Students' experiences of threshold capability development with intensive mode teaching

Sally Male

The University of Western Australia, Perth, Australia
sally.male@uwa.edu.au

Firoz Alam

RMIT University, Melbourne, Australia
firoz.alam@rmit.edu.au

Caroline Baillie

The University of Western Australia, Perth, Australia
caroline.bailie@uwa.edu.au

Stuart Crispin

University of Tasmania, Hobart, Australia
stuart.crispin@utas.edu.au

Phil Hancock

The University of Western Australia, Perth, Australia
phil.hancock@uwa.edu.au

Jeremy Leggoe

The University of Western Australia, Perth, Australia
jeremy.leggoe@uwa.edu.au

Cara MacNish

The University of Western Australia, Perth, Australia
cara.macnish@uwa.edu.au

Dev Ranmuthugala

University of Tasmania, Launceston, Australia
dranmuth@amc.edu.au

This study focuses on the student experience of passing through critical transformatory *thresholds*, facilitated by *intensive mode teaching*. Intensive mode teaching (IMT) involves students engaging in facilitated learning activities or classes over longer periods each day, and over fewer days than is traditional in the discipline. *Threshold concept theory* and the related *threshold capability theory* provide a particularly appropriate theoretical basis from which to study the transformation of students' learning in this mode. Threshold concepts are assumed to be transformative for students because they open new ways of thinking and knowing. With threshold capabilities students can apply threshold concepts to respond to previously unseen problems. Threshold capabilities are necessary for future learning or practice in a discipline and must be central to curriculum design. As IMT is becoming increasingly popular it is important to ensure that students' experience of learning with IMT is optimal. We investigated students' experiences of threshold capability in eight intensive mode units at four universities, including undergraduate and postgraduate units in business and engineering. The approach included an exploratory phase with students and teaching team members, rationalisation,

and surveys based on identified themes. Students' responses revealed that their experiences of threshold capabilities were not always as intended by academics. In some units, concepts that were not central occupied time that students could not readily afford. Students reported that factors that helped their learning included extended in-class discussion and group activities. The opportunity to ask questions was significantly more important to learning in intensive than other modes.

Keywords: intensive mode teaching, threshold concepts, threshold capabilities

Introduction

Intensive mode teaching (IMT) involves students engaging in facilitated learning activities or classes intensively over longer than a few hours in a day, and over fewer days than in a traditional course. This mode has been used extensively in business, health, and education in order to accommodate practical experience and employment (Davies, 2006), and the mode is increasingly common across the sector as more students balance study and work, technology enables increased options to access learning outside class-time, and universities teach offshore. In this context of increasing use of IMT, it is important that educators understand and optimise the students' experience of learning.

Theoretical framework: threshold concepts and threshold capabilities

Threshold capability theory (Baillie, Bowden, & Meyer, 2013), which builds on threshold concept theory (Meyer & Land, 2003) is relevant to this problem because in this framework researchers focus on how students experience learning. As described by Billett (2011, pp. 20-24), the 'experienced curriculum' is very different from the 'enacted curriculum' or 'intended curriculum'.

Threshold concepts are transformative for students because they open new ways of thinking and knowing it make it possible for students to do things they could not do without understanding of the threshold concept. Threshold concepts are usually troublesome for students in one of several ways such as being foreign, complex, counter-intuitive or requiring unfamiliar language (Perkins, 2006).

With *threshold capabilities* students can apply threshold concepts to respond to previously unseen problems. Threshold capabilities are necessary for future learning or practice in a discipline and usually depend on understanding one or more threshold concepts. By identifying threshold capabilities experienced by students in a discipline and understanding how they are troublesome and how students overcome them, curriculum designers can focus class time on the learning that is most critical and most troublesome for students.

