Introduction

Intensive mode teaching (IMT) involves students engaging in facilitated learning activities or classes over more hours in a day and over fewer days than in a traditional course in the discipline. Davies (2006) reported that IMT had been used by most Australian business schools on and offshore. Intensive mode has also been used extensively in health and education courses in which students fit intensive teaching between practical experience.

In the 21st century, IMT is increasing in popularity. IMT allows academics time to focus on other demands. IMT can allow students to fit courses into short blocks. Flexibility is important for students undertaking higher education, who now engage more heavily than in the past in paid employment during their courses. In engineering, IMT is used to teach students who are mainly off-campus, for units taught off-shore by academics visiting from the main campus, and for units taught on-campus from specialists from industry. IMT is being introduced in engineering at The University of Western Australia (UWA) to facilitate interactive learning opportunities. IMT is supported by advances in technology that allow information delivery, and interactive learning and assessment online, freeing class-time for interactive learning activities focusing on the most critical and troublesome parts of the curriculum, namely 'threshold capabilities' which are introduced below.

With the rapid adoption of IMT it is important to ensure that the student experience of learning is evidence-based. Previous studies have asked whether IMT is better or worse than traditional modes (e.g., Kucsera & Zimmaro, 2010). These have used students' perceptions, stakeholders' opinions, students' assessments, and comparison of measures of students' attitudes. While these studies contribute to arguments for and against using IMT, curriculum designers require recommendations based on students' experiences of learning in IMT. This paper reports the first phase of a national project to inform enhancement of student capability development in units with intensive mode teaching. It is the first study to investigate the students' experiences of threshold capability development in an intensive mode unit.

Context

This study was undertaken in an optional second year engineering unit on critical theories of technological development at an urban university in Australia. In first semester 2015, when the data were collected, the unit was offered in intensive mode for the first time having previously been offered in the traditional one-semester mode. Thirty-eight students took the unit. Students attended seven hours of interactive class-time every Friday, starting at 9am for seven weeks and undertook a major community service learning project. Assessment included participation, in class quizzes, poster presentation, a critical essay and a critical reflection journal.

Theoretical Framework

The framework for this project is threshold capability theory (Baillie, Bowden, & Meyer, 2013). This is adapted from threshold concept theory, which was first developed by Meyer and Land (2003), and has since been applied in numerous fields of higher education. Threshold concept theory assumes that every discipline has concepts that are transformative ontologically and epistemologically. These 'threshold concepts' are critical to future learning and working in the discipline and are usually troublesome for students in one of several ways such as being foreign, complex, counter-intuitive or requiring unfamiliar language (Perkins, 2006). In capability theory, Bowden (2004, pp. 42-44) argues that students must develop not only understanding of concepts, but capabilities for unseen futures. Threshold capabilities

are transformative and critical to future learning and practice in a discipline. They usually require understanding of one or more threshold concepts.

In threshold concept theory students are understood to be in a state called the 'liminal space' between when a concept comes into view and when they are comfortable with the concept (Meyer, Land, & Davies, 2008, p. 223). Traversing the liminal space can take years. Based on this understanding, it is imperative that academics teaching with intensive mode are aware of how to support students' threshold capability development within the mode.

This study addressed the questions:

1. How did students develop threshold capabilities in this unit?
2. What features of the unit supported and hindered the students?
3. What recommendations for intensive mode teaching can be made?

Method

Authors who were not were not teaching the unit held a 30-minute mini in-class workshop in the final class for the unit after the students' final assessments. The workshop was designed to be valuable both as a group and individual reflection on learning in the unit for the students, and as a data collection event for the study. Consistent with the ethics approval, every student received an envelope containing the participant information and consent form, and two questionnaires.

Initially we explained the purpose of the workshop, presented the theory of threshold concepts and threshold capabilities, compulsory features of thresholds (namely being transformative) and common features of thresholds (namely being troublesome, irreversible, 'integrative' meaning connecting other concepts, and 'discursive' meaning enhancing use of language) as described in threshold concept theory (Male & Baillie, 2014). We then facilitated a discussion among the students in which they identified threshold concepts and capabilities experienced in the unit, how they were troublesome, what they had done to develop threshold capabilities, and features of the unit that helped and hindered them in developing the threshold capabilities. We also took notes during and after the workshop.

