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CONTEXT: Intensive teaching formats, also known by various synonyms- accelerated, block, time-shortened, compressed, condensed, have been widely used to teach undergraduate engineering subjects both at domestic and, most commonly, at international partner institutions. The durations of these intensive teaching forms also vary- over one or more weeks, over one or more weekends, over several evenings and/or a combination of them. The extent to which the subject delivery is 'intensified' also varies from discipline to discipline, subject to subject, and institution to institution. Even though intensive teaching formats are becoming common place in engineering education, it is still unclear how they impact on student learning, particularly in engineering subjects that require huge amount of mathematical problem solving skills, which usually take a longer period of time and rigorous practice to be developed. This study investigates an important aspect of student learning- how local engineering students perceive the intensive teaching of engineering subjects by international academics. Case study is conducted at an Indian partner institution where a week-long intensive teaching was adopted to teach an undergraduate civil engineering subject by an Australian academic staff.

PURPOSE: This study aims to explore some important research questions- what do local engineering students think of intensive teaching by international academics? Are there any particular issues we need to worry about? Answers to these questions are based on a case study at an Indian institution taught by an Australian academic.

APPROACH: In order to understand what offshore engineering students think of intensive teaching of engineering subjects, this study adopted questionnaire approach to collect original data from students at an Indian institution by asking them about their perceptions through a series of statements. Five-point Likert-scale questionnaire was developed and responses were collected. Both quantitative and qualitative responses were analysed in order to elicit engineering students' perceptions of intensive teaching.

RESULTS: The analysis of the responses showed that the students perceived intensive teaching mode quite favourable as compared with similar experiences in Australia. It might be due to local socio-cultural context such as consequences of bias, social desirability and social acquiescence. Nonetheless, three issues, which were somewhat similar to other experiences elsewhere, were identified. First, students felt that they did not have sufficient time (1 week delivery was too short) to practise and develop problem solving skills in an engineering subject. Second, students found it difficult to concentrate and engage in learning sessions for long hours. Third, it was important to modify learning resources to include local context (standards, data and issues) when taught by an international academic staff.

CONCLUSIONS: This finding highlights the importance of addressing common issues in order to further improve the 'intensive' off-shore delivery of engineering subjects, particularly extending intensive duration, having sufficient breaks in between learning hours, learning resources to include local context (local standards, data, problems, field visits) when taught by off-shore academics and ensuring assessment tasks are appropriate for intensive format.

KEYWORDS: Intensive teaching, engineering subject, offshore, students' perceptions

Introduction

Most engineering schools in Australia schedule their courses/programs in 'traditional' subject/unit delivery formats several times per week, typically for 11 to 14 weeks (trimester or semester or other 'normal' duration). In recent decades, however, there has been an increase in other than 'normal' subject delivery format including intensive course delivery with no significant loss in contents or student contact times (Vreven & McFadden, 2007) due to a number of reasons- changing student demographics and demands; financial constraints and decrease in government funding and globalisation and international standing (Davies, 2006; Scott & Conrad, 1992), to name a few. Intensive learning specifically and adult education in higher education generally has made enormous inroads into higher education because they are money-makers (Wlodkowski & Kasworm, 2003). Non-traditional (part-time, working, matured, demanding, heterogeneous) student cohorts, financial pressure for academic institutions to maintain enrolments by offering alternatives to these non-traditional students by accommodating their schedules, and the necessity of building international educational collaborations and partnerships have resulted in changes in teaching methods as traditional teaching methods are no longer convenient for today's students (Davies, 2006) and they are also resource extensive.

Intensive delivery usually means that, rather than distributing face-to-face or online teaching and learning times in small, even, time-slots throughout the semester or trimester or other 'normal' duration, the equivalent learning times are allocated to very seldom, but for much longer blocks of times. Several synonymous forms and terminologies of intensive teaching formats- accelerated, block, time-shortened, compressed, condensed, immersed, concentrated- have been widely used to teach undergraduate engineering subjects both at domestic and, more commonly, at international partner institutions by Australian academics. Domestically, summer sessions and interim sessions are commonly in practice to fit the time slots between trimesters or semesters. Internationally, intensive teaching to local students at their institutions by an international academic staff is further intensified into just over a week or over few weeks. The durations of these intensive teaching formats also vary- over one or few weeks, over one or more weekends, over several evenings and/or a combination of them. The extent to which the subject delivery is 'intensified' also varies from discipline to discipline, subject to subject, and institution to institution.