Liminal space

The *liminal space* (Meyer & Land, 2003, p.10) is the state experienced by a student when a threshold concept or capability has come into view but the student is not yet comfortable with that threshold concept or capability. The duration of the liminal space varies greatly between students and may extend beyond the duration of a unit. Considering the liminal space is especially important for this study because available time for traversing the liminal space may be shorter with intensive mode than traditional modes of teaching.

Previous recommendations for intensive mode teaching

Previous studies on IMT 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 how students' experiences of learning in IMT can be optimised.

Recommendations for teaching with intensive mode are scarce but consistent. Kuiper, Solomonides, and Hardy (2015) interviewed academics teaching distance students with intensive mode at an Australian university and report that encouraging students to be committed from the beginning of the unit, "well-sequenced assessments", and maintaining student motivation using a well-structured course were important (p. 13). Similarly, Kops (2014) interviewed academic staff teaching with compressed modes in the US and in Canada and recommends a well-structured course introducing "important and complex concepts early" (p. 12), with carefully selected reading and carefully selected and timed assessments. A possible explanation, within the threshold framework, for introducing important and complex topics early is that this shifts forward the time when students enter the liminal space in order to improve the opportunity for students to completely traverse the liminal space during the intensive mode unit.

Few studies have investigated the student perspective. Wlodkowski and Ginsberg (2010) used motivation as the framework for US studies of IMT with non-traditional and adult students. The most significant study was in Australia. Lee and Horsfall (2010) interviewed 12 academics and surveyed 114 students, from multiple disciplines, about their comparison of a traditional 12-week mode and an intensive 6-week mode.

> From both faculty and student responses, findings indicated that the benefits of acceleration for learning rested largely on an intensified, active learning cycle of theory, practice, and feedback and a stronger social learning experience derived from peer support, guidance and feedback. (p. 196)

In the US, Scott (2003) undertook a study more limited in scope yet deeper in exploration of the student experiences. Scott investigated two English and marketing units that were taught in intensive and traditional modes with the same academics and content. She analysed data from student interviews, participant observation, and video-recorded classes to compare traditional and intensive modes. For intensive mode, students recommended: "active learning"; "classroom interaction and discussion"; "experiential and applied learning" using teaching practices such as "problem solving, role playing, simulation exercises, field-trips and skill-training practice"; "depth over breadth"; fostering "close student-student and student-teacher relationships"; "a relaxed classroom atmosphere that encourages student participation", with "a supportive non-judgemental atmosphere"; and "meaningful assignments that require them to apply or experience the material personally" (pp. 31-34). Among the benefits, students reported "focused uninterrupted learning" and "emphasis on core concepts" (pp. 35-36).

As noted, Scott's study was limited in scope. Furthermore, since Scott's study, learning technology and student cohorts have changed. A recent exploration of the student experience of intensive mode teaching in multiple units and disciplines was necessary.

Context

We investigated students' experiences of threshold capability development in eight intensive mode units, and three matched units taught with other modes, at four Australian universities (Table 1) (Crispin et al., forthcoming; Male et al., 2015). University A was in no network. University B was in the Australian Technology Network and Universities C and D were in research-intensive universities in the Group of Eight.

Table 1: Units in the study

Unit Code for this Study	Unit topic	Discipline	Year	University	Mode	Weeks Spanned by Classes	Weeks after Classes Before Final Assessment	Enrolment
SM_I	Strategic Management	Business	Masters	A	Intensive	5	3.5	21
AC_I	Accounting	Business	Masters	C	Intensive	7	0	20
AC_F	Accounting	Business	Masters	C	Flexible	10	0	45
MM_I	Mechanics of Machines	Engineering	2	B	Intensive	6	6	38[1]
MM_T	Mechanics of Machines	Engineering	2	B	Traditional	13	13	176
FT_I	Field Trip on a Working Fishing Vessel	Engineering	3	A	Intensive	5 days	8	15 to 20 students per voyage
CF_I	Computational Fluid Dynamics	Engineering	4	A	Intensive	5 days	8	13
CF_T	Computational Fluid Dynamics	Engineering	4	A	Traditional	13	1	17
CF_I2	Computational Fluid Dynamics	Engineering	Masters	C	Intensive	7	1	13
CT_I	Critical Theories of Technological Development	Engineering	2	C	Intensive	7	0	39
HE_I	Humanitarian Engineering	Engineering	3/4	D	Intensive	4	1	36 on campus +8 in the field

Note.
1. Additional students undertook intensive mode offshore but were not included in the study reported here.
2. Two focus groups were held with students from two separate voyages.

