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ASSESSABLE CASE BASED ACTIVITIES: TOWARDS STUDENT CENTRED TEACHING IN INFORMATION SYSTEMS

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ABSTRACT

Teaching subjects within a professional degree program involves external stakeholders in accreditation processes. For the accounting accredited subject Modelling Business Decisions external stakeholder preferences for the educational context covers both knowledge and method. General information technology content required by international bodies for professional qualification includes the use of information system tools and techniques and professional skills such as decision modelling. Australian accounting body accreditation guidelines encourage the employment of teaching methods to facilitate the development of generic skills such as self learning. This paper outlines an attempt to reconcile these imperatives within a specific subject by using assessable case based teaching and learning activities.

INTRODUCTION

The scope of knowledge and skills involved in Modelling Business Decisions (CO2815) are software applications, decision modelling and independent learning. General information technology content required for professional qualification by the International Federation of Accountants (IFAC 2003) includes the use of information system tools and techniques (International Education Standard 2) and professional skills such as decision modelling (International Education Standard 3). Australian professional accounting body policy advocates teaching approaches which foster generic skill development in the core curriculum (Anon. 2005, p. 12).

Professional accounting body consideration of generic skills stemmed from efforts to ascertain required competencies. In their international study validating competencies for the Certified General Accountants Association of Canada, Harrison *et al.* (2004, Appendix 2) reported the following relevant to Modelling Business Decisions: a working knowledge of current software used in accounting and finance applications such as spreadsheets and those used in management applications such as databases. Under the problem solving competency they list;

Uses a systematic application to problem solving from identifying the problem to developing and reporting recommendations, comprising of:

- Defines and formulates problems within a clear purpose, frame of reference and scope, and
- Assembles findings and conclusions to form a sound basis for decision making." (2004, Appendix A1)

Their analysis ranks "engages in continuing professional development as a lifelong process" as 12th most important (of 147 competency statements).

Sin and Reid (2005) review studies of generic skills and suggest curriculum that focuses on teaching a list of skills is not an appropriate approach. An integrated approach to teaching would encourage deep learning and higher order learning outcomes. Deep learning involves students taking an approach to activities wherein they have an intention to engage meaningfully, use their existing knowledge and to work conceptually to construct understanding (Biggs 2003, p. 16). Encouraging surface learning rather than deep learning is a problem in accredited accounting degrees (Booth *et al*. 1999). A learner-

centred approach will likely result in higher order learning outcomes and the acquisition of generic skills relevant to professional practice.

The traditional approach to teaching in accounting education is teacher centric. Adler *et al*. (2000) report that learner-centred approaches have not been significantly adopted by most accounting educators. A teacher focussed approach is viewing the teaching role as one of information transfer whereas student focussed teaching is viewing the role of instructor as facilitating conceptual change (Trigwell and Prosser, 2004). Explaining approach to teaching is best illustrated by statements in the teaching approach inventory (survey). Particularly those elements of teaching approach which changed most after teaching development interventions. From Prosser *et al.* (2006, p. 49) teacher focussed is, "Students should focus their study on what I provide them", in contrast to, "I encourage students to restructure their existing knowledge in terms of new ways of thinking about the subject that they will develop" and "..helping students develop new ways of thinking in this subject." This paper evolved from the educator's tussle with apparent learning outcomes from teacher-centric practices.

Prebble *et al.* synthesise the literature on teaching and learning concerning the links between student learning and teaching, including; students adopt a learning strategy depending upon the learning environment (2005, p.21, citing Ramsden, 1992), a deep learning approach tends to lead to higher quality learning outcomes (2005, p. 21 citing Marton and Saljo, 1977, Prosser and Miller, 1989, Ramsden, 1992, and Trigwell and Prosser, 1991), and changes in teachers' approaches to teaching may require changes in how they experience or conceptualise teaching (2005, p. 22, citing Trigwell and Prosser, 1996). The link between teaching conceptions and approach to teaching is established by Prosser et al (2005), Kember and Kwan (2000) and Leveson (2004). Leveson's (2004) categories for both conceptions and approaches are used to illustrate how case based teaching activities as assessment moves beyond traditional methods in accounting education.

A student centred approach focuses on learning experiences and aims to develop student understanding and conception of situations. Implementation will vary by subject. The teaching approach in Modelling Business Decisions (CO2815), an accredited core subject at second level, involves assessable case based teaching and learning activities to develop decision modelling skills. This innovation represents a small but significant shift from teacher centred to student centred approach to teaching.

