, a temporary imbalance occurs
(Timmermans, 2010). The gap in knowledge and subsequent discomfort experienced while
in a “liminal state” (Turner in Meyer and Land, 2005) set the stage for new learning. The
focus of my exploration of threshold concepts and crossings involves the relationship
between discipline knowledge and professional learning in education.

I first define threshold “crossings” and “concepts” in education and the teaching profession
as fundamental shifts in professional knowledge and understanding achieved through critical
reflection and learning, resulting in an altered professional identity and permanent change
in practice. The definition emphasizes the importance of using discipline-based knowledge
within communities of practice (Wenger, 1998) to facilitate a deeper understanding of
professional practice.

To illustrate the definition and process, I nominate and describe several recurring and
interrelated challenges in teaching for consideration as threshold concepts: fostering
positive relationships, providing feedback, and sustaining student engagement in learning. I
reveal the presence of threshold concepts lurking in the background by providing evidence
of conceptual change and shifts in professional practice, distinguishing novice from expert teachers in higher education and K-12 education. Using theories from several disciplines to shed light on effective practices, I show the powerful connection between discipline-based knowledge and professional practice. My argument: investigations of theoretical and professional “craft” knowledge must be considered simultaneously to expose the hidden knowledge and opportunities for learning found in the classroom and from the field. While my focus here concerns the teaching profession, the argument likely applies to professional roles and work in many fields.

4: Up Close and Personal: Engaging Learners with Service-User Perspectives

Gloria Kirwan, Trinity College Dublin

This presentation reports on the benefits gained from the creation of a high-challenge learning environment within one module of a professional social work degree programme. In a module entitled ‘Mental Health and Social Work’ for final year social work students, the traditional classroom landscape was transformed (and the safety perch of the lecturer-as-expert unseated) when two representatives of a mental health service-user organisation accepted an invitation to audit the module’s content and delivery. As part of conducting the audit, the service-users reviewed the module handouts, assignment guidelines and lecture content. They also sat in on all the lectures.

Appreciating the value of the service-user perspective and service-user feedback on service delivery is a threshold concept in social work. It is mandated by law in certain jurisdictions, such as Northern Ireland, that social work degree programmes promote service-user perspectives in the curriculum. Yet, for students it is an elusive and hard-to-grasp concept which can be perceived as ill-defined and ambiguous.

Finding ways to represent the views or the ‘voice’ of service-users in education of professional disciplines (not just social work but many other professions also) has consequently confronted lecturers and students alike with challenges of definition, conceptual understanding and application. This experimental audit of a module by two mental health service-users threw out the traditional rule-book on boundaries between expert and learner. Students, lecturer and service-users bravely embarked on a journey together into the uncharted territory of service-user involvement in the classroom. This paper reports on the transformative, irreversible, integrative and profoundly knowledge-changing elements of that journey for all concerned… so far.

5: Threshold Concepts in the Professional Development of Second Language Teaching: teaching grammar communicatively

Jacinta McKeon, University College Cork
Developing the professional practice of beginner second language teachers involves developing their capacity to teach a second language communicatively. In order to do this successfully beginner teachers need to understand, among other key aspects of communicative language pedagogy, how to teach grammar within a communicative approach. Often student teachers will have experienced a more traditional approach to second language teaching in their own schooling which will have involved a key focus on the explicit teaching of grammar in decontextualised exercises. The emphasis will have been on learning the grammar of the language in isolation with little emphasis on how grammar links to communication. With this extensive apprenticeship of observation, learning how the teaching of grammar fits into a communicative approach to second language teaching can be understood as a key threshold concept in the initial education of second language teachers. In my experience as a teacher educator I have found this aspect of the education of second language teachers to be one of the most challenging and troublesome concepts for beginner teachers.

This study will analyse reflections from 50 student teachers (completed in the years 2000 to 2011) on how their understanding of teaching grammar communicatively has developed over the course of the Post-graduate Diploma in Education (PGDE). Each year as part of their assessment they complete a project on their teaching of either French, German, Irish, Spanish or Italian and included in this is a short reflection on how their understanding of this threshold concept has developed over the course of the PGDE programme. A particular focus will be on the triggers both theoretical and practical which helped developed their understanding of teaching grammar communicatively. The interplay of theory, practice and reflection will be explored with a view to understanding how a threshold concept develops uniquely in the minds and teaching practices of individual beginner teachers.

6: What Concepts Underpin Skills Training in Community Services in Vocational Education and Training

Rhonda Fuzzard and Margaret Kiley, Australian National University

Many students enter community service courses in vocational education believing life experiences and motivation to ‘help’ or ‘give back’ are the basis for additional skill development, so they can graduate as good workers. However, the literature argues that workers in these fields must have more than skills training and their own unexamined life experiences to be effective workers in a demanding environment (Sercombe, 2010).

Experts from the field have understandings of skills required by students on graduation, and national training packages define the skills to be taught. Skills “are intimately tied up with values and knowledge” (Ife, 2002, p. 227), yet we do not fully understand the concepts that underpin those skills; so this is the focus of this study; to identify the threshold concepts that professional experts agree are key to community services training.
Six experts from the field agreed to participate in identifying concepts they believe are essential to understanding community services work. Using the Delphi method (Skulmoski, Hartman, and Krahn. 2007), results were integrated then forwarded back to the participants who then ranked the top five concepts.

These concepts were then analyzed against the criteria for a threshold concept. From the analysis, several of those identified by the experts are argued by the researchers to be Threshold Concepts. These will be discussed during the session, it is anticipated that initial data from the subsequent study will be available to support these early findings. The subsequent study aims to seek from classroom teachers what skills and behaviours they can identify in students, that signify who have, or have not crossed these important thresholds?


**Posters**

**ENGAGING STUDENTS WITH THRESHOLD CONCEPTS**

1. Teaching Students to Think the Unthinkable

*Bradley Bowers, Barry University, Florida*

As part of a university whose mission includes the words “Transformative Education,” I push my students to think in new ways; however, in line with recent studies, most resist perspective transformation and have no desire to abandon the paradigms which have so far served them well. Therefore, I exploit the one weakness they all share: complete faith in the authority of the “text,” whether it is a textbook, a cultural norm, the role of the professor, or the “textual expectations” of them as students. My approach undermines the authority of the text, of any text, of all texts. I invoke the foundational theorists Saussure and Derrida. I force them to confront the postmodern dilemma: “If everything is a text, which text has authority?” My desired outcome is to change these students from passive readers of the textual world they live in to active writers of the world they are creating.

Lesson One: Everything is a Text
I’m going to answer – definitively - the age-old philosophical question: If a tree falls in a forest, and no one is there to hear it, does it make any sound?

Lesson Two: The Sun Also Rises
When the sun sets this evening, I will watch it slowly go down until it disappears below the horizon—even though it didn’t. The next morning, the sun also rises.

Lesson Three: You can’t escape the text
Once you understand this dilemma of the postmodern world, the text will set you free. For example, the story of “Bartleby, the Scrivener,” by Herman Melville, illustrates that while you can’t escape the text, you can always change the story.

2. Engaging University Students in the 21st Century Classroom: The Creation and Implementation of Meaningful Multi-Dimensional Learning Spaces

*Janet Hamnett, Mount Royal University*

What constitutes a meaningful learning experience for students in the 21st century in and out of the classroom? As tertiary education communities of practice strive to inspire students to become critical and creative thinkers, and prepare them for careers beyond the classroom experience, this question is critical to not only understanding the relevance of multi-dimensional learning spaces and how they can be created, but how organizations can motivate practitioners to contribute in multiple ways to their organizational success and sustainability.
Framed in narrative inquiry, the author’s dissertation research focused on the conditions that enable vibrant and innovative communities of practice to attract and retain practitioners who are not only aligned with the organizational culture but are also motivated to contribute in multiple ways to the organization’s viability, relevance, success and sustainability.

The findings from this study were adapted for use by the author in the Mount Royal University undergraduate classroom experience in which a teaching model was developed that focussed on examining cultures of learning in the context of multidimensional spaces comprising structural, social, intellectual and liminal (threshold) spaces.

The findings from the dissertation research and in the classroom indicate that where multi-dimensional learning spaces are integrated within learning and work experiences, meaningful and innovative environments can emerge to become creative and sustainable communities of practice.

3. Evidencing Graduating Competency in Occupational Therapy: Resources and Thresholds to Evidence Competence

Carol Hills, Susan Ryan, Catherine Studdert, University of Newcastle, Australia; and Kim Nguyen, Hunter New England Heath, NSW Australia

In 2010 Occupational Therapy Australia [OTA] published “The Australian Minimum Competency Standards for New Graduate Occupational Therapists”. These Standards have to be met by students to be eligible for National Registration which is being introduced in 2012, as they delineate educational outcomes. The Standards are extensive, with seven units and each unit having many elements and performance criteria. For example Unit 1: Professional Behaviour has eight elements and 41 performance criteria. In the same time period this project team gained an Australian Learning and Teaching Council [ALTC] Grant for developing a student-focused competence-based web-site.

This project aimed to investigate students’ and practice educators’ views from five Australian Universities on the contents and composition of the competency website. Ten focus groups were conducted in the five Australian universities with students and practice educators. Students and educators identified that the competencies were difficult to evidence when related to practice and professional reasoning. Participants also requested specific examples of how to evidence these areas at different developmental levels.