At the end of the workshop the students were given ten minutes to complete the questionnaires and then return them in the envelopes with a consent form if they agreed to participate in the study. The first questionnaire included demographic questions. The second questionnaire was comprised of the questions below.

> *'The unit' refers to the unit that you are or were enrolled in that is being studied in this research project. This questionnaire is to inform development of a student survey on learning in the unit.*
> *Q1. Please identify a threshold concept that you have experienced in the unit.*
> *Q2. Please describe a threshold capability that you have experienced in the unit. It might be an application of the threshold concept identified above, or a different capability.*
> *Q3. How was the capability troublesome?*
> *Q4. What did you do to develop the capability?*
> *Q5. Please identify any feature of the unit that helped you to develop the capability.*
> *Q6. Please identify anything about you (such as your strengths, experience, or support) that helped you to develop the capability.*
> *Q7. Please identify any feature of the unit that hindered you in developing the capability.*
> *Q8. Please identify anything about you (such as your experience or commitments) that hindered you in developing the capability.*

Participants

Of the 38 students enrolled in the class, 33 consented to participate (Table 1). The students' ages ranged from 18 to 27 at their last birthday ($M = 20.9$, $SD = 2.1$). All of the students were studying engineering and/or science. Three were combining engineering with commerce. Two students did not indicate the degrees they were undertaking. Four students spent more than 20 hours undertaking sport in an average teaching week during the unit, and one student worked for more than 20 hours in an average teaching week.

Table 1: Participant characteristics

Demographic Characteristic	Values	N	%
Sex	Female	8	23.5
	Male	25	73.5
	Not provided	1	2.9
English as a second language	With English as a second language	7	20.6
	Not with English as a second language	26	76.5
Domestic or international enrolment	Domestic	29	85.3
	Exchange	1	2.9
	International	4	11.8

Analysis

We identified themes in the students' responses to the second questionnaire. NVivo™ V10 was used to manage the coding. The purpose was to identify the threshold capabilities experienced by the students, what they found troublesome about these, how they overcame the troublesome features to develop the capabilities, and the features of the unit and themselves that students found to help and hinder their capability development. We coded all of these directly from the responses, except that some troublesome features were coded according to known troublesome features of threshold concepts. The workshop notes assisted us in understanding the questionnaire responses.

Findings and Discussion

The workshop discussion and questionnaire responses revealed that the unit had been transformative for students. Threshold concepts and capabilities identified by multiple students are presented in Table 2. In some cases multiple sample comments are presented to reveal nuances within the theme. All sample comments are direct quotes.

Table 2: Thresholds experienced by students in the unit

Threshold Concept	Sample Comments	Comments
Social justice	*Applying social justice as a lens to deconstruct texts and arguments.*	10
Neoliberalism	*The understanding that we all view the world from worldview lenses, dominantly Neoliberal lens in Western society*	5
	Dominant Discourse (neoliberal capitalism in Australia).	
Globalisation	*The ability to critique globalisation.*	4
Threshold Capability	Sample Comments	Comments
Critical thinking	*Applying social justice as a lens to deconstruct texts and*	40

(including 3 specific themes below)	*arguments.*	
Critical thinking: analysing using various lenses	*(The understanding that we all view the world from worldview lenses, dominantly Neoliberal lens in Western society), and then being able to critique that worldview by taking on other 'lenses' i.e. critical thinking of hegemonic worldview.*	8
Critical thinking: framing and communicating a position	*The ability to articulate my argument with various resources, and recognise my own bias.*	5
Critical thinking: analysing using various perspectives	*Change the 'point of view', standing at other point of view of the question, to get the best solution for the question.*	3
Recognising inherent bias and dominant discourse	*The skills to critique the dominant paradigm of capitalistic agendas.* *Seeing the bias in everything and being able to understand and analyse it critically.*	20
Taking account of social and environmental context in engineering practice	*Change the way of thinking and analysis. I found it very useful for Engineer to look at the world in different perspectives (including economic, environment, political).*	4
Social justice as a threshold capability	*Being able to critique current social constructs from a social justice perspective to provide alternatives.*	3

The final threshold capability, social justice, is consistent with the threshold concept, social justice for engineering, described by Kabo and Baillie (2009). By identifying thresholds, students indicated that they had experienced transformational learning. The identified threshold capabilities also provided specific examples for them to think about when describing their learning. The troublesome features of the threshold capabilities indicated that the thresholds challenged the students both epistemologically and ontologically (Table 3).