The disciplinary basis of the subject as context for the framing of the teaching and learning activities highlights the influence on pedagogy, and is discussed next. Then the cases as teaching and learning activities and the assessment components are outlined. Finally, instructor comments on the alignment between assessment and learning objectives are offered along with some student feedback.

INFORMATION SYSTEMS AND DECISION SUPPORT THEORY

In the process of negotiating the development of a new subject, the opportunity arose to incorporate design characteristics with the potential to enhance deep learning opportunities. Ramsden (1992) identified structure and assessment as key components of subject design. The interplay between structure and assessment can include integration of teaching and learning activities with assessment. Integrating teaching and learning activities and assessment using case studies can lead to opportunities for deep learning approaches. Boyce *et al.* (2001) suggest that case studies may provide a vehicle for the development of deep learning approaches.

The content of Modelling Business Decisions (CO2815:03) involves creating business intelligence and aims for students to be able to build useful and error free computer-based decision models for simple to moderately complex business problems. The subject's theoretical foundation lies in decision support systems (DSS). This subject provides students with decision support theory and modelling skills that can be applied to develop models to support decision-making and understand intelligence emerging from expanding organisational information resources (JCU Courses and Subjects Database, CO2815 2004 Semester 1).

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Modelling Business Decisions covers planned, structured decision making in a business context, including both knowledge about the process of problem solving and the use of appropriate software. The aim of this subject is to give students the theory and practice necessary to be able to apply the systems development life cycle problem solving process to create a decision support system for moderately complex business decisions. Key to learning in this context is the ability to approach a problem in a structured way (conceptual knowledge). Given the focus on knowledge of problem solving as a process, Faculty Teaching and Learning staff suggested investigating the problem based learning approach. The problem based approach was explored and the implications of assigning marks to case based work in a staged setting was discussed.

Case study problems were broken into a series of stages, consistent with the system development life cycle, which students would work through culminating in formulation of a DSS for a realistic problem. The key feature of a problem based learning approach, group mediation of learning, could be incorporated after individual work on each stage. Group mediation is interpreted as students actively participating in tasks which uncover misunderstandings and exploring alternative conceptions by interacting with fellow learners. The problems would provide a clear link between assessment items and learning objectives. Using this approach would integrate the teaching and learning activities with assignments emphasising learning the process of modelling. Potentially constructively aligning student activities, assessment and desired learning outcomes.

The subject structure to support the use of a modified problem based learning approach included covering the conceptual framework for decision support systems as the first module. The first module would be delivered via the traditional lecture tutorial format, with early assessment by way of an invigilated summative test. During the first module students would also develop software skills. The aim of this activity was to establish a base level of proficiency. The second and third module would cover decision support systems using software applications. These later modules would employ the modified case based approach.

Milne and McConnell (2001, p. 67) outline Barrows (1986) taxonomy of problem based learning. According to that structure, these activities are a modified-case based approach, which involves case material where students investigate several alternatives. Such investigation is framed by the organisation of the case. Group work was used to mediate learning in discussion of alternatives and negotiation of the optimal solution. Ahlfeldt *et al.* (2005, p.16) suggest that student participation in groups leads to richer learning.

ASSESSABLE TEACHING AND LEARNING ACTIVITIES

The case based activities were designed to encourage and enable students to reflect upon and evaluate their own and each other's work critically. Each assignment was divided into a number of stages moving the student through scoping, specifying, designing and implementing a decision support model. Small groups were formed for each assignment. These groups were initially used to discuss the problem and start to unpack the elements. Students were then directed to complete a summative assessment task individually. At the end of each task small groups were then used to mediate student understanding of the problem. The aim was for each group to reach consensus on a satisfactory answer and several groups would present their answers to the whole group for evaluation. The group process should have enabled individuals to identify misunderstandings and errors. Students would then proceed to the next task, and the process continues until a solution is implemented.

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An example of the individual and group tasks associated with each assignment is detailed below.

Task Detail (Assignment 2, 2006)

1. In small groups discuss understanding of case material. Identify:
   - the objective of the model
   - and clarify ambiguities
   - and state any assumptions that you need to make
   - the intended users of the model
   - limitations of the model
   - the various scenarios outlined in the case description.