The project team reconfigured the Competency Standards by using an Occupational Therapy Practice Process Framework and setting aspects of professional reasoning against each section. Three threshold levels of competence were identified: emerging, consolidating and competent at graduation. These levels gave cognizance to the knowledge, skills and abilities needed in contemporary practice. Resources will now be developed which will assist students to understand the different thresholds and evidence at different stages the integration of these competencies in their developing professional practice.

Asha Khare, Indira Gandhi National Open University

The threshold concepts of understanding, interpreting and viewing performance of educational organization and its learners in Open and Distance Learning (ODL) is meant for the purpose of instruction and improvement of learning, to test the achievement of the learners and to evaluate the effectiveness of teaching methods and learners’ performance. When it is integrated into a cycle of activity involving behavioural objectives and formative and summative evaluation, it provides continuous feedback to the University for understanding, interpreting and viewing the performance of university and learners.

There is a paradigm shift in teaching/learning in the distance educational system. High drop-out rates, low skill and knowledge levels among learners and low levels of learner engagement in learning tasks suggest weakness in the current educational paradigm. In order to bring the threshold concept into the distance teaching/learning it is essential that the changes in student outcomes must be supported by parallel changes in curriculum and instruction. The threshold concepts i.e. understanding the needs of the learners, interpreting the course-delivery mechanism and learning outcomes, viewing and evaluating the performance of the educational organization and learners, and obtaining feedback for improving the curriculum, if adopted in distance teaching/learning, does wonders for the system.

The Indira Gandhi National Open University (IGNOU) too adopts the threshold concepts of understanding, interpreting and viewing the performance of university and learners for the purpose of improving the quality in ODL mode of teaching/learning. The paper describes the success story of IGNOU as how it uses these concepts to set the goals and objectives of the curriculum and evolves methodology and assessment methods for more sophisticated evaluation strategies to assess the quality of the delivery of its programmes and learners’ performance. It discusses in details the procedures/tools used by university to procure information/feedback to improve curriculum and to document accomplishments/failures. It also throws light on the evaluation system and the multiple methods used by the university to evaluate the learners’ performance.

5. Identifying Threshold Concepts in Learning Turkish by Undergraduate Students at Hacettepe University, Turkey

Didem Koban, Hacettepe University

This study is concerned with identifying threshold concepts in learning Turkish by foreign undergraduate students and seeking to improve their learning. Many students from different language backgrounds consider Turkish grammar as “troublesome”. Perkins (2006) and Meyer, Land and Smith (2008) define “troublesome knowledge” as knowledge that can
be perceived as “alien”, or counter-intuitive by students. The purpose of this study is to find out the common areas foreign students who continue their studies at Hacettepe University find difficult to explain and learn when learning Turkish. Data regarding “troublesome knowledge” about learning Turkish will be collected from undergraduate students (about 30) of different language backgrounds by means of a questionnaire, which will be used to categorize the common troublesome linguistic areas, such as syntax, morphology, semantics, and phonology. Quantitative and qualitative methods will be used to analyze the data. Drawing on student questionnaires, the study attempts to improve students’ learning experience.

6. Scientific Thinking as a Threshold Concept in Nursing Education: Transforming Avoidance into Engagement

Sarah List, University of South Australia

In order for the modern nurse to perform in their role effectively they must understand the science behind normal and abnormal physiology, think critically and apply solutions to problems in a systematic and structured manner to ensure good patient outcomes. A scientific approach to the theory and application of practice may therefore be considered a transformative threshold concept that enables entry to the profession.

However, considerable barriers must be overcome regarding scientific learning with this student group, as many come from non-traditional backgrounds and occupy a low socioeconomic bracket. Strong evidence suggests that students with these backgrounds hold lesser views of their self-efficacy (confidence in tackling new science problems) and self concept (how readily they learn science), and these affect their study achievement success. In addition to the fear of science being “too difficult to understand” and boring, some believe that science is irrelevant to their career.

A student’s perception of their scientific ability and its professional irrelevance may result in avoidance, procrastination and passive learning behaviours with the goal of “just passing”. This study reports on the positive findings of applying constructivist theory to achieve transformative learning outcomes for Nursing students at the University of South Australia, in order to facilitate their passage towards and across the threshold of meaningful application of science theory to practice.


7. Will an m-Learning Technique Promote Student Understanding of Problematic Knowledge and Key Threshold Concepts?

William Lyons, Dundalk Institute of Technology

The key aim of the research is to study how the introduction of m-Learning into my first year electronic modules will promote improved student understanding of problematic knowledge and key threshold concepts. M-Learning (or mobile-learning) facilitates the use of compact digital mobile devices as a tool to enhance and extend the reach of teaching and learning activities. The key challenge is to develop a method that would further engage students in identifying and addressing problematic knowledge and associated key threshold concepts.

Within electronic engineering, first year students are presented with a number of key concepts that form the foundation for future learning. As such, a large amount of independent student effort is required to review material in order that problematic knowledge and threshold concepts can be identified. Without this independent effort, traditional approaches such as teacher-led tutorials can result in limited success.

This paper reports on a study focusing on a group of thirty-five first year students enrolled in an electrical and electronic systems engineering course at Dundalk Institute of Technology. It is a qualitative based study using focus groups and interviews to access the use of m-Learning as an enhancement to formative assessment in both identifying and addressing troublesome knowledge.

Initial results have shown that the adoption of an m-learning approach utilised in parallel with formative assessment has facilitated both the development and implementation of a more problematic knowledge and key threshold concept lead student-focused tutorial sessions.

Although still at an early stage of investigation, the use of m-Learning has encouraged greater student engagement, which in turn has promoted stronger student reflection and identification of individual problematic knowledge and threshold concepts within the target modules. This in turn has resulted in an increase of student participation in tutorials.

8. Personalised E-Learning: Facilitating Students’ Understanding and Mastery of New Concepts

Eileen O’Donnell, Trinity College Dublin

Each individual perceives and experiences life and learning in their own unique way. Past experiences can influence our understanding and mastery of new concepts. Occasionally, learners meet obstacles in their learning experiences which they find difficult to surmount.
Not all learners require the same learning experience to reach the required thresholds or basic units of understanding which are expected to succeed with their course of study. Threshold concepts are part of the fundamentals of a subject which one builds upon to eventually achieve the required learning outcomes. The provision of personalised e-learning resources to assist students to surmount their personal learning difficulties could improve student engagement with the required threshold concepts and therefore assist each individual student in achieving their full potential. Tailored learning experiences which have been specifically selected to suit individual students learning requirements could be made available to the students who felt a need to use these resources to help them through frustrating times on route to grasping new concepts. This research reviews the functionality which non-technical educators would need to enable them to create personalised learning resources. The objective is to develop an authoring package which will enable non-technical authors create personalised learning resources and activities. These personalised e-learning resources and activities could be used to assist students in grasping a deeper understanding of the threshold concepts required for their discipline. A deeper understanding of the fundamental topics will help students during their progression through the rest of the curriculum and course of study. The authoring package for personalising e-learning should facilitate the creation of personalised learning resources and activities by non-technical authors. A modular approach will be undertaken in the development of this authoring package and evaluations will be conducted on completion of each module. An overall evaluation of this authoring package for personalising e-learning will be undertaken once the package is complete.

9. Exploration of the Use of Handheld Personal Response Systems with First Year Accountancy Students for Deep Learning and Understanding

Muireann O’Keeffe, Dublin Institute of Technology

Once a learner understands a particular concept they are then unlikely to forget and subsequently have the ability to apply their learning to similar and more complex tasks (Land et al., 2008).

Teaching basic concepts to novice accountancy learners can be a tricky task particularly as the teacher is already very familiar with the topic (Friedman, 2006). This paper describes the strategies used by a lecturer trying to accomplish understanding of basic concepts and calculations in accountancy with first year students at Dublin Institute of Technology. In particular we explore the use of clickers (personal response systems) with multiple choice questions to help students grasp and deeply understand basic but essential concepts.

Lecturers using clickers for learning have reported improved student interaction and engagement in class time. Clickers also provide immediate feedback for the lecturer and the student enabling rapid identification of misunderstandings.
In order to gauge the level of comprehension this lecturer uses a series of questions with clickers to determine if understanding has been achieved. Immediate feedback from the class indicates if further explanations or revision of the topic is necessary. Interestingly the use of clickers has also enabled the lecturer to test for deeper learning by developing more complex problems in order to test if students can apply the concepts to other tasks.

To date, in this research, the lecturer has observed that while surface understanding has been achieved, deeper understanding is often not accomplished and more support is needed in order to establish successful completion of complex problems.

This study correlates with Cousin’s (2010) call to establish deep reflective practice on teaching and learning strategies in order to facilitate deeper learning of threshold concepts. It is proposed that with the use of clickers combined with reflective practice that enhancement of student learning can be achieved.