Offering courses or units in intensive mode is not new and continue to be a part of the changing higher education landscape at Australian universities. Existing studies, albeit very limited and conflicting, have identified some advantages and disadvantages of intensive teaching formats for students, for teaching staff, for academic institutions and for educational outcomes. They have also suggested some best practice guidelines.

Advantages for students include, among others, flexibility and work/study-life balance; improved time management skills; increased motivation, commitment, concentration, engagement and interaction, rewarding and stimulating; focused, efficient, challenging and enjoyable; and closer relationships among students (Burton & Nesbit, 2002; Daniel, 2000; Grant, 2001; Scott & Conrad, 1992). Advantages for teaching staff include, among others, students tend to prepare better for intensive sessions; better student attendance; integration, concentration and continuity; flexibility and work-life balance; closer relationships with students; satisfaction, motivation and enjoyment; and similar, if not better, in terms of contents and learning outcomes (Burton & Nesbit, 2008; Grant, 2001; Scott & Conrad, 1992). Advantages for academic institutions include increased enrolments, reduced resources and allows for staffing flexibility and guest speakers (Burton & Nesbit, 2002; Grant, 2001). Advantages for educational outcomes include, similar or better student performance compared with 'traditional' format; does not compromise short- and long-term knowledge retention; increased quality of student learning and experience in terms of interaction, commitment and academic performance; and context-sensitive learning that can have

enormously high focus and impact on student learning (Burton & Nesbit, 2002; Faught, Law, & Zahradnik, 2016; Grant, 2001; Scott & Conrad, 1992).

On the other hand, intensive subject delivery has often been criticised as being too intensified 'to produce anything of educational value', reproached for sacrificing breadth, short-shrifting academic standards to accommodate time constraints, and obliging students to cram information at the expense of genuine learning and development (Scott & Conrad, 1992; Slichter, 1927). Many educators, in general, are concerned about learning outcomes (Daniel, 2000). In addition to these perceived disadvantages for educational outcomes, past studies have identified a list of disadvantages of intensive format for students and for teaching staff. Disadvantages for students, among others, include difficulties in switching to new materials without having time to review or reread old materials; difficulties in completing assessments to a high standard due to limited preparation times; less opportunities to meet teaching staff outside classes; excessive workload and information overload in a short period of time; and unsuitable, stressful, overstimulation and difficult for some students, particularly the slow learners (Henebry, 1997; Scott & Conrad, 1992). Disadvantages for teaching staff, among others, include necessity to revise, redevelop and redesign learning outcomes, contents, assessments, resources and activities; limited or decreased opportunity for extensive coverage; increased workload and time pressure- too little preparation time and too rapid assimilation; fatigue or difficulties in maintaining energy; little opportunity to adjust learning materials; difficulties in responding to student feedback on time; and unsuitable for some quantitative and difficult subjects (Burton & Nesbit, 2002; Daniel, 2000; Grant, 2001; Scott & Conrad, 1992).

A considerable amount of the literature on intensive teaching format appears to exist in academic areas where skill acquisition is paramount, rather than discursive, conceptual learning and it may be critical in assessing the value of intensive teaching in various subjects (Davies, 2006). While there is recent significant growth of accelerated degree programs, there is little empirical research regarding the quality and impact of accelerated degrees on adult learning (Kasworm, 2001). The literature in this area is not extensive. Even though intensive teaching formats are becoming common place in engineering education, it is still unclear how they impact on student learning, particularly in engineering subjects that require mathematical problem solving skills, the development of which usually takes a longer period of time and rigorous practice. Several research questions can be asked:

- Do 'intensive teaching' format, intensity, duration, times of the day or week or season make a difference in engineering students' academic performance and achievement?
- Do engineering educators revise, redevelop and redesign learning outcomes, contents, assessments, resources and activities for 'intensive teaching' contexts?
- How and why do engineering educators, institutions and students choose a particular format of 'intensive teaching'?
- What are the factors that impact the quality of 'intensive teaching'?
- How do engineering students perceive and learn in 'intensive teaching' format?
- Do engineering students learn, achieve, reflect and retain knowledge more effectively and efficiently in 'intensive teaching' format?