Table 3: Troublesome features of the threshold capabilities

Troublesome Feature	*Sample Comments*	*Comments*
New way of thinking	*The concept required us to step outside of our regular way of thinking and promoted counter-hegemonic standpoints.*	8
Foreign	*Didn't realise it existed prior to the course.*	6
Challenged previous beliefs	*It strongly challenged my previously held beliefs and understanding! It was almost a dislocative shift.*	5
Difficulty recognising own bias	*It was difficult to put aside my own bias, or even recognise it.*	4
Time consuming to develop capability	*The threshold basically teaches you to think. This is a very abstract subject and as such it is something that really requires a lot of time and evidence-based resources to bend your thinking.*	3
Difficulty recognising others' bias	*I was always searching for the view point of the author in the article and trying to identify their biases.*	2
Accepting multiple understandings rather than one truth	*Depending on right/wrong with regard to current social convention, it is easy to think that a piece of information is 'it'.*	2

Feeling different from others	*Considering that my own viewpoint can be drastically different to that of others.*	1
Language	*Some readings were very technical, using unfamiliar language.*	1

Students indicated what they did to develop the threshold capabilities. Preparation for class, activities in class, interaction with others and reflection were important (Table 4).

Table 4: How students developed the threshold capabilities

Action	Sample Comments	Comments
Reading	*Reading papers written from alternative, counter-hegemonic viewpoints*	17
In-depth in-class discussions	*In-depth, in-class discussions allowed me to see many different opinions on one topic.*	15
Discussion with friends	*I started assessing comments and statements made by friends and family, and actively chose to attempt to give them a balanced outlook on the topic*	6
Self-reflection	*Try to think why I've responded to things the way I have-ask myself how I might have reacted if I had different experiences.*	5
Critical analysis assignment	*Critical response paper.*	2
Group activities	*Group activities*	1
Using feedback	*By writing reflections and being given feedback on what scale of position to opinion my reflection related.*	1

Factors that supported development of threshold capabilities included features for which IMT was well-suited, namely extended discussions, group activities, real-world applications, and learning from others (Table 5). These were enhanced by the open nature of the facilitated discussions and the selected reading.

The students' comments about learning from each other are consistent with them having developed a learning community during the unit (Wenger, 1998). Their comments about reading, discussing with friends, reflecting and being willing to learn are consistent with self-regulated learning, which is known to enhance learning (Vermunt, 2005).

Table 5: Factors that supported development of the threshold capabilities

Personal Strengths	Sample Comments	Comments
Well-prepared and skilled for the thresholds	*Previous experience in critical thinking in Literature Studies.*	10
Love of learning and open mind	*Willingness to expand my way of thinking, the desire for understanding.*	9
Relevant experience	*I'm not the Western background student and I hope from a different cultural background to look at Western culture.*	5
	I have experienced injustices as a female in Engineering.	
	I frequently oppose the viewpoints of family members.	
Aligned values and interests	*I try to be as fair as possible and am willing to look at different views-so acceptance of different views.*	5

Friends and family	*I have a large and broad friend base, with sub-groups that hold many differing views (which I have exposure to and like to debate).*	3
Personal journal	*I have a log of self-introspection and I used this to think a lot about my own views.*	1

Unit Strengths	*Sample Comments*	*Comments*
Open, extended, informed in-class discussions	*In-class debating. Listing and defending our answers after the weekly in-class test not just amongst the class, but even with [the coordinator] (who would grant those points if she was convincingly swayed).*	24
	The openness of the discussion encouraged me to speak more freely.	
	Public discussions by a group of diverse people.	
Selected readings with different viewpoints	*Reading a number of articles that have many different views.*	5
Learning from others	*The class discussions, which required pre-reading, allowed me to learn not only from the coordinator but also other peers.*	4
Intensive mode	*Extended discussions-short classes limit retention capacity for a unit of this nature*	4
Engaging activities	*Role playing from the perspective of people in different situations than mine.*	3
Writing reflections	*Journal writing*	3
Real-world applications	*Getting involved in a real-world project.*	3
Feedback	*Project feedback*	1

While personal factors such as background, interests, and skills supported capability development for some, for other students they were barriers (Table 6). This is consistent with pre-liminal variation influencing their experiences of the liminal space (Meyer et al., 2008).