10. Using Assessment Activities to Engage Students with Threshold Concepts

Liz Springfield, University of Queensland

Assessment activities are integral to developing an effective learning environment and should be reflective of curricular goals and learning objectives. The transformative curriculum reform in the Division of Occupational Therapy, School of Health and Rehabilitation Sciences at The University of Queensland, has integrated five threshold concepts consistent with the characteristics identified by Meyer and Land (2005) within the program. Whilst the curriculum theoretically functions as an integrated whole, specialised discipline streams exist, including occupational therapy for children and youth. A range of formative and summative assessments were developed to integrate with the content to be delivered within this stream. These assessment activities aimed to develop students’ understanding of threshold concepts, through engagement with authentic problem focused activities, with increased question complexity and decreased scaffolding as students completed each subsequent course.

To investigate whether these formative and summative assessment activities met these aims and as one stage of a larger project focusing on exploration of the implementation of threshold concepts in the occupational therapy curriculum, multiple stakeholders, including academic staff, clinicians and students were interviewed individually or in focus groups with respect to the assessment tasks used across the child and youth courses. Areas discussed included the manner in which the tasks engaged students with, and supported and transformed their increased understanding of the threshold concepts. Content analysis of select samples of student assessments were undertaken, including identification of opportunities for choice of theory and concepts, and demonstration of level of understanding of threshold concepts.
The key findings will be discussed and implications addressed for development of assessment tasks to engage occupational therapy students with threshold concepts within the child and youth curriculum and across curriculum more broadly.


11. The Effects of Genre on Student Learning from Informational Text: Implications for Teacher Educators

Reece Wilson, University of Pittsburgh - Bradford

The purpose of this study was to compare the effects of text genre on student learning from science text, using science-related traditional informational and poetic informational texts, with fifth-graders. Four texts were used: a traditional informational text about caves, a poetic informational text about caves, a traditional informational text about mountains, and a poetic informational text about mountains. One group of students worked with the traditional informational cave text and the poetic information mountain text, while a second group worked with the traditional informational mountains text and the poetic informational caves text. After reading each text, students completed comprehension questions and a sorting task involving the main concepts of each text. Results indicated that genre was not a factor in student comprehension of science text. Study results might be interpreted as an indication that in a classroom, some students might learn better from poetic texts, and that a variety of text types may be useful. Thus, as teacher educators, education candidates should be exposed to the idea that students can learn from a variety of informational text.
12. Welcome to My House! Enter Freely of Your Own Free Will! : Literary Experience and Threshold Concepts

Richard Hayes and Catherine Lowry-O’Neill, Waterford Institute of Technology

“Welcome to my house! Enter freely and of your own free will!” He made no motion of stepping to meet me, but stood like a statue, as though his gesture of welcome had fixed him into stone. The instant, however, that I had stepped over the threshold, he moved impulsively forward, and holding out his hand grasped mine with a strength which made me wince.

- Bram Stoker, Dracula

An interrogation of the idea of “threshold concepts” might usefully start from the metaphoric nature of the description of the concept itself. Of course, the analysis of figurative language is the business of Literary Studies. This presentation will demonstrate the usefulness of using literary concepts and methods to consider the teaching encounter and, specifically, to consider the idea of threshold concepts.

The paper will consider the experience of liminality as central to the learning experience and will offer examples of literary texts that not only describe liminal experiences but also, in themselves, involve the reader enacting such experiences in the process of reading. In this way, the paper proposes a similarity between the act of reading and the act of learning and, in making this analogy, offers a new way of understanding the place of thresholds in thinking about teaching and learning. At their core, both reading and learning seem to involve moments of self-forgetfulness and yet both draw on and contribute to the ongoing process of identity formation; in this way, both reading and learning seem to involve the self and other at the same time. This paper will seek to illustrate this curious dynamic in order better to understand it.

13. The Same but Different: Troublesomeness when Students’ and the Lecturer’s Disciplines Do Not Match

Sophie Hill, Oslo and Akershus University College of Applied Sciences

Inter-disciplinary threshold concepts shared across disciplines may well exist. Many subjects share a supporting knowledge base, for instance in maths or anatomy and physiology, and may be taught in multidisciplinary classes and/or by a lecturer in a different discipline to that of the students. The difference in disciplinary background may play a role in how concepts are viewed. As part of a larger research project exploring the experience of difficult concepts in studying prosthetics I found that some troublesomeness arose in subject areas taught by lecturers who were from a different disciplinary background than the students. The troublesomeness was exhibited in the students’ perception of relevance and application
of the concepts to their discipline. Professional socialisation literature concerns itself with how people become a member of that discipline including the ways of thinking and practicing. Other research has shown that different disciplines view the same concept differently. If we accept that different disciplines think and practice in different ways, then it follows that subjects that form part of many disciplinary knowledge bases may be viewed and applied differently by different professions. The possible negative impact of being taught by lecturers from a different discipline has been mentioned by others. Being taught by a lecturer from another discipline may cause separation in the minds of students, impacting negatively on their learning and understanding.

My findings suggest that who teaches a subject is more important for supporting modules than for core disciplinary modules. Within core disciplinary modules the relevance and contextualised application appears to occur more naturally. I suggest that it is therefore important in supporting modules taught by lecturers whose discipline is different to the students, that the relevance of the concept is made explicit and that the application of the concept is contextually appropriate to the students’ discipline.

14. Transcending Self-Reference – Disciplinary Integration as Threshold Concepts

Leif Martin Hokstad and Vidar Gynnild, Norwegian University of Science and Technology

This paper will report from an evaluation project of a revision of a teacher-training program. The revision addressed the need to more closely integrate the three components of the program; subject related didactics, pedagogy and supervised practice. Through the first year of the revised program the Section for Educational Development at NTNU monitored the implementation through an evaluation project. The overall evaluation goal was to measure and describe the new integrated model and track how the participants perceived this, and to assess whether or not the learners received a more synthesized learning experience. The perspectives investigated into were that of the teacher-training program itself, the students and the supervisors in the schools (i.e. the field of practice). The intended outcome for the revision project is that the students should arrive at a synthesis of the different disciplines to enhance their competence as coming practitioners. Methods used were questionnaires to students and teacher, interviews of students and teachers, observation of classes and lectures. From the empirical material we pursue three characteristics in more detail:

- Integration issues for the students – how to make sense based on input from three different and sometimes conflicting disciplines
- Integration issues for the teacher trainers – how to relate to other disciplines involved in the teacher training program
- The issues of transcending self reference as a threshold concept
To analytically describe the findings we suggest an analytical framework where the threshold concept framework is supported by insights from interdisciplinary studies and the complexity framework. Drawing upon interdisciplinary studies we discuss issues related to the integration of disciplines. From complexity theory, we draw upon the notion of self-reference in disciplines and how this may be perceived as threshold concepts where an integration of disciplines is desired.

15. Thresholds in Engineering Education for Sustainability – Beyond Transdisciplinarity

Johanna Lönngren, Chalmers University of Technology

Engineering Education for Sustainability (EEfS) is concerned with fostering complex competencies such as the ability to think critically and creatively, the ability to take different perspectives and understand the systemic nature of complex problems, and an attitude which is conducive to taking responsible actions. Previous research indicates that frustration may be a major barrier to student learning in EEfS; it is our impression that students’ “troublesome” experiences as they develop core EEfS competencies resemble those described in the threshold concept (TC) literature.

In this presentation, we therefore attempt to apply the TC framework to EEfS. In doing so, we make two observations that may be of relevance for future discussions about TCs: 1. Thresholds in EEfS often consist of abilities and attitudes rather than concepts, and 2. Thresholds in EEfS are complex and require multidimensional approaches in teaching and learning activities.

As an example of such a multidimensional threshold in EEfS, we discuss the ability to shift perspective, which we define as “a competence which requires critical awareness of one’s own mental positioning and an ability to understand and temporarily adopt alternative positionings”, and which we consider to be one of the most important thresholds in EEfS. On the basis of this example, we argue that complex threshold abilities probably cannot be understood or learned in disciplinary settings but that transdisciplinary approaches that also address other dimensions such as transculturality, transspatiality, and transtemporality may be necessary.

16. Separating the Chaff from the Wheat: Threshold Concepts in Higher Education Assessment

Louise Lutze-Mann, The University of New South Wales; and Marie Northcote, Avondale College of Higher Education

Assessment in higher education can be problematic for both students and lecturers. For lecturers, the process of setting and marking assessment tasks can be challenging and even restrictive. Students are not always sure about how to complete set assessment tasks and how much assistance to expect. Consequently, communication about assessment and
feedback issues between students and lecturers can also be troublesome, especially when assessment tasks require students to be independent and resourceful. How much assistance should be given to students and how much assistance should students expect?

Students and lecturers at two higher education institutions were asked about how threshold concepts were assessed in their courses. This paper reports on this study. Findings from the study provide recommendations for how friction between students and lecturers about assessment issues can be reduced by encouraging a greater awareness of the other's intentions, difficulties and perceptions. By making the threshold concepts within a course more transparent to students, lecturers can prioritise which concepts are considered to be threshold concepts and, therefore, more important in the assessment process. Comparison of the data between a small private college and a large urban university allowed the impact of class size, diversity of the student body and educational focus on the assessment of threshold concepts to be analysed.