Unfortunately, existing literature does not fully answer these questions, neither does this study as it is difficult to accommodate all these issues in a single study. However, this study attempts to investigate an important aspect of student learning- how engineering students perceive the 'intensive teaching' of engineering subjects in a particular context. A case study is conducted at an Indian partner institution where a week-long intensive teaching was adopted to teach an undergraduate civil engineering subject 'Road Design & Safety' to local students at their institutions by an Australian academic. The learning outcomes and associated contents of the subject, in brief, included (i) discussion of the linkages between road design and safety, (ii) identification, collection and calculation of road design input parameters, and (iii) design and detailing of road geometric elements based on Australian

experience and design standards. The teaching method adopted was mostly lecture-tutorial based sessions and in-class discussions. At the end of the week, an examination that contained questions of several levels of difficulties was conducted to assess the students' learning achievement.

Study method

As previously discussed, the primary objective of this study is to capture engineering students' perceptions of intensive teaching of engineering subjects in a particular context. Questionnaire was used for eliciting such perceptions. The student learning experience questionnaire was designed using well established literature in Study Process Questionaries (SPQ) (for example, (Biggs, 2011; Biggs, Kember, & Leung, 2001)) that included a range of statements that help capture these perceptions through students' responses. Qualitative data were also collected in addition to quantitative responses.

In total, 59 questionnaires were completed physically in the classroom by the students collected by a non-teaching staff in 2016 representing a response rate of 98.33%. The questionnaire requested respondents to provide their perceptions and opinions about statements related to subject, teaching staff and their own learning as either (1) strongly disagree (2) disagree (3) neutral (4) agree or (5) strongly agree. These statements were derived from several studies (Biggs, 1987, 2011; Biggs et al., 2001; Jenkins, Edwards, Nepal, & Bolton, 2011; Justicia, Pichardo, Cano, Berbén, & De la Fuente, 2008; Kember & Leung, 1998). Unidentifiable background information about the respondents was also collected. These 5-point Likert-type ordered responses were statistically analysed in order to gain insight into the research questions.

Respondents' Profile

The responses collected were from third year Bachelor of civil engineering students at an Indian university. The student cohort were all male students, who were freshly graduated from high school and of 18-21 years of age (only one student was 22 year or older). This profile is something different than the Australian engineering student cohorts. As expected, about 65% of them had Hindi as their first language, about 15% of them indicated English as their first language and remaining 20% spoke Punjabi or other languages. About 70% of them had achieved 50-70% overall percentage marks before this intensive subject.

Data analysis and results

Even though several existing studies have used mean and standard deviation to describe ordinal scale data, the most appropriate way of analysing them is through median, mode, range and percentiles as discussed in the following sub-sections.

Quantitative analysis of the students' perceptions of the intensive Subject

The resulting descriptive statistics (median, mode, range and percent difference) of the responses relating to students' perceptions of the intensive subject are summarised in Table 1. Both median and mode scores vary from 4 to 5 and the ranges are 1-2. The small ranges indicate that students' responses are consistent. It is interesting to see that scores of the statements relating to assessment (exam) are slightly lower than other statements. It may indicate that the assessments (exams) were not properly designed to suit intensive learning environment or students got very limited time to prepare for assessments (exams).

