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Using simulations to teach threshold concepts:
The Everest team simulation

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ANZAM PELT GRANT REPORT
USING SIMULATIONS TO TEACH THRESHOLD CONCEPTS: THE EVEREST TEAM SIMULATION

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Introduction

Threshold concepts involve 'seeing things in a new or transformed way' (Meyer & Land, 2003, p.1) and can be troublesome for students to learn because they require awareness and reflexivity of a discipline's ways of thinking (Land et al, 2005; Hibbert & Cunliffe, 2015). Research suggests courses should be designed to move students from a preliminal state (yet to approach threshold, common-sense understanding) to a liminal state (stuck at threshold, engaged in rote learning) to a postliminal state (across threshold, discipline-based understanding) (Davies & Mangan, 2007; Wright & Gilmore, 2012). In this guide we discuss how educators can incorporate simulations, which align with the preferred learning style of the virtual generation of students (Proserpio & Gioia, 2007), into the design of courses to help students learn threshold concepts.

Our particular focus in this guide is on the use of the Everest Team simulation, available through Harvard Business Publishing, to teach the threshold concept of "management is a practice informed by theory" (Wright & Gilmore, 2012) in an undergraduate introductory management course. Typically, first-year undergraduate students have a common-sense understanding of management as something managers do in organisations, and may struggle to develop a discipline-based understanding of management as an evidence-based body of knowledge applicable to management practice. Although teachers may seek to expose undergraduate students to concepts, models and frameworks that constitute management theory, the lack of context for applying theory to practice impedes progress towards the threshold. Students may feel frustrated that they are learning 'theory for theory's sake' rather than recognising the value of robustly developed theory as codified evidence.

In this guide, we explain how simulations can provide a context for students to apply management theory to solve practical management problems. Students experience using management theory to inform and improve management practice by participating in a simulation, identifying management problems they faced in the simulation, locating academic research to address those problems through an evidence-based approach, and reflecting on their experience in a written assignment We suggest that this process can enable most undergraduate students to move from a pre-liminal to a liminal understanding of the threshold concept, and facilitate some students to move to a post-liminal understanding.

Using a simulation to teach threshold concepts

To teach the threshold concept of "management is a practice informed by theory" (Wright & Gilmore, 2012) we use the 'Leadership and Team Simulation: Everest V2' released by Harvard Business Publishing. This simulation is particularly suitable for an undergraduate introductory management course because, unlike other business simulations, students do not need to have an understanding of management concepts to participate. In the simulation, students play one of five roles in a team of hikers who are attempting to climb to the summit of Mount Everest on a commercial expedition. The students must work together as a team through six rounds of decision-making, which simulates six days on the mountain, and takes between 2 to 3 hours in the classroom. During the simulation students need to share information to make decisions to climb up or down the mountain, to distribute resources such as oxygen canisters and medical supplies, and to pursue individual goals that may conflict with the team goal of reaching the summit. At the end of the simulation students are provided with an individual-score and a team-score based on the goals they achieved.

To teach the threshold concept, we guide the students through the four steps presented in Table 1. In the first step, we expose students to some key management concepts and theories through traditional lectures. Second, students participate in the simulation. At this stage, students are not expected to reflect on the management concepts, but to engage in the group decision-making tasks presented in the simulation. Third, after finishing the simulation, students are asked to identify problems that their team experienced that are relevant to the management concepts of planning/controlling and leadership. Students then complete a written assignment where they must locate and apply academic literature to help them solve their planning/controlling and leadership problems. In this assignment, students are also asked to reflect on their experience of doing evidence-based management (i.e. identifying and solving a management problem using academic research). Fourth, we continue to introduce students to new management theories through the course lecture program and encourage them to reflect on how these theories might help them make further sense of their simulation experience. In the tutorials, students participate in group discussions about case studies where they attempt to link theory to practice. In Table 1 we describe how each of these four steps help students move from a pre-liminal to a liminal and then post-liminal understanding of management as a practice underpinned by theory.