17. Crossing Subject Specific Threshold Concepts via Short Story Writing: Law Students Demonstrate an Increased Understanding of Human Rights

Alyson Morris, Coventry University

‘Given the centrality of narrative in the human experience, we can begin to appreciate the power of stories in teaching and learning.’ (Rossiter 2002)

Creative Writing can be a key contributor to learning difficult concepts in higher education. It is a challenging subject in its own right, but should be a viable learning tool in every discipline. Using it as a teaching aid is not a new concept, American and Australian universities have adopted it, but Europeans are slow to respond. Why? In the Short Story Workshop module on the BA English course at Coventry University, students studying joint degrees with Law or History admitted gaining more knowledge about their subject areas through writing fiction. For example, one participant studying History delved deeper into her subject, ‘My short story, Broken Lungs, which focused on a soldier’s experience in WW1, enabled me to learn about aspects of history in fine-tuned detail. Research allowed me to make the story as believable as possible, and in turn helped with the elements left to my imagination.’ In response to this, the University’s Law School was approached in 2010 and Dr Stephen Foster accepted a proposal to trial short fiction with Level 3 Human Rights students. Consequently, twenty students chose to write a story for their assessment, rather than a case study, and the outcome showed that most displayed a more in-depth knowledge of the law than the case study students, and received higher grades. This project has now reached its second year, and 80% of the current Law students have chosen the short story route to demonstrate their understanding of Human Rights. The History Department is now exploring the possibility that learning can be heightened through writing fictional texts, and many other departments are considering it for 2012 onwards.
18. Innovation: Transgressive Learning in Working with Knowledge

Lorraine White-Hancock, Monash University

This study is concerned with innovation through cross-disciplinary, collaborative work and learning, and transgression (as a threshold concept) in the context of globalisation. In Australia and globally, governments identify innovation as a key to national economic prosperity and wellbeing (Cutler, 2008). Research finds that much of the government policy emphasis in Australia focuses narrowly on innovation in science and technology (White-Hancock, 2006). Yet innovation is not restricted to these fields. It is also evident in the arts although there is little policy recognition of this.

Collaboration and knowledge building have become significant parts of government and managerial rhetoric related to innovation. Australian government policy suggests that because collaborative work is believed to generate new knowledge, it will just happen. Yet there is no indication of how this is to occur. In recent times, more people work collaboratively - locally and globally. Yet research points to the boundaries and structures of workplaces that impact on collaboration, learning, and innovation, and that cross-boundary work is not all ‘smooth sailing’ (Unwin, 2009). There is little research about the conditions that support cross-disciplinary collaboration or about the experience and effects of such work.

This study identifies the features of cross-disciplinary workplace learning that generate and constrain innovation and transgression. It reports on my PhD study of the liminal spaces and work that generate new practices and knowledge. The research involves Australian government policy analysis; analysis of arts discourse and a case study (the Bauhaus); an auto-ethnographic study of a cross-cultural workshop (Crosslife, Malta, 2008); and interviews with artists and scientists working on collaborative projects (Synapse residencies).

I argue that a particular kind of praxis employed in the arts that involves engaging with situated knowledge across disciplinary boundaries, transgression and collaboration, is significant to innovation and learning.
THRESHOLD CONCEPTS IN PROFESSIONAL DEVELOPMENT

19. Using a Professional Community to Support the Identification of Threshold Concepts: A Physiotherapy Example

Sarah Barradell, La Trobe University

One of the strengths of the existing threshold concepts literature is that it makes use of transactional curriculum inquiry. Transactional curriculum inquiry refers to the dialogue that takes place within and between different parties in order to identify threshold concepts (Cousin, 2009). Transactional curriculum inquiry has been recognised as an important part of the identification process because the discussions provoke invaluable reflection. It can also feed into the curriculum design process as the range of stakeholders it involves can signal a more holistic representation of the complexity of knowledge, skills and practice within a curriculum. Transactional curriculum inquiry typically involves lecturers, students and educational designers.

In addition to these stakeholders, I propose that the wider community should be considered as participants in the threshold concepts dialogue. Higher education should prepare students for life beyond the course they are enrolled in. Professions thus have the potential to offer a unique perspective about the needs of the workforce. For courses which must meet certain requirements such as registration and accreditation, involvement of the profession in a dialogue about curriculum may be even more crucial. The context of the discipline and how that discipline is situated should therefore be taken into account.

This presentation will report on the first stage of a project related to threshold concepts in physiotherapy. The purpose of this stage of the project was to use Nominal Group Technique (NGT) to support a group of physiotherapy clinical educators to identify threshold concepts for an undergraduate physiotherapy subject. Thirteen ranked statements were identified by the clinicians and aspects of this list will be explored. The identification process, including the benefits and challenges of the extended transactional curriculum inquiry, will also be discussed.


20. Hard Fun as a Threshold Concept in Problem-Based Learning

Terry Barrett, University College Dublin

At the centre of this research study was the research question: “What can we learn about problem-based learning (PBL) from how lecturers, as PBL students, talked about learning in PBL tutorials?” The focus of this study was the naturally occurring students’ talk in PBL tutorials. All the PBL tutorials for a full module were video and audio-recorded. The talk was analysed informed by critical discourse analysis. Firstly, The study identified and explored the different ways each team talked about learning, that is, the interpretive repertoires. There were consistencies and contradictions together with agreements and conflicts in the
way both one student and a team of students talked about learning. Secondly, the study involved deriving the threshold concept of hard fun by analysing the interpretive repertoires about learning across both teams.

The experience of creating the concept of learning in PBL as hard fun has transformed my understanding of learning in PBL. This understanding is irreversible as this important insight has affected both the way other colleagues and I think about and implement PBL and PBL education development. The concept of hard fun is integrative in that it brings together my analysis of how the two teams of PBL students talked about their learning. Learning in PBL is about the fun of laughter, creativity and playfulness and the hardness of the demanding activity levels, the difficulties, and the transformations. Fun without hardness is frivolity and hardness without fun is drudgery. Learning in PBL demands both the fun of playing with ideas and the hardness of refining and reworking ideas. Hardness and fun are complementary parts required for learning. One implication for practice is the challenge of working together to design "hard fun" problems in different communities of practice (Barrett, Moore and Cashman, 2010).


21. Embracing Threshold Competencies and Concepts as an Educational Model for the Professional Development of PhD Students

*Barbara Bender and Monica Devanas, Rutgers University*

The Graduate School-New Brunswick of Rutgers University has embraced a holistic methodology to address the threshold concepts underpinning the professional development of graduate students across the disciplines. This session will focus on Rutgers’ comprehensive approach to preparing Ph.D. students to become successful professionals as they assume increasing levels of responsibility in the academy. We will examine the programs that we have planned and implemented to help graduate students consider and acquire the multiple competencies that will be expected of them as they pursue careers as faculty and administrators. Specifically, in addition to disciplinary research training, we will examine the mechanisms we have developed to provide training on teaching, leadership, mentorship and the critical issues pertaining to career development.

For the past twenty-five years, Rutgers University has provided myriad professional development opportunities for Ph.D. students planning to enter the professoriate. Focusing primarily on pedagogical techniques and philosophical approaches to teaching at colleges and universities, these programs provided an effective means to help Ph.D. students prepare for their lives as faculty. With building financial pressures on the academy and the increasing likelihood that many new Ph.D.s will have significant challenges securing full-time positions in a college or university, Rutgers has analyzed the multiple skills needed for a career in the academy and developed expanded professional development opportunities to create a more
comprehensive approach to preparing Ph.D.s. Especially important, with the significant reduction of full-time faculty positions in the United States, special efforts will need to be made to establish a new means of preparing discipline-trained Ph.D.s for leadership roles in the academy.

The presenters will acquaint participants with our teaching programs and courses and discuss the new leadership programs, mentorship initiatives and efforts to adapt career development services for graduate students as well as the assessment of these projects.

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22. Transforming the Practitioners: An Exploration of the Application of Threshold Concepts to a Multidisciplinary Professional Development Masters Course in Christian Leadership

*Kerry Greer, Aoife McLoughlin, Eugene Duffy, Mary Immaculate College, University of Limerick; and Amalee Meehan, CEIST*

The authors will present a case study that details the impact of the application of a Threshold Concept approach (Cousins, 2010; Myers and Land, 2006) on the experience and performance of Practitioner-Students on a professional development Masters Program. (The Masters in Christian Leadership offered by Mary Immaculate College, University of Limerick in 2010-2011). The students were professional educators and mostly Principals in second level education in Ireland.

The case study describes an intensive module: the ‘Integrating Seminar’ that ran over a two week period at the end of the taught component of the Masters Program (June 2011). This module was structured to create a learning environment that would support the production of a range of novel solutions to complex, topical and realistic issues facing Practitioners. In doing so, it encapsulated the key principles of Threshold Concepts by facilitating a transformative space in which participants went through a liminal (and troublesome) space, leading ultimately to more integrated and profound understanding.

The Integrating Seminar was a pedagogical vehicle designed to encourage the assimilation of the academic knowledge and research components of the three multi-disciplinary streams that constituted the Masters in Christian Leadership (Theology, Psychology and Educational Practice & Leadership, taught over twelve course modules), with the professional experience of the students. The aim was to induce ‘novel knowledge’ that could be used by the students to address and evaluate a series of realistic and complex problems with a range of solutions/action plans.