Traditional and flexible mode units were taught over 13 weeks with examinations at least one week later. Intensive mode units were taught over one to eight weeks with final assessments during the last week of class or within one to eight weeks of classes ending.

Method

Adapting the method for identifying threshold concepts that was developed by Male and Baillie (2011), students' experiences of thresholds in each unit were explored through an exploratory stage and rationalised through negotiation. Where practical, the generalisability of findings among students in each unit was assessed with a quantitative survey. Details of both phases are described below.

Exploratory phase

A student focus group or in-class mini-workshop was held in each unit. The focus groups were over light lunch, approximately 45 minutes long, and were recorded and later transcribed. The workshops were held in class (30 minutes) and were not recorded. In the focus groups and workshops, students were introduced to the theory, and discussed the thresholds they had experienced and factors that had helped or hindered their learning. They also completed two questionnaires. The first collected demographic data. In the second they identified a threshold capability they had experienced in the unit, how it was transformative and troublesome, what they had done to overcome it, and features of the units and themselves that had helped or hindered them in overcoming the threshold. Participant demographics are reported in Table 2.

Table 2: Student participants in exploratory phase

Unit	Method	N	n_{female}	Age (years) (M, SD)	Attendance in Workshop or Focus Group
SM_I	Workshop	13	6	29.3, 9.0	21
AC_I	Focus group	17	3	31.5, 4.9	17
AC_F	Workshop	12	4	37.5, 7.4	40
MM_I	Focus group	3	1	20.0, 1.0	3
MM_T	Workshop	42	4	20.5, 2.9	73
FT_I	Focus group	9	0	23.1, 2.7	9
CF_I	Workshop	12	2	22.0, 2.5	13
CF_T	Focus group	17	1	22.8, 2.9	17
CF_I2	Workshop	11	4	22.0, 1.9	15
CT_I	Workshop	33	8	20.9, 2.1	34
HE_I	Workshop	28	9	22.2, 1.5	32
Total		**197**	**42**		**275**

Note.
1. Not all participants who attended the in-class workshops elected for their responses to be analysed in the study. Therefore the attendance at each workshop was usually greater than the number of workshop attendees who participated in the study.
2. Two focus groups were held with students who took the field trip unit. These were held after the field trip but before the final assessment was due. Data for these focus groups are collated in the table.

In addition to students, teaching team members participated in interviews in the exploratory stage. They were asked to identify examples of threshold concepts and capabilities they had observed students experiencing in the units, observations that informed their identification of examples, how students had overcome the thresholds, and features of the units and students that they, as teachers, had observed to support or hinder students in overcoming thresholds. Interviews were 30 to 60 minutes in duration and were recorded and transcribed.

Analysis

Questionnaire responses, student focus group transcripts, interview transcripts, and researchers' notes were analysed thematically to identify threshold concepts and threshold capabilities experienced by the students, approaches to overcoming these, and features of units and students that helped or hindered them in overcoming the thresholds. NVIVO 10^{TM} was used to manage the analysis.

Rationalisation phase

After students had received their grades, unit coordinators were presented with the themes from the exploratory phase. Teaching team members and researchers in the discipline of the unit refined and rationalised the identified themes in a 45-minute discussion led by the principal researcher.