   When: Lecture 8.
   Weight: nil

2. Individually complete scope and specification.
   When to do: Own time
   Weight: 8%
   Due: *The following week, before the lecture*

3. In small groups
   - Review scope and specification completed by individual group members.
   - Reach consensus on a viable Scope and Specification for implementation.
   - Report back to whole group.

   When: Lecture 9.
   Weight: 5% peer assessed participation mark for group contribution
   Due: At the end of Lecture 9.
   Submit: Peer assessment form (which will be given to each group to complete)

4. Individually implement the model using EXCEL. Which warehouse combination provides the best financial outcome for Fun Phones given (1) an unchanging economy, and (2) an inflated economy. Support your recommendation – include this discussion as a separate worksheet?
   You must submit an Excel spreadsheet that includes:
   - A financial analysis of the various warehouse combinations for each economic scenario
   - A discussion of the financial analysis and your recommendation to management.

   Your answer should include several worksheets. The first worksheet should be an assignment coversheet. Another worksheet should summarise your findings and recommendations. Other worksheets should be developed in accordance with the spreadsheet development best practice principles.
   When to do: Own time
   Weight: 12%

The spreadsheet cases were drawn from Brady and Monk (2005) (*Problem-solving Cases in Microsoft® Access and Excel)*. In the 2006 offering the summative components were; model design and function (assignment 1, weighted at 10%), scope and specification (assignment 2, weighted at 8%), model design and function (assignment 2, weighted at 12%), specification (assignment 3, weighted at 5%) and model function (assignment 3, weighted at 10%). These assignments were used as teaching and learning activities spread over two or three weeks of the teaching period each. The role of the instructor in the case section of the course was to facilitate learning, to encourage students to venture alternative answers and explore elements of problems and their relationships. The teaching and learning activities culminated in a decision support system for a realistic business problem.

The two spreadsheet representations of a business problem (below) indicate the software skills required; types of MS Excel functionality and familiarity to successfully engage in problem solving.