The Case Study highlights the importance of detailed structure in the design of such pedagogical tools in order to optimize the student experience of the threshold concept approach. Importantly, the authors explore the student and lecturer feedback on those experiences.
23. The Process and Lessons Learned in Developing Interdisciplinary Threshold Concepts

Jody Horn, Oklahoma City University

This poster presents the rationale, process, and lessons learned in the creation of threshold concepts in a small, multidisciplinary, social science program in the southern United States. Our Sociology and Justice Studies program offers three majors: a major in sociology, a major in Justice Studies-Peace & Conflict, and a major in Justice Studies-Criminology. The faculty’s process of creating these threshold concepts began through discussion of two student problems: i.e., their inability to grasp the relevance or coherency of the curriculum and their lack of a critical perspective. These were important issues because central to all three majors were critiques of the social structure and systems of justice. Department dialogue beginning with what were the big questions in each of these majors, to what did students have trouble understanding, to, finally, what did students need to know to understand these questions and the curriculum. Unintentionally we arrived at what became our four threshold concepts that we concluded were central to all three majors: restorative justice, victim-offender dyad, sociological imagination, and self-authorship. We realized that these concepts were lenses to better understand our disciplines, for example, through restorative justice students understood the victim and community were central to violence and conflict, not the state and the offender. Through the victim-offender dyad students became aware of the ambiguity of the victim and offender. By promoting critical thinking we were able to move them into a much more critical space. Retrospectively, the logic of these interdisciplinary threshold concepts is a confirmation of the grouping of these majors. We learned several valuable lessons from this negotiation process that are worth recognizing from the necessity of a safe, friendly environment where faculty could engage in authentic, and often conflicting, dialogue to the required patience for all faculty to talk through their vision and understanding of the disciplines.

24. Crossing the Threshold into Reflective Practice

Pauline Joyce, Royal College of Surgeons in Ireland

This paper will present the experiences of academics in one institution of progressing reflective practice across all postgraduate programmes. The struggle in encouraging health professionals to write reflections as part of their Personal Development Plans and e-portfolios is discussed. Some of the challenges encountered in assessing reflective practice are presented and a framework for grading reflections is outlined. The benefits of encouraging reflection in each module are balanced against the criticisms of a modular outcomes-based curricular approach. In particular the paper will focus on reflective practice under 4 curriculum design principles outlined by Land et al (2005): Jewels in the curriculum; listening for understanding; a holding environment for the toleration of confusion; and recursiveness and excursiveness. The pursuit of reflective practice from the start of a programme right through to the end invites the health professional to enter a liminal space,
making sense of their experience in the context of evidence-based literature and best practice research. Once this journey starts the paper will argue that reflective practice has the potential to be transformative, irreversible, integrative, bounded and will involve further troublesome knowledge. Finally, issues of confidentiality and anonymity are discussed as ongoing challenges in using reflection for teaching and learning activities.

25. Bringing the Discipline into Generic Professional Development Programmes: Open Materials for Exploring Disciplinary Ways of Thinking and Practising

Helen King, University of Bath

Threshold Concepts are one aspect of a growing interest in higher education in the ways in which experts think and practise (e.g. Threshold Concepts, Meyer and Land, 2003; Decoding the Disciplines, Pace and Middendorf, 2004; and, in Geoscience, the emerging field of Geocognition, Libarkin, 2006). From this perspective, learning and teaching is a journey from novice towards expert; and the nature of the subject area becomes a key issue for professional development in learning and teaching.

Discipline-based academic development has had a high profile over the last 15 years or so, particularly within the UK, and it has been argued that it is essential in order to relate to the academics’ community of practice (e.g. Jenkins, 1996). Indeed, the UK Professional Standards Framework identifies the need for knowledge of “Appropriate methods for teaching and learning in the subject” and “How students learn...within their subject” (HEA, 2011). There has been some argument, however, that this emphasis is misplaced as there are very few disciplinary differences in pedagogy (e.g. Gibbs, 2000; Wareing, 2009). If teaching principles are generic and students do not learn differently in different subjects, then disciplinary ways of thinking and practising hold the key for institutional academic development programmes to align with the specific context that teaching staff work within and feel affiliated to.

This workshop will provide an opportunity for participants to experience and explore a set of open learning materials devised specifically to help staff elucidate their discipline-based practice. The learning activities are designed to be used within generic courses or programmes and will also help staff in accessing the wealth of literature and resources on learning and teaching available in most disciplines. These materials have been produced through an HEA/JISC-funded OER project and will be freely available under a Creative Commons license.

26. An Investigation of Dance as Art within the Threshold Concepts Theory of Learning

Teresa Leahy, London Metropolitan University

A group of non-dance specialist teachers participated in a dance-as-art programme at the University of Limerick, Ireland. They spent a total of 30 days being taught dance content
material, both practical and theoretical, which was spread over one academic year. The course took place on alternate Saturdays in over two academic semesters. In addition there were two extended periods where the participants were in residence at the university. Participants demonstrated an observable significant improvement in artistic dance knowledge and understanding.

The aim of this study was to find the reasons for this outstanding improvement recorded by the participants and to examine it within the lens of the ‘Threshold Concepts’ theory of learning (Land et al., 2003; 2005). A qualitative research approach was adopted utilising the focus group method. In keeping with the concept of ‘stuck’ moments within the threshold concepts idiom, the students on this dance programme had many such ‘blocked’ and ‘stuck’ instances when attempting to learn central basic understandings in dance-as-art.

The three main tenets of this theory namely, integration, transformation and troublesome knowledge emerge as clear stepping-stones towards deeper learning and command of the subject. Participants discussed their seismic shift in understanding of movement and dance knowledge particularly during the two university based residential periods of the programme. This they attributed to a) Continuity of learning without gaps of time between each teaching period allowing them to be immersed in the activity in a stress and fear free environment and b) The content and philosophy of both dance materials and teaching methods employed by the teachers.

The research has implications for dance-as-art pedagogy as being an experiential somatic pedagogy as opposed to predominantly cognitive and a facilitative pedagogy allowing participants to evolve as artists through guided discovery.

27. Evidence-Based Practice in Nursing Education: Exploring Learning and Practice Thresholds

Linda Martindale, Lorraine Walsh, University of Dundee; and Ray Land, Durham University

Undergraduate nursing students are expected to acquire skills of evidence-based practice (EBP), as a fundamental attribute of becoming a nurse and joining this community of practice. EBP is a way of thinking and practising which students acquire through classroom teaching and clinical placements.

An on-going narrative research study is investigating threshold concepts in research and EBP in the context of nursing education. The study includes a perspective on how students understand EBP in terms of their emerging professional identity and membership of the nursing community. Final year undergraduates were interviewed at the start of a research and EBP module. Participants’ exposure to research and EBP in the classroom was explored and also encounters with research and EBP in clinical settings. Students' perceptions of EBP as part of their future professional identity were also documented. Preliminary results reveal thresholds nursing students seem to face when learning about research and EBP and how these thresholds may interface with professional identity.
Emerging themes suggest that EBP is a way of thinking and practising which is both a threshold concept and a threshold practice. Students encounter the threshold concept of EBP in both the classroom and practice settings, though practice experiences may influence students’ perceptions of EBP more and this potentially affects academic learning. EBP as a threshold practice is fundamental to "being a nurse" yet evidence indicates that nurses have often failed to cross this threshold. The research supports this evidence and may offer additional insight into why this happens, related to EBP as a threshold concept and to difficulties and thresholds in learning about research.

Learning threshold concepts in research and EBP are influenced both positively and negatively by student experiences in academic learning and practice learning and have long-term implications for professional identity and practice.

28. Threshold Concepts and Troublesome Knowledge in the First Year Curriculum at a UK Medical School

Sarah Meek and Susan Jamieson, University of Glasgow

Medical education integrates multiple academic disciplines and professional training. Several Threshold Concepts (TCs) have been proposed in bioscience and nursing that are likely also relevant in medical education. These include probability and uncertainty; scale; hypothesis creation; care; and professional identity. In this study, we set out to identify troublesome areas and potential TCs in the medical curriculum at Glasgow University.

As a first step, we designed questions to probe, directly and indirectly, staff perceptions about which areas of the current curriculum are particularly troublesome for first year medical students. First year is often a time of personal, academic and social transition, and transition is a defining TC characteristic. The Glasgow Year 1 curriculum includes both professional and discipline-specific topics (clinical and vocational skills; basic biomedical, social and psychological sciences), allowing exploration of TCs in multiple areas. Experts, learners or both may define TCs, so data from both is important. To date, we have examined staff perceptions and student exam performance.

Semi-structured interviews with key teaching staff (n=4/8), and questionnaire responses from end-of-year exam markers (n=11/23), were analysed qualitatively using the Miles and Huberman approach to analytic induction. Our results suggest that several previously-identified areas of troublesome knowledge (TKs) are also troublesome in Year 1 Medicine. We describe how these TKs map to previously-proposed TCs, including scale, dynamics (spatial and temporal), integration and link-making, equilibrium, metalearning, and discipline-based ways of organising and using knowledge. Additional TK areas were also identified, e.g. systems-based approaches to discipline integration, and specific skills. We discuss whether these indicate novel TCs. Many of the areas identified here are central to non-judgemental, patient-centred practice, which is a GMC requirement in training and professional development.
Finally, we summarise teaching and assessment practices described by participants as enhancing TK/TC learning. The limitations and generalisability of this study are discussed.

