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By Martin Roberts, Tony O'brien, Dafydd Mali & Jayne Reville

Sheffield Hallam University

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This study examines the effects of a transition over four years on 2,612 students at a UK university, changing teaching methods from a year-long (two semesters) method of teaching to a more compressed US-style of only one semester long module method.

The main findings are that overall pass rates stay approximately the same but there is concern that the number of awards at a first class and upper second level has been diminished. This is potentially due to the students not having the time to assimilate the course-material, develop a deeper learning and understanding of the course materials.

Keywords: *semesters, modules, undergraduates.*

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Martin Roberts [α], Tony O'brien [σ], Dafydd Mali [ρ] & Jayne Reville [ω]

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I. Introduction

The purpose of this study is to investigate the effects teaching in a semester format as opposed to the material taught in a year-long module has on student performance. It will analyse and examine whether allowing students less time to study the teaching material on the modular course will lead to students achieving poorer academic results. This study will analyse in excess of six hundred first year undergraduate students a year (over four years) within one of the UK's largest applied universities (in terms of student numbers) who are studying similar modules across a range of business and finance courses during two academic years.

The modules use exactly the same wide ranging summative and formative assessment package comprising of: group presentations, on-line phase tests, analytical investigations, investment decision making, together with a final comprehensive examination, part of which was undertaken this last year using on-line digital technology as an alternative to the traditional paper method. The new academic year has seen a fundamental change in the modules' delivery pattern moving from the more traditional dual-semester model running September to May, to a new more compact single-semester delivery across all courses within the University. Having detailed assessment performance information readily available, this has allowed the researchers enable the University to compare the performance of the two delivery modes across six hundred students a year.

Author α σ ω: Department of Finance, Accounting and Business Systems, Sheffield Hallam University, Sheffield, United Kingdom.
e-mail: martin.roberts@shu.ac.uk
Author ρ: School of Finance and Accounting, University of Nottingham, Nottingham, United Kingdom.

II. Literature Review

a) *The growth of modules and semesters in university pedagogy*

Malik in 2012 identified that teaching materials in modules and semesters was becoming a more and more popular method of delivery amongst universities. This is seen as a popular way for universities to best effective use of their resources to create degree pathways and increase student choice (Osgerby et al. 2018).The phrases "semesterisation" (semesters) and "modularisation" (modules) are widely used in university education across the world. Modularisation means splitting the year into two semesters following the pattern of many North American and European Universities. Different universities can operate different systems but the overall method is that the university divides teaching into standard size units with standard credit allocations. Subject material is taught in compressed modular units (Jessop and Tomas 2017). The most common pattern is one of twelve teaching weeks contained in a fifteen week semester (Harris and Tribe 1995). This style of teaching has also been called "Immersive Teaching" (Burton and Nesbit 2008, Kuscera and Zimmaro 2010, Richmond et al. 2015, Turner et al. 2021). The traditional UK university system is based upon a programme where subject material is taught and is assessed over an entire academic year (Knight 2000). This approach is viewed as inflexible long-winded and out-of-date (Knight and Yorke 2003). The US system is seen as better because as the students can gain credits for passing modules every semester, allowing for administrative flexibility and fitting the modern students' needs for part-time education. It is also claimed that a student can easily change university and even their major if necessary (Bostwick et al. 2018).

b) *The benefits of modules to students*

The initial idea behind using modules was to allow students from all backgrounds and all ages to

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study in higher education (Dejene 2019). It is meant to allow students to be more able to study on a part-time basis and fit family life and other commitments in with studying for a degree (Jessop and Tomas 2017). This flexibility of study patterns is meant to lead to an increase of student choice and create new students markets (Brennan and Taylor 1996). In contrast to the one year long taught courses, modules were associated with delivering knowledge in bite-sized, independent units (Kamakshi 2011). This in turn should enable them to be taught intensively in twelve week segments, in different order and different speeds (French 2015). Therefore discrete modules can be accumulated at a variety of rates by either part-time or full-time study. This will allow students to build up credits at their own pace to obtain a degree or masters in a particular specialisation (Ali et al 2010). Morris went on further to claim that modular teaching moved university offering to become consumer focused. Universities have to respond to demand and offer what the customer (mainly the students and future employers of students) wants rather than be suppliers and delivering what universities want to deliver. This approach is claimed by Malik (2012) to be an outcome-based paradigm. Each module should be self-contained and short in duration (Yoseph and Mekuwanint 2015). Students therefore can move between departments within a university or other universities taking their credits with them (Massoud and Ayoubi 2019). This however means that modules focus on delivering specific core parts of a degree rather than working as a whole towards an overall broader course.