Table 1: Embedding Threshold Conceptions in the Everest Team Simulation

Activity	Description	Link to Threshold Concept
1. Introduction to relevant management theory	Students attend lectures where management theory pertaining to topics of planning and control and leadership is presented.	Exposure to building-block concepts, models and frameworks that constitute management theory is intended to move students away from a common-sense to a more discipline-based understanding of management. However, lack of an experiential context for management practice may cause students to be overwhelmed by the abstraction of theory and become 'stuck' in seeing the threshold conception of management as theory that informs practice (preliminal → liminal).
2. Participation in simulation	Students participate in the Everest Team Simulation in class. Taking on their assigned roles, students discuss and negotiate within their team during each decision round. Students record in a simulation log the factors influencing individual and team decision making for each decision round.	Students bracket their exposure to management theory and engage with the simulation in a preliminal state. Rather than being required to think and act like a management scholar, students experience the simulation in the context of their assigned role (experiential context).
3. Applying management theory to simulation experience	Students review their simulation log and identify problems or issues in their simulation experience which they perceive as able to be explained using management theory of planning/controlling and leadership. Students then search in the scholarly management literature for journal articles that provide further insights to help them make sense of and solve their identified problems or issues.	Simulation creates an experiential context for bringing the threshold conception into view. As students review their simulation log and research the management literature, they begin to navigate the liminal space by appropriately contextualising their problems or issues in the realm of management theory and research. They 'see' how their performance in the simulation could have been improved by the application of theory about (1) the environmental conditions under which different planning and control approaches are effective, and (2) the individual, group and situational variables that influence leadership effectiveness. By re-working their simulation experience in the context of the discipline's knowledge base as published in peer-reviewed academic journals, students gain a deep understanding of how management theory can be used to inform practice (preliminal → liminal →postliminal).
4. Ongoing reflection on simulation experience as additional management theories are introduced	As new management theories (such as external environment, strategy, structure) are introduced in lectures that follow the simulation, the lecturer encourages students to make connections between each new theory and their simulation experience.	By continuously reflecting on their simulation experience in the context of new management theory, students gain a more integrated understanding of management as a web of theoretical concepts that can be used to inform and improve their own practice (preliminal → liminal → postliminal).

Assessing the impact of simulations on student's learning

To better understand the extent to which simulations can help students to learn threshold concepts, we analysed a sample of student assignments. As part of the written assignment for the introductory management course, students were asked to read Rousseau and McCarthy's (2007) article about evidence-based management and apply it to their simulation experience. Rousseau and McCarthy (2007, pg. 84) define evidence-based management as "managerial decisions and organisational practices informed by the best available scientific evidence". We suggest that evidence-based management captures the threshold concept of "management as a practice informed by theory". Once students understand that management is not just what managers do but is underpinned by a body of theory, they become open to the idea that academic research, which builds and tests theory, is a body of knowledge that managers can draw on to make decisions and solve problems. After completing the Everest Team simulation, students were asked to analyse their simulation experience by applying Rousseau and McCarthy's (2007) four steps for doing evidence-based management: (1) identifying a management problem, (2) searching for the best available research evidence, (3) critically evaluating that evidence, and (4) implementing a solution based on relevant evidence. The assignment task description, simulation log in which student's record their team's decision-making processes throughout the simulation, and marking rubric are included in the appendices to this report.

As part of their written assignment, students were asked to write a 400-word reflection about (1) their understanding of evidence based-management, and (2) whether or not they would use evidence-based management in their future career. We obtained ethical approval through our university to use student's assignments for the purpose of our research. After course results were released, students were contacted to seek permission to use their assignments in our research. A total of 205 students who completed the introductory management course in Semester 1 2015 consented to their assignments being used for our research.

A research assistant read through the 205 student reflections and inductively coded portions of text, giving them labels that summarised their meaning. Where possible, the research assistant used labels that were based on the student's own words (i.e. in vivo codes). She began by looking for similarities and differences between students that might indicate whether they have a pre-liminal, liminal, or post-liminal understanding of the concept of EBM. Initial codes related to student understandings of EBM (e.g. guidelines for decision-making, alternative to intuitive decision-making, process for applying and adapting evidence), benefits and drawbacks of EBM (time consuming and costly, good for managing ambiguity and risk, facilitates professional development), and when they would and would not use EBM (e.g. depends on level of experience, organisation, nature of decision).