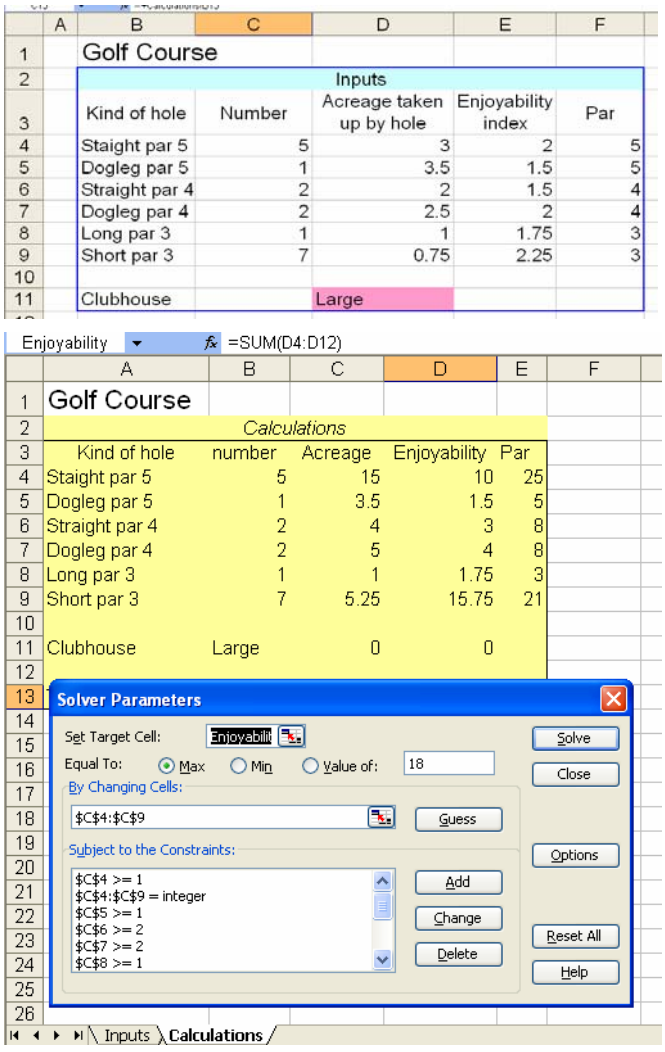
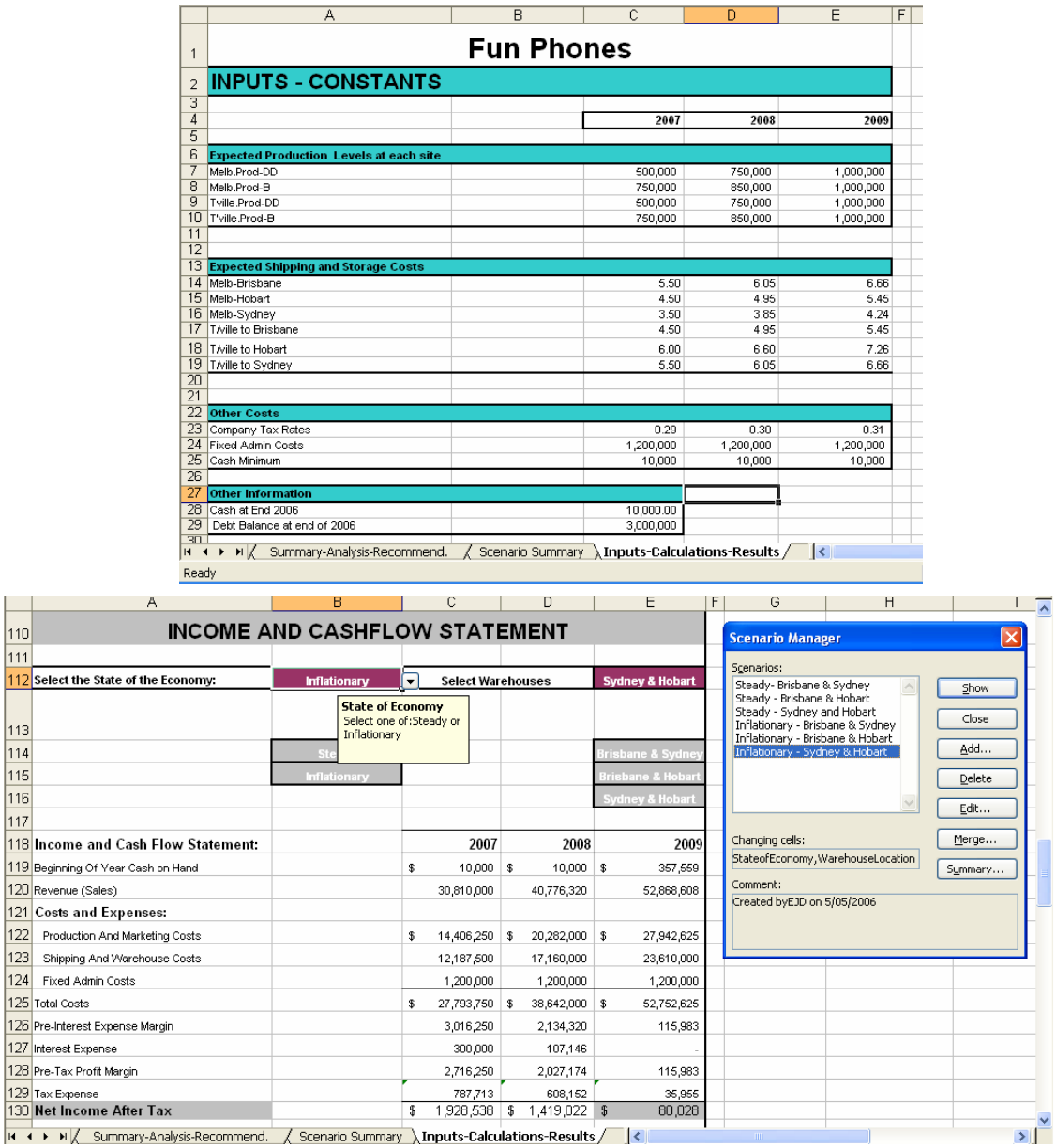


Figure I: First example of a spreadsheet model (assignment 1 2005)

This assignment involved the modelling of a solution to designing a golf course subject to various constraints. In the top part of this figure the inputs and data are laid out. The coloured background cell D11 is used to highlight a key input which distinguishes between two alternate values representing either a standard size clubhouse or the incorporation of a conference venue.

In the lower part of the figure, the computational elements are carried out, referring to the cells above in formulae. This illustrates the separation of inputs from calculations.