c) Student challenges

It has been claimed that teaching via modules and semesters can better meet the needs of students with improved student focused content and quality. The use of modularization in a curriculum it is claimed that students are at centre of the teaching and learning process (Dejene 2019). Dejenes did have a few words of caution though in that although a modular approach to teaching enables the learner to have control, the student must take greater individual responsibility for learning. A module system demands greater maturity on the part of the learner. Therefore a modular approach may be more appropriate for more mature students. This declaration replicates the findings of an earlier study by Watson (1996) who found that the advantages of teaching in modules and semesters did indeed give flexibility and choice to the student but led to a lack of coherence and misunderstanding in the students as they attempted created their own degrees. One of the key contentious issues is that of time that is needed for the student to become an expert in the material delivered in a modular format. Adopting the current format of semesters leads to compressing all the teaching materials into modules lasting only twelve weeks. From the earliest work of Ebinghaus (1913), there have been a number of studies suggesting that expanding the time over which practice occurs is beneficial to long-term retention (Bjork 1979, Dempster 1989, Cepeda et al. 2006, Thouless 2017). This concept appears to be very robust and the futher experiments that appear in psychology literature should have big implications for the design of future condensed classes and assessments (Rohrer and Pashler 2007, Cepeda 2008). The main implications drawn from this are that students even in a tight twelve week teaching window should be given room to study at their own pace (Kain 2003; Loughran and Berry 2005; Nadeem, 2013), be able to choose to be managers of their own learning (Ali et al. 2010; Adesope and Ahiakwo 2016) and identify their own strengths and weaknesses (Malik 2012).

d) Pedagogic challenges

The teaching in compressed modules can therefore lead to problems. As early as 1973 Goldschmid and Goldschmid suggested in order successfully implement modularisation that modular teaching requires a lot of work from the tutor. Their main concern was the amount of feedback that was required to be given by the tutor in order for the student to be successful whilst on any given course. They deemed the number of immediate and continuous checks needed on a student's learning progression was too much for tutor's to cope with. There were further early warning signs of using a modular system as the UK's HEQC in 1997 reported that "modularity poses considerable challenges to academic practice in defining, measuring, evaluating and verifying academic standards" (page 72). Rich and Scott (1997) developed this further and went on to suggest that whilst popular the motives for adopting by UK higher education institutions in the 1990s were not really clear. Some academics were suspicious of the introduction of modular teaching suggesting the presence of a 'hidden agenda', in which the arrival of modularisation is used as a smoke-screen for more radical change (Morris 2000). The reasons for introducing this new form of teaching was not to serve the best interests of the student but to serve the best interest of ambitious managers, to remove the pressure from regulatory agencies and to copy what other institutions had done in fear of being left behind. Rengel in 2009 noted that for instruction to be successful in enhancing student knowledge over the course of one semester there needed to be a lot of regular individual assessment for each student. This regular assessment as first suggested by Isaksson in 2007 would help students become more motivated towards becoming independent learners. However this takes a tremendous amount of time and effort on behalf of the tutors as the tutor must consider each students individual difference. So the tutor must consider the format, the content and the pace of such assessment to each individual student (Hernandez 2012). To enhance this deep learning this

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continuous assessment must be part of a well-designed module that sets out clear expectations of what is required from the student and what the student can get out of the module (Rushton 2005). There must be a reasonable workload for the student which gives an opportunity for the student to rehearse and practice formative assessment before receiving summative feedback.