Where practical, students completed surveys, focusing on one main threshold capability and relevant threshold concepts experienced by students in the unit, based on the themes that had been identified and rationalised in the study. In the surveys, students rated the extent to which thresholds were transformative and challenging. They were also asked to rate the extent to which a range of factors "… influenced your development of the capability to […]" where the capability in the square brackets was customised for the unit and had been identified in the exploratory phase. Factors included features of the units and their lives and practices that had arisen in the exploratory phase as well as features directly related to the teaching mode, such as time between classes. The response scale had seven points (1 = strongly hindered your development of the capability; 7 = strongly supported your development of the capability).

Table 3: Student participants in surveys

Unit	N	n_{female}	Age (years) (M, SD)
AC_I	5	2	32.0, 5.2
AC_F	13	5	33.3, 7.5
CF_I	4	1	24.0, 2.1
CF_T	7	1	21.8, 1.0
CF_I2	6	1	22.3, 1.5
HE_I	20	8	22.0. 1.2
Total	**55**	**10**	

Note.
1. Not all participants who attended the in-class workshops elected for their responses to be analysed in the study.
2. Two focus groups were held with students who took the field trip unit. These were held after the field trip but before the final assessment was due.

Analysis

Descriptive statistics for survey response were analysed to validate the threshold (transformative and challenging) nature of the capability and potential threshold concepts on which it relied, and to determine the factors that students perceived as most supportive and hindering for their experiences of developing the nominated threshold capabilities.

Students' ratings of the influence of factors on their development of the specific threshold capability nominated in the survey for their unit were analysed descriptively. For those factors relevant to all units included in the survey, t-tests were undertaken using SPSS V22™ to compare mean ratings by students who did and did not take their unit in intensive mode.

Findings

Exploratory phase

Students' reports of what they did to overcome thresholds included: practice, undertaking set reading, reflecting, and attending classes. Additionally, and not in previous studies, many students reported sourcing information from outside the unit from peers, family, and especially the internet. Consistent with the previous studies, students reported that interactive class activities, extended informed discussions, real world examples, simulations, practical exercises, guest lectures, site visits, quizzes that motivated them to prepare, learning from peers, asking questions, carefully selected reading, and reflection, supported them in overcoming thresholds. Students valued the opportunity to learn about theory and apply it and ask questions on the same day. In the teaching team interviews, it became clear that many of these supportive factors were only possible or more readily achieved in intensive mode due to the extended class time.

The students reported that personal features that helped their learning included interest in the topic, alignment with values, relevant prior learning or life experience, family support, motivation, and commitment. Factors that hindered students' learning included self-reported laziness in both modes, difficulty reading quickly, misaligned prior learning or interest, tiring in class reported in both modes, and finding interactive activities uncomfortable. Students identified clashes with other classes and lack of accommodation for illness as hindering their learning in intensive mode. Students in one intensive unit also lamented the lack of interaction on the learning management system.

Rationalisation phase

Significantly, when the unit coordinators saw the students' responses they realized that the students' experiences of threshold capabilities were not always as intended by the unit coordinators. In the accounting unit, students identified thresholds related to terminology and presentation of tables, among other thresholds aligned with the coordinators' expectations. Terminology and the presentation of tables were not intended to be challenging. In the units on computational fluid dynamics, the students identified several thresholds related to learning to use the software rather than the transformative learning of using mesh analysis to model fluid flow which the coordinators had intended to be the main learning in the unit. Indeed students were experiencing trouble that they could not readily afford in intensive mode. The unit coordinators of the computational fluid dynamics units had intended that students in computational fluid dynamics would be challenged by thresholds such as the capability to predict regions of variation in fluid flow and thereby design an appropriate mesh to analyse the fluid dynamics. Students were being delayed in tackling and overcoming this challenge, by learning to use the software.