Table 1: Descriptive statistics of students' perceptions on the subject

Study Process Questionnaire (SPQ) Statements	Median	Mode	Range		Percent Difference (Strongly Agree/Agree MINUS Disagree/Strongly Disagree)
			Max.	Min.	
1. The Subject was designed appropriately to cover safety and road design details	5	5	5	3	96.6%
2. The Subject was structured well at the level suitable for students	4	4	5	2	87.9%
3. All contents offered in this Subject were of significant importance for working as a professional road designer	5	5	5	3	91.3%
4. The Subject Learning Outcomes (SLOs) in this Subject were clearly identified	4	4	5	3	92.9%
5. The quality of teaching in this Subject helped me to achieve the Subject Learning Outcomes (SLOs)	5	5	5	3	93.0%
6. Assessment (exam) of the Subject was appropriate and fair	4	4	5	2	73.7%
7. Overall, I am satisfied with this Subject	4	4	5	3	93.1%

Quantitative analysis of the students' perceptions of teaching staff

The descriptive statistics (median, mode, range and percent difference) of the responses relating to students' perceptions of teaching staff are summarised in Table 2. Both median and mode scores vary from 4 to 5 and the ranges are 1-2. The small ranges indicate that students' responses are consistent. All scores were similar. There are no significant outliers.

Table 2: Descriptive statistics of students' perceptions of teaching staff

Study Process Questionnaire (SPQ) Statements	Median	Mode	Range		Percent Difference (Strongly Agree/Agree MINUS Disagree/Strongly Disagree)
			Max.	Min.	
8. Teaching staff had expert content knowledge of the Subject	5	5	5	4	100.0%
9. Teaching staff had appropriate teaching skills	5	4	5	3	98.3%
10. Teaching staff was able to relate the contents with applications	5	5	5	3	94.8%
11. Teaching staff had strong beliefs, values, motives, attitudes and expectations in teaching and learning	5	4	5	3	96.5%
12. Overall, I am satisfied with the teaching staff	5	5	5	3	96.5%
13. Overall, rate your satisfaction with this Subject	4	4	5	1	96.6%

Qualitative analysis of the responses

In addition to the quantitative responses, qualitative responses were also collected. Respondents were asked to provide experiences in relation to (i) the best aspects of the subject, and (ii) aspects of the subject in need of improvement. These qualitative responses were closely scrutinised. Some examples of the responses are provided below:

Some examples of good aspects:

"Learnt about road safety and design."

"… increased our knowledge of road safety and design."

"The importance of the topic in India. We should train ourselves for this."

"Strong practical approach and excellent teaching."

"… provides us with exposure of types of teaching in other countries."

Aspects in need of improvement:

"Standards were needed Indian"

"Indian system of roadways was not explained in detail."

"… if students get practical knowledge, i.e., by taking them to road construction site…"

"There should be a site visit of the roads which we are studying to design".

"Duration of the course should be more."

"I think doing 7 hours of the subject in a day was a little boring".

"Needed more time"

"Numerical type of problems needed more time to practice."

"This subject is too short. It should last for at least 2-3 weeks, so that we can learn…"

"Too much contents for a week to learn and do a test"

A few important observations can be made from these qualitative responses. First, majority of these responses are related to learning 'contents' rather than learning 'process' and 'outcomes'. This observation is expected in an Indian learning context as content-focused learning at Indian academic institutions are widely known. Second, even though students appreciated the quality of subject and teaching staff, they felt that the intensive delivery of the subject was not adequate for them particularly due to long hours of delivery, limited time to practise numerical problems, lack of field visits for practical knowledge and learning resources not being modified to include local contexts. Most of these issues are associated with the limited time availability for the subject. Hence, one week of intensive delivery may not be sufficient for engineering design subjects.

Conclusion

This study adopted a questionnaire approach to collect original data through a range of statements that help explore the students' perceptions of intensive delivery of an engineering subject. The computed quantitative statistics show that the students evaluated quite favourably the subject and the teaching staff as compared with similar Australian context. The analysis of qualitative data reveals four important issues to be addressed. First, students felt that they did not have sufficient time (1 week delivery was too short!) to practise and develop problem solving skills in an engineering subject. Second, students found it difficult to concentrate and engage in classroom environments for long hours. Third, it was important to modify learning resources by including local contexts (local standards, data and problems) when taught by international academics. Fourth, students indicated that the assessment was somewhat not appropriate. Future studies can be extended to students' academic performance and achievement, factors that impact the quality of learning and learning process in intensive delivery and other research questions listed on Page 3 of this paper.

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