		2007	2008	2009
1	**Fun Phones**			
2	**INPUTS - CONSTANTS**			
4		2007	2008	2009
6	**Expected Production Levels at each site**			
7	Melb.Prod-DD	500,000	750,000	1,000,000
8	Melb.Prod-B	750,000	850,000	1,000,000
9	Tville.Prod-DD	500,000	750,000	1,000,000
10	Tville.Prod-B	750,000	850,000	1,000,000
13	**Expected Shipping and Storage Costs**			
14	Melb-Brisbane	5.50	6.05	6.66
15	Melb-Hobart	4.50	4.95	5.45
16	Melb-Sydney	3.50	3.85	4.24
17	Tville to Brisbane	4.50	4.95	5.45
18	Tville to Hobart	6.00	6.60	7.26
19	Tville to Sydney	5.50	6.05	6.66
22	**Other Costs**			
23	Company Tax Rates	0.29	0.30	0.31
24	Fixed Admin Costs	1,200,000	1,200,000	1,200,000
25	Cash Minimum	10,000	10,000	10,000
27	**Other Information**			
28	Cash at End 2006	10,000.00		
29	Debt Balance at end of 2006	3,000,000		

Summary-Analysis-Recommend. | Scenario Summary | Inputs-Calculations-Results

Ready

		2007	2008	2009
110	**INCOME AND CASHFLOW STATEMENT**			
112	**Select the State of the Economy:**	Inflationary	Select Warehouses	Sydney & Hobart
118	**Income and Cash Flow Statement:**	2007	2008	2009
119	Beginning Of Year Cash on Hand	$ 10,000	$ 10,000	$ 357,559
120	Revenue (Sales)	30,810,000	40,776,320	52,868,608
121	**Costs and Expenses:**			
122	Production And Marketing Costs	$ 14,406,250	$ 20,282,000	$ 27,942,625
123	Shipping And Warehouse Costs	12,187,500	17,160,000	23,610,000
124	Fixed Admin Costs	1,200,000	1,200,000	1,200,000
125	Total Costs	$ 27,793,750	$ 38,642,000	$ 52,752,625
126	Pre-Interest Expense Margin	3,016,250	2,134,320	115,983
127	Interest Expense	300,000	107,146	-
128	Pre-Tax Profit Margin	2,716,250	2,027,174	115,983
129	Tax Expense	787,713	608,152	35,955
130	**Net Income After Tax**	$ 1,928,538	$ 1,419,022	$ 80,028

State of Economy
Select one of:Steady or Inflationary

Brisbane & Sydney
Brisbane & Hobart
Sydney & Hobart

Scenario Manager
Scenarios:
Steady- Brisbane & Sydney
Steady - Brisbane & Hobart
Steady - Sydney and Hobart
Inflationary - Brisbane & Sydney
Inflationary - Brisbane & Hobart
Inflationary - Sydney & Hobart
Show
Close
Add...
Delete
Edit...
Merge...
Summary...
Changing cells:
StateofEconomy,WarehouseLocation
Comment:
Created byEJD on 5/05/2006

Summary-Analysis-Recommend. | Scenario Summary | Inputs-Calculations-Results

Figure 2: Second example of a spreadsheet model (assignment 2 2006)

This assignment involves a more complex model. With more complex models efficient design requires disciplined attention to process before detailing perhaps familiar computational elements (the income statement). Students struggle with paying sufficient attention to process when faced with larger problems.

> "I initially found it difficult to follow the SDLC ... as I tended to want to jump in and start designing the model in Excel before undertaking the steps previously discussed. As a result I wasted a lot of time and effort in attempting to model something that I did not understand." (Student, 2005)

Assignment 2 student submission used with permission

To illustrate one way in which students face conceptual challenges, is to recognise that the efficient solution does not involve six spreadsheets of the income statement, but rather one sheet with two variables that can be changed (see the area B112 . E116 in figure II).

A range of strategies were employed to enhance deep learning and make learning more stimulating and challenging. Students had the opportunity to learn from seeing how other students approached solving the problems. Students developed both individual initiative in completing tasks and co-operative skills as they shared understanding of stages. Students should receive adequate and timely feedback on their progress towards achieving desired learning outcomes.