Survey results

Figure 1 presents the comparison between the influence of factors on developing threshold capabilities in intensive and non-intensive modes. Only items that were included in all surveys are included in this graph. In all units, but significantly more so in intensive mode, the opportunity to ask questions and the number of students in the class were rated by students as especially supportive to their development of the nominated threshold capabilities. This result coupled with the discomfort with interactive activities reported by some students, highlights the importance of the teacher(s) establishing an inclusive learning environment.
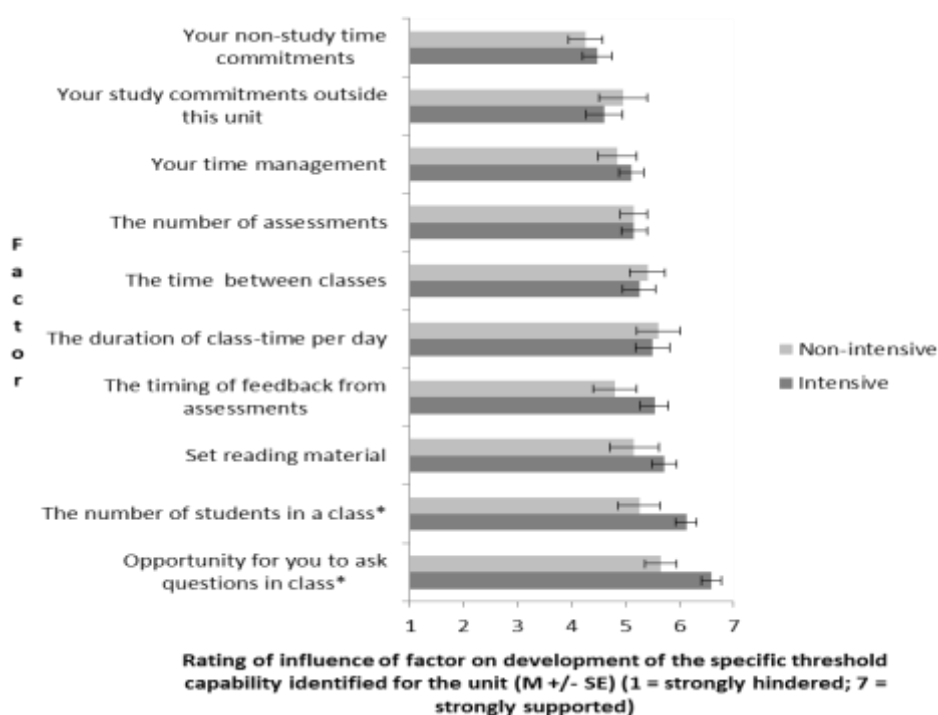
Figure 1: Student ratings of the influence of factors on their development of a main threshold capability in their unit, by mode of study ($N_{intensive} = 35$; $N_{non-intensive} = 20$)

Note.
1. Items are ranked by mean rating by the intensive mode students
2. Only items rated in all surveys are included.
3. * indicates a significant difference between means ($p < 0.05$)

Discussion

We investigated students' learning in units in the disciplines of business and engineering in 2015, and findings were consistent with previous studies. However, we make the additional finding that the opportunity to source information from outside the class using the internet has become a popular factor in students' learning since previous studies.

The survey results demonstrate that the opportunity to ask questions in class is important to students' learning in intensive mode, consistent with previous studies. The results also indicate that factors directly related to the mode alone, such as the schedule, were equally likely to influence students' learning in intensive and traditional modes. As reported in previous studies, the critical benefits of intensive mode lie in the opportunities to support learning through teaching strategies rather than the mode alone.

Value of thresholds framework

The thresholds framework was found to be especially useful in studying students' experiences of learning in intensive mode. The focus on students' experiences of transformative and troublesome learning facilitated identification of differences between the learning intended by academics and that experienced by students. The following were all important to the study.

- The students' experiences of learning in the unit

- The teachers' experiences of teaching in the unit

- The teachers' understanding of which concepts and capabilities are important for further study.