Tutors have complained that there is not enough time to create assessments and to monitor students to such an individual extent as previously described (Dejene 2019). There are also complaints that modules cannot deliver the teaching and continuous assessment required to allow the module to be a success due to large class sizes. This has also led to modular curriculums developing assessments that occur in the midway point and at the end of the module. This has drawn criticism from Donnelly and Fitzmaurice (2005) who state that this leaves students with an unacceptable burden of students handing in multiple assignments at these two key points in any semester. There have also been complaints from the students that the work required becomes very similar and that tutors are reluctant to set and mark group assignments as they are difficult to arrange, mark, moderate and provide timely feedback (Hernandez 2012). Entwhistle et al (1992) have noted that students can either take a deep or surface level approach to their studies. Surface learners are concerned with obtaining the right answer and assimilate unaltered pieces of knowledge by means of rote learning. This is not the route that should be taken by university students. They should adopt a more deep-learning approach meaning that they should be concerned with the overall picture, the logic of an argument and questioning the conclusions of others. This approach is meant to make students more versatile and able to answer more hypothetical questions than those students who are merely able to regurgitate facts. It is thought that a successful student is one who adopts a deep learning approach towards their studies (Gibbs 1992). To get the student to adopt this philosophy is down to the design of each course by the tutor. If a course is indeed designed correctly then this will have a good effect on the student's attitudes towards learning which in turn will have a positive effect on the quality of the assessed learning outcomes (Kane et al. 2015).

The opposite of a deep learning approach is a surface learning approach and Gibbs goes on to warn that there are key themes that make students adopt a surface-learning approach. Unfortunately a lot of these themes will resonate with tutors and students who engage with a lot of modules in one semester. They include the lack of opportunity to study a subject in depth due to subject taught in isolation, a large amount of course material crammed into a short space of time, high class-contact time and an assessment timetable and method that can create anxiety. All of this combined in a semester system will reduce the interest in the subject being studied. Perceived learning devolved to simply mastery of the materials in workshops rather than tutorials. Increasingly it is proving difficult to provide rapid and effective feedback. Tutors are regularly reporting that levels of plagiarism are increasing with the individual assignments set. Students are either copying from other students of the same class or copying from students on the same module but in different classes. (Imran and Ayobami, 2011; Witherspoon et al. 2012).

e) Addition to knowledge

There is a fear that superficial learning and fragmentation of knowledge will become the norm amongst students (Entwistle and Preston 2004). Sugrue and Solbrekke (2017) state that due to the Bologna Declaration (1999) universities focusing their teaching more towards vocalisation and the needs of employers has led to less space for students to obtain more foundational, conceptual and theoretical knowledge.

As academic developers, the authors wish the aim of this study to communicate what indeed has happened to the students due to the increasing "massification" of higher education (Sugrue et al. 2018) and at this UK university with students taking modules in short twelve week semesters as opposed to year-long study blocks. This work will add to the significant gap in data and knowledge that is considered to exist between those students taking "long thin" modules versus "short fat" (Burton and Nesbit 2008, Richmond et al. 2015, Turner et al. 2021).

The contribution to knowledge will be that this study will either point to the semester system creating students being surface-learners (Biggs 2003), being just tourists of education (Harland et al. 2015) and not gaining the depth of knowledge of the subject (Jessop and Tomas 2017); Or more importantly this study will demonstrate that the semester system will encourage students to take an interest in their education and help them become better prepared graduates for the workplace (Naidoo and Jamieson 2005).

III. Methodology

The adoption of both modularisation and semesters by this UK University has resulted in shortened teaching periods compared to traditional practice. This study will focus on a module now taught over a 12 week period as opposed to double that over a long-thin module. This module is an introductory module taken by all first year undergraduate students entering the business school who are enrolled on either any business degree or any finance and accounting degree. The modules were entitled "Data Analysis" for those undergraduates who were enrolled on a business degree and "Financial Analysis for Business" for those enrolled on an accounting or finance degree.

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The development of this module from being taught over two semesters to just being taught over one, may raise many questions over the students' learning experience, the teaching experience and the maintenance of academic standards. The data on modularisation, semesters and assessment patterns are taken from the results so far received. This will provide empirical evidence.

The data comprises the student marks for the four academic years and originates from the University's Grade Centre containing the individual grade for each summative and formative assessment undertaken by each student during each academic year. Both modules delivered in either a single or dual semester format, comprised a series of eight 'study blocks' with related lectures and workshop. In addition there are introductory and revision lectures and workshops, plus weekly optional timetabled drop-in sessions. In addition there are weekly on-line optional SAT tests to test the students' learning and appreciation of each topic.