Hindrances to capability development that arose from IMT were time clashes and weariness. The extended discussions were difficult for some students, only highlighting the importance of the facilitation which was also appreciated by many students.

Table 6: Factors that hindered development of the threshold capabilities

Personal Barriers	*Sample Comments*	*Comments*
Clashes with university and life	*Clashed in some cases with commitments with other units and other time commitments (work, etc.).*	6
	My family is very close-knit, so I had to dedicate a chunk of time for them.	
Difficulty presenting	*Because I struggle to present my opinions normally.*	5
	I am reluctant to speak in front of an audience, therefore could not share my thoughts extensively.	
Misalignment between background and	*I've been studying in the Business School for a long time. It was hard to shake some deeply held convictions.*	5
	Coming from an Engineering background.	

	skills		
Difficulty reading quickly or much	*I can't really read quickly.*	3	
	Long readings-can lose interest.		
English as a second language	*English as a secondary language.*	2	
Narrow experience	*I have lived in Australia all my life and have been naïve and ignorant to other perspectives.*	2	
Preference to avoid conflict or change	*I tend to want to go with what's easiest-I can recognise when something is wrong/unjust, but I prefer to hang back, not 'rock the boat'.*	2	
	I am quite stubborn, so I was resistant to different points of view.		
Illness	*Mental illness-Depression*	1	
Being a member of a minority	*I am growing up under different concepts from the domestic students as an international student.*	1	

Unit Barriers	Sample Comments	Comments
Time required to cope with content and reading	*Too much reading each week and combined with the journal entries = too much work.*	12
Interactions	*I am not confident in large public speaking tasks so I didn't participate as actively in discussions.*	5
Tiring during class	*The workshop starts in the morning and I feel tired about it.*	3
Long periods between classes	*Only a single, long, weekly class. Bi-weekly classes of shorter length would have helped.*	1
Limitations of the cohort	*Despite a diverse group, we were all still uni students and not in the poorest demographic.*	1

Limitations and Further Research

This study investigated students' perceptions in relation to the intensive mode of the class and does not take into account the many pedagogical interventions creating the potential transformations. All students completed a critical assessment journal and their learnings during the unit, as they passed through the liminal space, were accurately mapped. This will give us an important way to ascertain the detail leading to the transformation noted above and will be explored in future papers. Findings will then be triangulated with an interview with the unit coordinator. We are undertaking additional studies in engineering and business units at four universities. Recommendations for enhancing threshold capability with IMT will be drafted based on these studies. Concurrently, we have undertaken a sector-wide survey of coordinators of units with IMT, to map the use of IMT and expand the relevance of the recommendations. In 2016 we will hold workshops around Australia with people who use IMT across the higher education sector in order to achieve generalizability of recommendations.

Conclusions

The students' experiences of threshold capability development indicate that the subject of the unit, namely critical theories of technological development and the way in which it was taught

and assessed, were well-suited to IMT. Students' comments revealed that they experienced epistemologically and ontologically transformative capability development in the unit, acquiring critical thinking skills that were foreign to many of the students. IMT allowed for extended class discussions, learning from peers, group activities and exposure to real-world problems, all of which supported threshold capability development. Student learning was also supported by facilitation of open discussions, and selected reading by the unit coordinator; and students' enthusiasm for learning and for the topic. Factors that hindered students' development of capabilities were illness, the time necessary to develop the threshold capabilities, the quantity of reading for those who read slowly or had large time commitments, difficulty with discussions and presentations, and tiring during class. This study has demonstrated: that students can develop threshold capabilities with IMT; valuable approaches to teaching with IMT; and issues to pre-empt or monitor.

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