INSTRUCTOR COMMENTS

In order to consider whether or not using these activities could indicate an approach to teaching, the educator's conception of teaching (also called understanding of subject matter) as noted in Kember and Kwan (2000), Leveson (2004) and Prosser *et al.* (2005) is explored. These three papers hold the lower orders of conception as being focussed on the knowledge involved. There is also agreement about the higher orders of conception as being about facilitating learning. In Modelling Business Decisions the three cases were developed to encourage learning by doing, engaging students in the process of learning by requiring involvement. However this does not mesh clearly with Kember and Kwan's study which elucidates higher order conceptions as meeting student's learning needs or personal intellectual development (2000, p 483-484). The cases specifically target the development of concepts, through engaging in the process of modelling three times. This indicates a conception of learning at about the mid-point of Leveson's scale (2004, p. 536). Requiring activities which focus on concepts but as a coherent whole seems to fit in the mid-point of Prosser *et al.*'s experiences of understanding (2005, p. 142).

The studies in Kember and Kwan (2000), Leveson (2004) and Prosser *et al.* (2005) also explicated teaching approach (also called experience of teaching and learning). Here the scales ranged from content-centred / educator-centred / teacher-focused to learning-centered / student-initiated / student-focused. Kember and Kwan note six indicators covering motivation and strategy. The structure of the case approach indicates a mix of tendencies, but overall neither favouring one nor the other of the ends of the spectrum (2000, p. 476). The case based teaching activities seek to allow students to experience problem solving and modelling decisions. This fits with a category C approach in Leveson's table 3 (2004, p. 539). The approach seeks to help students to acquire the concepts of the syllabus, thus matching with experience C in Prosser *et al.*'s experience of teaching and learning scale, involving student activity (2005, p. 143).

The stated desired learning outcomes for the subject include the ability to conceptualise modelling as a process and the ability to design, build and test models to support decisions. Boyce *et al.* develop a list of strategies to reinforce deep learning (2001, p. 52, Table 2). That framework is used to consider whether the stated learning objectives for this subject were consistent with assessment design to provide an opportunity for deep learning.

- Tailored questions – Formative and summative assessment tasks on both process and content were delineated on the basis of modelling life cycle steps. Learner activities included focussing on

the analytical method. The process of solving problems was also used to explicitly address practical modelling skills.

- Providing clear objectives – We elaborated upon a range of student responsibilities of and explicitly required active participation. The detail of the tasks provided students with individual and group duties.
- Interactive classroom – Active and interactive methods to enhance cooperation and participation were employed through small group and larger group student led facilitated discussions in case based teaching and learning tasks.
- Peer teaching – Students teaching each other also featured in the assessment structure. Opportunities for students to discuss individual work and approaches to model construction were provided. Student interactions were structured using group work so that their learning was based on the learning of all members experiences, not just their own thus proving a richer learning experience (Ahlfeldt *et al.* 2005, p. 9).

On the basis that the case based teaching and learning activities indicate a less information focussed conception of teaching, a less educator-centred teaching approach and develops elements of deep learning, there is prospect for moving away from educator centred teaching approaches.

Learner narratives from the 2005 offering included common responses such as: *things students liked;* the importance of the subject matter, no final examination and learning how to use Excel; *dislikes;* the frequency of assessable components, and difficulty in determining outputs from assignment information. Student feedback from the 2006 offering (response rate of 25.16%) including;

- How well did the two excel assignments fit with the objectives and content of the subject? (1 = not well, 2= not that well, 3 = average, 4, quite well, 5 = very well) Mean = 3.74, SD = 0.10.
- To what extent has completing assignments in stages helped you to develop your problem solving ability? (1= completely unsuccessful, 2 = not really successful, 3 = acceptable, 4 = more than acceptable skill improvement, 5 = excellent skill improvement) Mean = 3.21, SD = 0.22.

Common responses to things students liked in 2006 included; learning how to use Excel and interacting with other students. Common dislikes included; the way it was taught and lack of direction as far as assignment material expectations.

CONCLUSION

This case study demonstrates the application of assessable case based teaching and learning activities in an information systems core subject available in semester mode to on-campus accounting students at a regional university. The subject spans information system software, decision modelling knowledge and generic skill development. To move away from traditional teaching modes a less educator-centred approach was used to structure teaching and learning activities, aiming for constructive alignment with learning objectives through formative and summative assessment components. Where educators may feel constrained by external accreditation processes, using a teaching approach emphasising generic skills such as self learning can help to reconcile educative and professional objectives. This example demonstrates an important thinking point for accounting educators.

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