29. Threshold Concepts in a TEE (Teaching English in English) Context

David Moroney, Trinity College Dublin

Recent times in South Korea have seen a surge of interest in English language learning. With increased financial burden on households, governments have implemented educational policies characterized by current trends in language methodologies such as Communicative Language Teaching, Task-Based Language Teaching and recently Teaching English in English (TEE). These approaches have brought a sharp rise in Korean language teachers participating in training programs, partly in response to the competition brought by the large influx of non-Korean English language teachers.

Previous studies have indicated that there are a considerable number of Korean educators who lack confidence in their own English teaching ability and state that with inadequate training received, they are unable to follow the syllabus and are apprehensive of co-teaching with proficient speakers. Instead of adopting a surface approach to TEE, such as the memorization of classroom expressions, this study attempts to develop ‘jewels in the curriculum’ which offers powerful and memorable transformative points from which teachers could progress incrementally, through ‘portals’ and apply that knowledge from their studies to their own teaching situation.

Analyzing 15 in-service teachers attending a graduate level TEE course, this study utilizes teaching reflections, interviews and questionnaires to discover knowledge that proved troublesome and developed Threshold Concepts (TC) for the course. Some of these concepts include; introducing and explaining tasks/activities, arranging the classroom, checking students’ understanding, developing rapport with students and co-teachers, and improving teachers’ level of English via a parallel language component. As a result, a TC perspective can be seen as beneficial for language teachers’ professional development in the TEE discipline where troublesome knowledge can be identified and formulated into TCs. These can combat ‘post coursual depression’ where the trainers’ eloquent ideas are not directly transferable to the teachers’ classroom and where the attainment of transformative points can strive to smoothen that transition.

30. Prospective Mathematics Teachers’ Development of Understanding of the Threshold Concept of a Function

Kerstin Pettersson and Max Scheja, Stockholm University

For decades research into students’ understanding of a function has shown that this concept poses great difficulties for students’ learning. The threshold concept of a function is almost invariably introduced as a process, but students also need to understand a function in terms
of an object. The present paper explores longitudinally transformations in 18 prospective mathematics teachers’ understandings of the concept of a function. The students were first-year teacher students at a large Swedish university taking courses in mathematics. Data were collected through observations of lectures and tutorials, questionnaires distributed to the students on three occasions, individual interviews with students on four occasions over a nine month period. Interviews were also carried out with the lecturers. The qualitative analysis of data drew on a person-context oriented framework and focused on how students’ developed contextualized and highly personal understandings of the concept of a function. These analyses underscore different aspects of transformation illustrating the complexity involved in coming to understand the threshold concept of a function. While most students conceptualized function in terms of a process, the paper also illustrates, through a longitudinal analysis of a particular case, the threshold character of developing understanding of a function involving a broadening of the context for interpreting this concept in both process and object terms. The study underscores the complexity involved in developing an understanding of a function, particularly in relation to the time and latitude that students may need to transform their initial and preliminary interpretations into conceptually viable and coherent conceptions. This observation takes on added importance in view of the fact that teacher students have to reflect on their own learning processes in relation to how others will learn from their teaching in the future.

31. Identifying and Addressing Threshold Principles in the Study of Classical Voice

Reid Spencer, Mount Royal University

As teachers in the university classroom we have an understanding of the significant concepts that are crucial to a deeper understanding and mastery of discipline, and their relation to the acquisition of deeper knowledge. But the situation is less clear in music skills acquisition in general, and particularly in the study of classical voice. In a situation where the instrument is intrinsic, both to the physical being of the student, and to the emotional state and body image of the singer, there is a different dynamic in play. Especially at the undergraduate level when the instrument is immature and the personality to support it is not yet formed, teachers in the studio face a challenge to impart these critical threshold skills. As teachers of classical voice, we have seen a marked change in student attitude to the process of mentoring from the time that we ourselves were students, and we face the challenge of realigning our methods to a new paradigm of student learning. This paper will address early findings of a new study in studio pedagogy that seeks to bring student voice into the process; it will take as its investigative approach the scholarship of teaching and learning, wherein student learning is examined from an evidence-based perspective by the instructor who is responsible for the pedagogy of the course. By connecting the process of student learning inquiry in music performance to the theoretical framework of threshold concepts, this paper builds a deeper understanding of both the learning and the inquiry process,
opening new doors to understanding and improving our pedagogy and our students’ learning.

32. Cybercells as a Concept for the Integration of Virtual and Actual Learning Spaces

Ken Stevens, Memorial University of Newfoundland

A cybercell is a threshold concept in the professional work of teachers that describes the integration of actual and virtual groups in which face to face members extend their discussions to collaborate with virtual visitors (Stevens and Stewart, 2005). Cybercells enable groups of people meeting in physical spaces to engage with virtual visitors using a range of contemporary and emerging technologies. By joining a cybercell from a distance, physically-isolated people such as those in rural communities (or in prisons or hospitals) can become part of actual groups in real time, able to be seen and heard and, thereby, contribute to discussions. There are spatial, cultural, social and technological dimensions of cybercells to be considered. Spatially, cybercells make physical spaces larger by including within them, virtual visitors on demand. Cybercells challenge institutions by extending their physical space to include virtual members such as other students, specialists and experts. The location of teachers and learners in relation to one another reduces in significance as virtual and actual teaching and learning spaces interact and merge in pursuit of common interests. Culturally, cybercells can change classrooms and other physical spaces by facilitating new understandings between groups that are both actually and virtually present. The culture of a classroom has the potential to be changed through reality-sharing in a cybercell between those who have an actual presence and those who enter a physical space virtually. Socially, collaborative teaching and collaborative learning are facilitated by the linking of physical and virtual spaces. One possible outcome of the advent of cybercells in teaching and learning is transformation of the concept of education as something that happens only in schools and in school time. Cybercells make use of new technologies, including interaction facilitated by Web 2.0, to reconstitute learning environments that extend beyond the physical confines of classrooms.


33. Creating an Occupational Therapy Student-Centred Website and e-Portfolio using a Threshold Level Framework to Evidence Competence and Professional Development

Catherine Studdert, Susan Ryan, Caroline Hills, University of Newcastle, Australia, and Kim Nguyen, Hunter New England Health, NSW, Australia

In 2010, the authors and four partner universities received an Australian Learning and Teaching Council (ALTC) award to create an Occupational Therapy student-centred website with a range of learning resources including an e-Portfolio to support and evidence the progression of students’ competence and ongoing professional development. This project is
particularly timely considering the publishing of the 2010 revised Australian Occupational Therapy competency standards (Australian Occupational Therapy, 2010) and the 2012 introduction of National registration in Australia. In order to situate the resources within the website in a meaningful way, the formulation of a competency threshold conceptual framework was explored.

The aim of this project was to create a website with a link to an e-Portfolio platform that will engage today's tech-savvy generation (Studdert et al, 2009) and support students' academic and professional development throughout their undergraduate programme and beyond graduation in professional practice.

A conceptual model was devised underpinning the website and e-Portfolio's purpose and framework, the literature reviewed, potential web-tools scoped and a qualitative methodology adopted with ethics approval obtained (number: H-2011-0121) to conduct Heads of School and Heads of Practice Education discussions and ten student and practice educator focus groups, a research method recommended by Kielhofner (2006), at the five universities to identify the students’ needs to achieve and evidence competence and progress their professional development.

Discussion and focus group participants concurred that a student-centred website with a link to an e-Portfolio would be most beneficial in supporting professional development. The e-Portfolio functionality could include: a log of clinical placements; a competency level framework with the ability to self-assess, reflect and for tutor, supervisor and peer feedback; the capacity for uploading multi-media as evidence; and the ability for portability of the e-Portfolio at graduation for continued professional development. They also identified the need to establish specific competency threshold developmental levels against which to evidence competence, and to create resource examples demonstrating the levels of competence in practice. This resulted in the project group devising three threshold levels: emerging, consolidating and competent at graduation. The website, learning resources and e-Portfolio will be created and scaffolded using this competency threshold framework providing a platform to support undergraduate development throughout the programme, ongoing professional development and the application of theory to practice.

34. Threshold Concepts and the Social Professions

Mark Taylor and Perry Share, Institute of Technology, Sligo

First, to examine whether it useful to think about the presence of a common “Threshold Concept” for professions where care is a predominant quality.

Second, to offer a framework to help students in the social professions to make sense of a “Threshold Concept”, supporting them to bridge their learning experiences between the college environment and practice placements.
A close reading of a number of “Threshold Concept” papers (e.g. Tanner (2011); Sibbett and Thompson (2008); Clouder (2005)) suggests that key elements of the transformative experience may be common across different caring professions: students need to experience and contain the burden of responsibility in caring for others and to recognise the uniqueness of every service user.

Drawing on research conducted by us in the USA, Ireland and Denmark with undergraduate students, lecturers, practitioners and placement supervisors in the professions of Social Care, Social Pedagogy, and Early Childhood Education and Care, we will explore with workshop participants the impact that caring for others has on the formation of a professional identity and discuss whether a common “Threshold Concept” is evident across these professions.

A useful place from which to help students bridge their college and practice placement experiences is to acknowledge Carey’s (1991) learning framework that identifies three processes - replacement, differentiation and coalescence - to enrich students’ comprehension of concepts. Unfortunately, we believe that “Threshold Concepts” papers to date for the caring professions have neglected the process of coalescence. In other words, students need help to link their understanding of different concepts and we discuss how a “Threshold Concept” such as care can be linked to other concepts to strengthen the formation of practitioners’ identities in the social professions.