The modules' pedagogy on which this study is based is highly focused on employability. The output of the students is based on their ability to utilise Microsoft Excel. The students have lectures once a week, followed by workshops whereby the students sit at computer terminals (in class sizes of approximately twenty five people) and follow step-by-step guides to create two pieces of output based on sales data of a fictional department store. The methodology mirrors Marriott's (2004) paper in which these modules use a computer-based simulation to allow for spreadsheet modelling in a realistic setting to help enhance the students' experiences and learning.

IV. Initial Analysis and Findings

The data collected and analysed is on the performance of level four (first year undergraduate) students over the course of four academic years. These students are all enrolled on either a business studies course or an accounting course at the business school at a UK university (approximately 600 students per year). The first two years analysis shows the performance of the students who undertook the module on a "Year Long" basis (stretched over two semesters). The last two years show the performance of the students on a "Semester" basis (the same material is now taught over just one semester).

The results at a summary level are as follows:

a) Analysis of All students

Table 1

COMBINED TOTAL								
	Year Long		Year Long		Semester		Semester	
Students	743		658		618		612	
Mark Range:								
<40	94	13.1%	77	12.4%	55	9.3%	70	12.0%
40-50	94	13.1%	70	11.3%	41	6.9%	54	9.2%
50-60	190	26.5%	187	30.2%	122	20.6%	210	35.9%
60-70	231	32.3%	214	34.6%	309	52.3%	208	35.6%
>70	107	14.9%	71	11.5%	64	10.8%	43	7.4%
	716		619		591		585	
Total	743		658		618		612	
Participation	716		619		591		585	
Participation Rate	96.4%		94.1%		95.6%		95.6%	

The chart above shows the total number of students enrolled on course (business students and accounting students), plus the mark range for those that participated in the course and the actual level of participation.

There is a slight reduction in the number of students who passed the module in the first sitting of the module (they must achieve greater than 40%) as it went to a one semester basis, but after reflection and adjustment of the assessment scheme, the results very soon mirror the results of prior year results when taught over both semesters. What is immediately apparent as declining is the number of overall firsts awarded in this collective module reducing from 14.9% awarded a first to only 7.4% achieving a first in the final semester of this study. Retention rates have remained consistent with approximately only 5% of all students not participating in the module.

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b) T-test Results

Table 2

Mark Category	Observations	Average	Mean difference	T-test
>70 Year Long	83	74.11		
>70 Semester	22	71.50	2.61	3.42***
60-69 Year Long	155	65.02		
60-69 Semester	186	63.70	1.33	4.43***
50-59 Year Long	97	55.36		
50-59 Semester	122	56.07	0.71	-1.97*
40-49 Year Long	45	44.60		
40-49 Semester	26	44.70	0.10	0.18
40< Year Long	69	14.74		
40< Semester	40	14.74	0.00	0.00
Total	845			

In Table 2 below, a comparison between student marks obtained either during the module taught over one academic year or just one semester was undertaken using mean difference T-Tests. The results from students obtaining a mark of seventy or higher clearly demonstrate that more students received the better marks when studying the same subject material over a full year. Furthermore, the average score of the students that received those higher marks are greater by 2.61 marks, and are statistically significantly (t value 3.42***).

This did not just apply to the awarding of first, but the results also demonstrate that on average, students in the 60-69 mark category received higher grades by 1.33% (t value 4.43***) when studying over a whole academic year as opposed to one semester. Results also seem to suggest that more students in the semester form of teaching are receiving lower marks. In the 50-59 mark category students in the semester group have statistically significantly lower performance (t value -1.97*).

The results for the lowest categories are not different so it means that the same number of students are either failing or just passing the course no matter the method of delivery. However taken together, the results imply that more of students who studied the same subject material over a year outperformed the student group that studied the material over just one semester.

V. Implications, Discussion and Future Research

This study has attempted to investigate the relationship between student results in relation to switching to a modular curriculum in a semester model. By analysing the assessment data held we have been able to provide relevant information to deliver important insights into the performance debate. As mentioned before this 12 week learning and 3 week assessment model has been adopted from the US university system and does not easily fit into the traditional UK academic year. The short-term nature of semesters creates a very fast pace mode of instruction and limits the time over which the learning process can take place (Thouless 2017).