All of the themes identified in the exploratory stage are consistent with supporting students to enter and experience the liminal space during the intensive mode unit. The framework therefore provides a possible explanation for the findings.

Recommendations

We recommend that educators identify the thresholds they hope that students will experience during their intensive mode units. Educators should plan opportunities for students to experience the troublesome features of intended thresholds during intensive mode units. Furthermore, we recommend that educators investigate the students' experiences of thresholds in their units as these may differ from their expectations and teachers may be able to support students to more quickly overcome trouble that is not intended to be central to the unit.

Teaching strategies to ensure that students experience the liminal space are good practice in any mode. However best practice may be even more important in intensive than other modes, and indeed many aspects of best practice teaching are facilitated by the extended continuous class-time available in intensive mode.

Limitations and further studies

The limitations of this study are the range of units and samples sizes in the surveys. The sample sizes are insufficient to compare sub-groups such as male and female or domestic and international students. Further surveys involving larger samples of students and students on offshore campuses will be undertaken. During 2016 a guide will be disseminated at workshops across the sector. Students and academics from all disciplines will be invited to review the guidelines and they will be refined iteratively.

Acknowledgements

References

Baillie, C., Bowden, J. A., & Meyer, J. H. F. (2013). Threshold Capabilities: threshold concepts and knowledge capability linked through variation theory. *Higher Education, 65*(2), 227-246.

Billett, S. (2011). Final Report Curriculum and pedagogic bases for effectively integrating practice-based experiences. Strawberry Hills NSW: Australian Learning and Teaching Council.

Crispin, S., Hancock, P., Male, S. A., Baillie, C., MacNish, C., Leggoe, J., . . . Alam, F. (forthcoming). Threshold capability development in intensive mode business units. *Education & Training, 58*(5). doi: 10.1108/et-02-2016-0033

Davies, W. M. (2006). Intensive teaching formats: A review. *Issues in Educational Research, 16*, 1-18.

Kops, W. J. (2014). Teaching compressed-format courses: Teacher-based best practices. *Canadian Journal of University Continuing Education, 40*(1), 1-18.

Kucsera, J. V., & Zimmaro, D. M. (2010). Comparing the effectiveness of intensive and traditional courses. *College Teaching, 58*(2), 62-68.

Kuiper, A., Solomonides, I., & Hardy, L. (2015). Time on task in intensive modes of delivery. *Distance Education*.

Lee, N., & Horsfall, B. (2010). Accelerated learning: A study of faculty and student experiences. *Innovative Higher Education, 35*(3), 191-202. doi: 10.1007/s10755-010-9141-0

Male, S. A., Baillie, C., MacNish, C., Leggoe, J., Hancock, P., Alam, F., . . . Ranmuthugala, D. (2015). *Student Experiences of Threshold Capability Development in an Engineering Unit with Intensive Mode.* Paper presented at the Australasian Association for Engineering Education Conference, Geelong, Victoria.

Male, S. A., & Baillie, C. A. (2011). *Threshold concept methodology*. Paper presented at the Research in Engineering Education Symposium, Madrid.

Meyer, J. H. F., & Land, R. (2003). Enhancing teaching-learning environments in undergraduate courses, Occasional Report 4 Retrieved from http://www.etl.tla.ed.ac.uk/docs/ETLreport4.pdf

Perkins, D. (2006). Constructivism and troublesome knowledge. In J. H. F. Meyer & R. Land (Eds.), *Overcoming barriers to student understanding: Threshold concepts and troublesome knowledge* (pp. 33-47). London and New York: Routledge.

Scott, P. A. (2003). Attributes of high-quality intensive courses. *New Directions for Adult & Continuing Education,* (97), 29-38. doi: 10.1002/ace.86

Wlodkowski, R. J., & Ginsberg, M. B. (2010). *Teaching intensive and accelerated courses : Instruction that motivates learning* (1st ed.). Hoboken: Wiley.