35. Threshold Concepts in Search Expertise

Virginia Tucker, Christine Bruce, Sylvia Edwards, Queensland University of Technology; and Judith Weedman, San Jose State University

This paper reports on a study of threshold concepts in the development of search expertise, concepts that transform the novice searcher’s perception and learning-to-search experience. Two groups of subjects were studied: highly experienced professional searchers and novice-student searchers who had exhibited expertlike behaviours in graduate coursework. Using these two groups allowed a nuanced understanding of the process of learning to search, with data from those who search at a very high level as well as those passing through a learning “portal” (Meyer and Land, 2003), en route to expertise.

In library and information science (LIS) research, search expertise has been much studied, spanning over 30 years of research from the literal, command-based interfaces of the 1970s to today’s sophisticated, web-based search engines designed for the greenest novice. This well-established foundation provided a solid research base upon which to study the existence of threshold concepts, add to our understanding of search expertise, and explore implications for enhancing the development of professional-level searching abilities in students.

Grounded theory provided a useful approach for eliciting evidence of threshold concepts. The study used semi-structured interviews and search tasks with think-aloud narratives and
talk-after protocols. Searches were screen-captured simultaneous with audio-recording of the talk-aloud narrative during the search interaction. Themes that emerged from the study suggest three essential concepts in the experience of becoming an expert searcher; however, only one concept which fuses these three may be considered a threshold concept, having the characteristic of integration of these key understandings. The three concepts identified are information structures, information environment, and information vocabularies. The threshold concept that integrates these is termed “concept fusion” and may be similar in nature to the idea of a compounded threshold identified for electrical engineering (Flanagan et al, 2010). Implications for LIS curriculum are currently being explored as part of the larger research study.

36. Expectation Failure and the Pedagogy of Threshold Concepts

Brad Wuetherick, University of Saskatchewan

Inevitably, when introducing the concept of threshold concepts in the academic development activities at my institution, the conversation moves beyond what threshold concepts are, and how we might identify them, to how we best facilitate students’ acquisition of threshold concepts. One of the strengths of threshold concepts is that it provides a framework for discussing complex issues related to how disciplinary ways of thinking and practicing (disciplinary epistemologies) influence the pedagogical strategies that might be used in that disciplinary context (Meyer and Land, 2003). This workshop, however, explores one particular pedagogical strategy, explored by Bain (2004), that seems to have proven particularly successful in facilitating students’ learning of threshold concepts across several disciplines - the expectation failure.

Setting up safe, low risk space for students to experience an expectation failure, which Bain describes as “a situation in which existing mental models lead to faulty expectations, causing ... students to realize the problems they face in believing whatever they believe”, can help students to try their own thinking related to a threshold concept, come up short, receive feedback, and try again (Bain, 2004, 28). Constructing an expectation failure well can result in students reflecting on how and why their mental models do not work in addressing a particular challenge, to make explicit the liminal state in which students might find themselves. Participants will explore ways in which expectation failures can be set up for threshold concepts in their disciplines.
37. Cyberchondria: A Contemporary Transformative Concept

Mary Aiken, Royal College of Surgeons Ireland; and Mike Berry, Manchester Metropolitan University

The Internet is a source of valuable medical information, however caveat quaeor (let the searcher beware) the Web has the potential to increase anxieties of people who have little or no training, especially when employed as a diagnostic procedure. This phenomenon is known in the discipline of Cyberpsychology as Cyberchondria; that is unfounded escalation of concerns about common symptomatology based on review of search results and literature online (White and Horvitz, 2009). The field of Cyberpsychology; the study of the impact of emerging technology on human behaviour, may in itself be considered an Interdisciplinary Threshold Concept and therefore likely to generate further threshold concepts. This paper will consider research measures required to support a threshold concept such as Cyberchondria, a transformative consideration of the classic Somatoform disorder Hypochondria, additionally intergenerational factors will be considered in terms of delineating this conceptual space, focus group results indicate that youth may impact on likelihood of acceptance of a technology mediated threshold premise.

38. Learning as a Threshold Concept for Teaching

Marion Palmer, Dún Laoghaire Institute of Art, Design and Technology

Ideas and theories of learning have changed in recent years. However fundamental assumptions about learning as ‘getting information’ remain for students, lecturers and the higher education system as exemplified by discourse such as ‘delivery of courses’. This underlying assumption about learning influences lecturers in their teaching.

In higher education lecturers when appointed move from learning and/or doing and becoming expert to teaching their subject in one step. They know how they learn and how they develop in their disciplines but learning as done by someone else is alien and unknown. It can be argued that lecturers tend to teach based on their prior knowledge and experience, very much guided and influenced by their disciplinary practice.

This paper examines learning as a concept and applies to it the criteria for threshold concepts (Meyer and Land, 2003). The paper argues that learning itself is a threshold concept for higher education lecturers and that an understanding of student learning opens up new ways of thinking about teaching and transforms teaching in the higher education classroom. Challenging an understanding of learning in new and experienced lecturers leads to learning itself being ‘troublesome knowledge’ (Meyer and Land, 2003, p. 5).

Learning is a key concept in academic professional development courses. The paper argues that consideration of learning is essential to ‘ways of thinking and practising’ (Meyer and
Land, 2003, p. 9) as a teacher in higher education. The paper is supported by evidence from lecturers who took a Certificate in Learning and Teaching in the author’s Institute in recent years.

### List of Posters

**ENGAGING STUDENTS WITH THRESHOLD CONCEPTS**

<table>
<thead>
<tr>
<th></th>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bradley Bowers</td>
<td>Teaching Students to Think the Unthinkable</td>
</tr>
<tr>
<td>2</td>
<td>Janet Hamnett</td>
<td>Engaging University Students in the 21st century Classroom: The Creation and Implementation of Meaningful Multi-Dimensional Learning Spaces</td>
</tr>
<tr>
<td>3</td>
<td>Carol Hills <em>et al</em></td>
<td>Evidencing Graduating Competency in Occupational Therapy: Resources and Thresholds to Evidence Competence</td>
</tr>
<tr>
<td>4</td>
<td>Asha Khare</td>
<td>Threshold Concepts in ODL: Understanding, Interpreting and Viewing Performance in IGNOU</td>
</tr>
<tr>
<td>5</td>
<td>Didem Koban</td>
<td>Identifying Threshold Concepts in Learning Turkish by Undergraduate Students at Hacettepe University, Turkey</td>
</tr>
<tr>
<td>6</td>
<td>Sarah List</td>
<td>Scientific Thinking as a Threshold Concept in Nursing Education: Transforming Avoidance into Engagement</td>
</tr>
<tr>
<td>7</td>
<td>William Lyons</td>
<td>Will an m-Learning Technique Promote Student Understanding of Problematic Knowledge and Key Threshold Concepts?</td>
</tr>
<tr>
<td>8</td>
<td>Eileen O’Donnell</td>
<td>Personalised E-Learning: Facilitating Students’ Understanding and Mastery of New Concepts</td>
</tr>
<tr>
<td>9</td>
<td>Muireann O’Keefe</td>
<td>Exploration of the Use of Handheld Personal Response Systems with First Year Accountancy Students for Deep Learning and Understanding</td>
</tr>
<tr>
<td>10</td>
<td>Liz Springfield</td>
<td>Using Assessment Activities to Engage Students with Threshold Concepts</td>
</tr>
<tr>
<td>11</td>
<td>Reece Wilson</td>
<td>The Effects of Genre on Student Learning from Informational Text: Implications for Teacher Educators</td>
</tr>
</tbody>
</table>