The defence for this adoption of modules taught over a semester is that is a response to the ever increasing numbers of students who wish to come to university (Ali et al. 2010) and that these modular schemes are popular with students. Ayoubi in 2019 provided results that suggested that UK universities that provide opportunities for students to study modules under a semester experience have a higher number of new student enrolments (both at home and international level)than those UK universities who do not. However as early as 2000, Morris suggested that teaching via the use of modules and semesters has had limited effects on the experiences of both staff and students. Morris even goes to claim that the introduction of modules and semesters have significantly increased costs to universities without the students or the universities achieving any additional benefits in cost savings or increase in student satisfaction.

This study replicates findings both here in the UK (Jessop and Tomas 2017) and across other countries such as India (Knight and Yorke 2003) Australia (Jessop, El Hakim, and Gibbs 2014) and New Zealand (Harland et al. 2015) that assessment on modular degree programmes over short semesters does not help students obtain deep understanding of the subject but rather adopt a surface learning approach (Biggs 2003; Rust 2007). Learning outcomes that have been indicated in the modules should be assessed using applicable and appropriate assessment

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procedures so that the outcomes provide evidence of mastery of the desired learning outcomes. The fundamental principle of assessment in modular program is that the assessment methods should be in accordance with the learning outcomes of the module and should foster a deep approach to learning (Dejene 2019). Student learning takes the idea of what is to be learned from what the teacher desires to teach and directs instruction to what students need to learn. Students to form ideas, take risks, make mistakes, critically think, fix mistakes, and learn how to solve problem from those mistakes. Marriott (2004) suggests that having simulations is vital in enhancing student learning and preventing them from adopting a surface learning approach.

These results have shown that despite the implications from other academics that the semester system is more for promotional gain for some academic leaders or for commercial purposes, rather than the good of the student or indeed the academics delivering the course (Morris 2000), the good news is that modules can be delivered without major detriment to the students' marks, progress or retention. The results from this study have shown that for the students, the retention and the general categorisation of marks have remained on the whole consistent for the students whether delivered as a full academic year (a two semester module) or as a single semester model. The only real concern and one that must be monitored closely is the lack of firsts awarded after the one semester model approach was adopted. The number of first did decrease slightly in the last two semester delivery approach so there may be thoughts as to the general achievement of students.

Whilst modules have become concertinaed in to a single twelve week semester, the number of modules taken at one time has as a consequence been reduced from six to three. Whilst the students have far less time to obtain a deep 'feel' for each module, their spread of their curriculum at any single moment has been halved. It could be argued that a semester delivery could benefit the students in that they are focused upon specific objectives, targets and the delivery of outputs in shorter time spans which potentially replicates to a greater degree the 'real world requirements of business.' It certainly is evidence that counteracts the argument that degree programmes have students being awarded higher level degree classifications (Haggis 2006). The main concern here is that the delivery of the module is fast paced and it has been felt that the students are so time pressured that they do not have the time available to adopt a deep learning approach and adopt a purely surface learning approach. This idea of module being delivered too quickly and too time pressured has been discussed before by Thouless (2017) who suggests that previous and extensive education research has pointed to students needing more time if they are to retain greater knowledge in the subject they are studying. As Gibbs (1992) points out, a student must adopt a deep approach to learning. However if there is every little time to absorb the information then the students will naturally adopt a surface learning approach (Entwhistle et al. 1992). This seems to be the approach taken by the students here. In order to combat it, there is the obvious call to put the module back to being taught over two semesters, but with this being the new approach of this University, there will be little chance for change.

Therefore to overcome this problem, there needs to be another review of the pedagogy. There are calls that there should be smaller class sizes (Hernandez 2012) and that students should be masters of their own learning and progress (Dejene 2019). In this study, the class size is determined by the University and therefore there will not be plans to reduce them. In order for students to become more and more masters of their own studies there already is the ability for the students to self-test their progress through the course with weekly tests, but more should be made of this as one of the best ways for the student to change their approach is to continually assess themselves as to how they are performing (Isaksson 2007). In terms of support we must continue as tutors to be facilitators and guides (Dejene 2019). Whilst the review of the relevant literature has unearthed rich material relating to student performance and it appears that none of the previous studies have investigated this inter-connect area of student development and of comparing and contrasting differing modes of semester module delivery. Therefore further research and input into the international debate from this UK perspective can be seen as being both new and extremely useful. It can be claimed that the intended outcomes described above do attempt to fill a current void in presenting student information in a different way and as a consequence provides relevance to future studies and adds real value to the field of student development and support.

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