In the second round of coding, the research assistant grouped together codes that seemed to be shared by students with pre-liminal, liminal and post-liminal understandings of EBM. For example, students with a pre-liminal understanding of EBM tended to focus on the problems with EBM (e.g. time consuming and costly, difficult to implement), while students with a liminal understanding tended to describe when they would and would not use EBM (e.g. depends on nature of decision, depends on novelty of situation), and students with a post-liminal understanding focused on the skills they required to implement EBM (judgement required to apply EBM, professional and personal development). At this point, the chief investigators and the research assistant discussed the initial coding. In the third phase of coding, the research team reviewed each transcript again, seeking to understand each student's response holistically. The team classified each student as either pre-liminal, liminal, or post-liminal, and outlined the major characteristics associated with each understanding. We provide an overview of each understanding and example text from student reflections in Table 2.

Table 2: Student understandings of Evidence-Based Management

Understanding	Key characteristics	Examples from Student Reflections
Pre-liminal understanding	• Identifies the problems with EBM (difficult to implement, time consuming, relevant evidence is not always available) • Will use EBM only if they are required to by their future managers	• I guess the problem comes with EBM is the ongoing time and effort you have to put into finding appropriate research, reading, understanding and application • Furthermore evidence is an extremely clinical and scientific term. When dealing with humans and human emotions, clinical is not the best approach • In my future career, I may be faced with a situation where the internal environment or culture of the organisation I am working for does not encourage or see the value in Evidence-Based Management approaches. In this case, it may be difficult to bring such approaches into practice. • Realistically, people aren't prioritising the evidence presented in journals.
Liminal understanding	• Views EBM as a superior alternative to intuition-based management. • Has an instrumental view of EBM (used to justify decisions, manage risk). • Views EBM as providing clear guidelines that can be followed mechanistically. • Views EBM as the best approach for certain situations.	• Whilst the intuitive models of management create a simpler and quicker directive for decision-making, it also creates more issues in regards to accountability and efficiency. • Having evidences backed with decisions will reduces the chances of same mistake and have a higher chance of favourable outcomes as these decisions made are justifiable by past examples. • By using evidence-based management, there will be a standardised method of handling problems within the organisation. • I would use evidence based management in an organisation, but only for decisions where the improved decision quality is sufficient to justify the outlay of money and time.
Post-liminal understanding	• Suggests that managers need to use professional judgement when applying EBM • Views EBM as about ongoing learning and professional development • Views EBM as the basis for innovation and ethical decision-making	• I found that even when EBM research did not immediately offer me a solution, it greatly assisted in diagnosing the problem, and because of this increased understanding, I was able to develop effective solutions on my own. • My continuing education will be at my discretion. By practicing EBM, I will ensure my organisation is always in line with the current techniques and my knowledge and practice remains relevant. • Additionally, I believe that being accountable for each of your decisions and being able to demonstrate the reasons for them is important both legally and ethically. • AdditionallyRousseau and McCarthy draw a parallel to the practice of professional medicine, wherein the successful application of scientific evidence is manifested in the constant innovation and refinement of medical procedural knowledge and technologies.

Implications for teaching practice and further research

This study helps management educators to consider how a particular approach to teaching threshold concepts – using simulations – may be operationalised, and the spread of learning outcomes that can be expected. Overall, the grade distribution in the class studied here was in line with the improved outcomes described by Wright and Gilmore (2012), and for that reason it is confirmed as a useful approach. There are two potential questions for future research that could be allied to further implementations of the approach. First, it seems that some students who failed to progress beyond the pre-liminal stage did not recognise the benefits of investing time in a systematic approach. This might be linked to attitudes towards study and research processes more generally; there is an opportunity for future studies to clarify this and thereby further enhance learning outcomes. Second, some post-liminal students emphasised (directly or indirectly) the value of a professional approach. Although management is not a profession per se, there is merit in future research that considers professionalism as an additional threshold concept in management education.

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