**INTERDISCIPLINARY THRESHOLD CONCEPTS**

<table>
<thead>
<tr>
<th></th>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Richard Hayes <em>et al</em></td>
<td>Welcome to My House! Enter Freely of Your Own Free Will! Literary Experience and Threshold Concepts</td>
</tr>
<tr>
<td>13</td>
<td>Sophie Hill</td>
<td>The Same But Different: Troublesomeness when the Students’ and the Lecturer’s Disciplines Do Not Match</td>
</tr>
<tr>
<td>14</td>
<td>Leif M. Hokstad <em>et al</em></td>
<td>Transcending Self-Reference – Disciplinary Integration as Threshold Concepts</td>
</tr>
<tr>
<td>15</td>
<td>Johanna Lönngren</td>
<td>Thresholds in Engineering Education for Sustainability - beyond transdisciplinarity</td>
</tr>
<tr>
<td>16</td>
<td>Louise Lutze-Mann <em>et al</em></td>
<td>Separating the Chaff from the Wheat: Threshold Concepts in Higher Education Assessment</td>
</tr>
<tr>
<td>17</td>
<td>Alyson Morris</td>
<td>Crossing Subject Specific Threshold Concepts via Short Story Writing: Law Students Demonstrate an Increased</td>
</tr>
<tr>
<td>No.</td>
<td>Author(s)</td>
<td>Title</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>18</td>
<td>Lorraine White-Hancock</td>
<td>Understanding of Human Rights</td>
</tr>
<tr>
<td>19</td>
<td>Sarah Barradell</td>
<td>Using a Professional Community to Support the Identification of Threshold Concepts: A Physiotherapy Example</td>
</tr>
<tr>
<td>20</td>
<td>Terry Barrett</td>
<td>Hard Fun as a Threshold Concept in Problem-Based Learning</td>
</tr>
<tr>
<td>21</td>
<td>Barbara Bender et al</td>
<td>Embracing Threshold Competencies and Concepts as an Educational Model for the Professional Development of PhD Students</td>
</tr>
<tr>
<td>22</td>
<td>Kerry Greer et al</td>
<td>Transforming the Practioners: An Exploration of the Application of Threshold Concepts to a Multidisciplinary Professional Development Masters Course in Christian Leadership.</td>
</tr>
<tr>
<td>23</td>
<td>Jody Horn</td>
<td>The Process and Lessons Learned in Developing Interdisciplinary Threshold Concepts</td>
</tr>
<tr>
<td>24</td>
<td>Pauline Joyce</td>
<td>Crossing the Threshold into Reflective Practice</td>
</tr>
<tr>
<td>25</td>
<td>Helen King</td>
<td>Bringing the Discipline into Generic Professional Development Programmes: Open Materials for Exploring Disciplinary Ways of Thinking and Practising</td>
</tr>
<tr>
<td>26</td>
<td>Teresa Leahy</td>
<td>An Investigation of Dance as Art within the Threshold Concepts Theory of Learning</td>
</tr>
<tr>
<td>27</td>
<td>Linda Martindale et al</td>
<td>Evidence-Based Practice in Nursing Education: Exploring Learning and Practice Thresholds</td>
</tr>
<tr>
<td>28</td>
<td>Sarah Meek et al</td>
<td>Threshold Concepts and Troublesome Knowledge in the First Year Curriculum at a UK Medical School</td>
</tr>
<tr>
<td>29</td>
<td>David Moroney</td>
<td>Threshold Concepts in a TEE (Teaching English in English) Context</td>
</tr>
<tr>
<td>30</td>
<td>Kerstin Pettersson et al</td>
<td>Prospective Mathematics Teachers’ Development of Understanding of the Threshold Concept of a Function</td>
</tr>
<tr>
<td>31</td>
<td>Reid Spencer</td>
<td>Identifying and addressing Threshold Principles in the Study of Classical Voice</td>
</tr>
<tr>
<td>32</td>
<td>Ken Stevens</td>
<td>Cybercells as a Concept for the Integration of Virtual and Actual Learning Spaces</td>
</tr>
<tr>
<td>33</td>
<td>Catherine Studdert et al</td>
<td>Creating an Occupational Therapy Student-Centred Website and e-Portfolio Using a Threshold Level Framework to Evidence Competence and Professional Development</td>
</tr>
<tr>
<td>34</td>
<td>Mark Taylor et al</td>
<td>Threshold Concepts and the Social Professions</td>
</tr>
<tr>
<td></td>
<td>Authors</td>
<td>Title</td>
</tr>
<tr>
<td>---</td>
<td>------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>35</td>
<td>Virginia Tucker et al</td>
<td>Threshold Concepts in Search Expertise</td>
</tr>
<tr>
<td>36</td>
<td>Brad Wuetherick</td>
<td>Expectation Failure and the Pedagogy of Threshold Concepts</td>
</tr>
</tbody>
</table>

**NEW DEVELOPMENTS IN THRESHOLD CONCEPTS**

<table>
<thead>
<tr>
<th></th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Mary Aiken et al</td>
<td>Cyberchondria: A Contemporary Transformative Concept</td>
</tr>
<tr>
<td>38</td>
<td>Marion Palmer</td>
<td>Learning as a Threshold Concept for Teaching</td>
</tr>
</tbody>
</table>
List of Presenters

Adawi, Tom ........................................... 28
Aiken, Mary ........................................... 129
Akerlind, Gerlise ..................................... 47
Allen, Belinda ........................................... 72
Atherton, James ....................................... 69
Barnatt, Joan ........................................... 25
Barradell, Sarah ....................................... 72, 116
Barrett, Terry .......................................... 116
Barton, Graham ....................................... 95
Bedek, Michael ....................................... 93
Bender, Barbara ....................................... 117
Bernhard, Jonte ....................................... 77
Blackmore, Margaret .................................. 87
Blackshields, Daniel .................................. 97
Blair, Lorrie ............................................ 35
Boggs, Katherine .................................... 21
Bowers, Bradley ....................................... 103
Boyd, Diane ............................................ 82
Breen, Sinead .......................................... 18
Brunetti, Korey ....................................... 40
Carmichael, Patrick .................................... 14
Carstensen, Anna-Karin ............................. 37
Ciccone, Anthony ..................................... 78
Clouder, Lynn ......................................... 83
Cooper, Trudi ......................................... 44
Coughlan, Paul ........................................ 60
Cousin, Glynis .......................................... 14
Cowart, Monica ...................................... 81
Cronin, James ......................................... 79
Davies, Jason ......................................... 38
Davies, Peter .......................................... 49
Delany, David ......................................... 90
Devanas, Monica ..................................... 47
Devitt, Ann ............................................ 69
Easdown, David ....................................... 96
Fellenz, Martin ....................................... 31
Foley, Brian ........................................... 17
Fortune, Tracey ....................................... 64
Fuzzard, Rhonda ..................................... 101
Getman Eraso, Jordi ................................. 57
Gillane, Colleen ....................................... 44
Gilvary, Gerry ........................................ 64
Greer, Kerry ........................................... 118
Grogan, Sam ........................................... 63
Guerin, Cally .......................................... 30
Hall, Brendan ......................................... 40
Hamnett, Janet ........................................ 103
Harlow, Ann ........................................... 37
Hayes, Richard ....................................... 111
Hersey, Corrine ....................................... 89
Higgs, Bettie ........................................... 13
Hill, Sophie ............................................ 111
Hills, Carol ............................................. 104
Hokstad, Leif Jung .................................... 112
Hokstad, Leif Martin .................................. 24
Holland, Donal ........................................ 18
Horn, Jody ............................................. 42, 119
Johansson, Charity .................................... 76
Joyce, Pauline ......................................... 119
Kabo, Jens .............................................. 41
Kautz, Christian ...................................... 75
Keefer, Jeffrey ........................................ 61
Kennedy, Eileen ...................................... 53
Khare, Asha ........................................... 105
Kiley, Margaret ....................................... 59
King, Helen ............................................ 84, 98
Kinchin, Ian ........................................... 120
Kirwan, Gloria ........................................ 100
Koban, Didem ......................................... 105
Kobus, Marta .......................................... 52
Land, Ray .............................................. 13
Leahy, Teresa ......................................... 120
List, Sarah ............................................. 106
Lönngren, Johanna ................................... 113
Love, Jane ............................................. 93
Lutze-Mann, Louise .................................. 113
Lyons, William ....................................... 107
MacKay, Bruce ........................................... 81
Magdziarz, Sonia ........................................... 75
Maguire, Sarah ............................................. 24
Marguerite, Koole .......................................... 66
Mortindale, Linda .......................................... 121
McCarthy, Marian ........................................... 55
McKeon, Jacinta .............................................. 100
Meek, Sarah .................................................... 99
Mills, Ruth ....................................................... 83
Moroney, David .............................................. 123
Morris, Alyson ............................................... 114
Murray, Shannon ............................................. 35
Noonan, Sarah ............................................... 99
Northcote, Maria ........................................... 51
Ó Donnchadha, Brian ....................................... 70
O’Beirne-Ryan, Anne Marie ............................ 21
O’Keeffe, Muireann .......................................... 108
O’Donnell, Eileen ............................................. 107
Orsini-Jones, Marina ........................................... 32
Osmond, Jane ................................................... 33
Pace, David ...................................................... 55
Palmer, Marion ................................................ 129
Parker, Jan ....................................................... 91
Peter, Mira ....................................................... 22
Pettersson, Kerstin .......................................... 123
Pilkington, Ruth ................................................. 98
Quinlan, Kathleen ............................................ 28
Quinnell, Rosanne ........................................... 67
Rodger, Sylvia .................................................. 51
Ryan, Tony ....................................................... 26
Scott, Jonathan ............................................... 89
Sebert, Candy ................................................... 34
Sendziuk, Paul ................................................ 78
Shinners-Kennedy, Dermot ............................ 92
Shopkow, Leah ............................................... 31
Spencer, Reid .................................................... 124
Springfield, Liz ............................................... 109
Stevens, Ken ................................................... 125
Studdert, Catherine ......................................... 125
Sweeney, John .................................................. 86
Taylor, Charlotte ............................................. 19
Taylor, Mark ................................................... 126
Thomas, Lynda ............................................... 45
Thompson, Rachel .......................................... 23
Timmermans, Julie .......................................... 43
Tucker, Virginia ............................................... 127
Webster, Elaine ............................................... 53
Wertzler, Lee .................................................... 66
Whalley, Brian ............................................... 73
White-Hancock, Lorraine ............................... 115
Wilson, Reece ............................................... 110
Wisker, Gina .................................................... 56
Wood, Leigh ..................................................... 86
Wright, Alan ..................................................... 62
Wuetherick, Brad ............................................. 29, 60, 128
Zimbardi, Kirsten ............................................ 48