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A DISJOINTED INCREMENTAL DISCOURSE TO VISUALISE ASSURANCE OF LEARNING

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

Discipline of Accounting
Business School
University of Sydney

Cameron Esslemont

2014
“This delivering of knowledge in distinct and disjointed aphorisms doth leave the wit of man more free to turn and toss and to make use of that which is so delivered to more several purposes and applications”

Francis Bacon, Sr. Lawyer and Philosopher 1561-1626
Acknowledgements

I would like to express my special appreciation and thanks to my supervisors Professor Sandra van der Laan and Professor Graeme Dean who have mentored me through this journey, encouraging my research and for allowing me to embed myself in their teaching sessions as we collected and analysed the data.

I would also like to thank Professor Frank Clarke for his much appreciated, insightful comments.

Finally, a special thanks to my family especially my wife Sarah who will be glad that it is finally completed.
Statement of Originality

This is to certify that to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

Signed: _________________________
Cameron Booth Esslemont

Dated: 18 October 2014
Synopsis

Many higher education institutions throughout the world have embraced the Association to Advance Collegiate Schools of Business (AACSB) International accreditation process requiring the systematic collection of data about student learning, its review, and subsequent use to continuously develop and improve the institutions’ degree programs. A major focus of the AACSB is the accreditation process, a comprehensive review of an educational institution’s mission, faculty qualifications, and curricula. Accreditation ensures that students are learning material most relevant to their field of study, preparing them to be effective leaders upon graduation.

One of the major elements of AACSB accreditation is the requirement to implement a process to validate Assurance of Learning. Standards in respect of Assurance of Learning have been formulated. They support the principles of accreditation, accountability and continuous improvement. The evaluation of Assurance of Learning takes place at the program level, where learning goals reflecting a range of educational expectations and major intellectual and behavioural competencies are stated and assessed. Learning goals which “derive from and are consonant with the school’s mission, expected outcomes, and strategies” (AACSB | n.d.)¹ are, by necessity, very broad statements and not suitable for assessment purposes. These broad statements require translation into one or more learning objectives which describe a measurable attribute of the learning goal. Each learning objective then needs to have a well-defined assessment instrument associated with it to allow the evaluation of students, thus providing validation of Assurance of Learning.

This primary focus of the AACSB on curriculum management invokes a slightly different emphasis to a layman’s interpretation of Assurance of Learning. Indeed it could perhaps be better termed assurance of the opportunity to learn, given that

the mere statement and attainment of learning goals at a program level cannot in itself validate learning. There are perhaps additional aspects to Assurance of Learning worthy of consideration in an expanded validation process including: validation of teaching proficiency; and validation of cognitive progression and retention. This broader process for satisfying Assurance of Learning undergirds the analysis in this study. It is demonstrated that Assurance of Learning benefits from a dialogic concept mapping process which is shown to provide the visual recording and interpretation of changes in a student’s knowledge space. This change reflects cognitive progression and retention within a Unit of Study, while at the same time providing an opportunity for feedback to support teaching proficiency and curriculum management in a contemporaneous manner.

An opportunity arose to undertake a study at the University of Sydney Business School, within the capstone postgraduate Unit of Study ACCT6007: Contemporary Issues in Auditing. Therein dialogic concept mapping was used to validate Assurance of Learning through the development of an assessment framework and the observation of its practical implementation. In other instances in the extant literature dialogic concept mapping has been shown to be a valid process to facilitate learning and challenge misunderstandings. Here its use was deemed appropriate because it built on previous work undertaken by the researcher, where it had become apparent that the discourse that evolved during the development and assessment of a sequence of student-developed concept maps gave rise to visible positive change in a student’s knowledge space.

This acted as the genesis of what is reported here. In this study a framework in support of the validation of a broader Assurance of Learning process was developed and tested. It integrated the validation of curriculum management through the provision of concept maps of lecture summaries; the validation of teaching proficiency through the comparative analysis of student-developed concept maps against expert maps; and the validation of student cognitive progression and retention through an iterative multi-phased assessment task. In order to ensure focus, the validation process, necessitating a transformational change in a students’ knowledge space, centred on the discipline specific
threshold concepts of ‘auditor independence’ and ‘true and fair view’. The achievement and validation of such a transformational change for what are deemed troublesome concepts in the discipline domain, is acknowledged in the literature as an essential element in the way a student learns and a precursor to further knowledge assimilation in this domain, based on validated prior knowledge.

Design-based research was used as the research methodology as it enabled the establishment of design principles applicable to resolving practical educational problems. Further, it is deemed suitable for complex, innovative tasks, supporting an iterative approach involving a range of prototypes that incrementally meet the research requirements.

The use of the word *disjointed* in the title of this study serves an important purpose, informing the reader that they will find observations intertwined with references to a small but focused corpus of literature, sometimes skimming over in-depth analysis, but always seeking relevance with regard to the main focus of the study. This constant *thought experimentation* throughout the observation phase of the work provides an iterative speculative approach where plausible explanations are sought to reinforce observation.

The study is broken down into four parts.

Part A (Chapters 1 to 3) provides the scope and nature of the study based on experimental work, culminating in issues around constructive alignment relating to the use of Biggs SOLO Taxonomy as a metric to validate learning. Further, it provides the details of the adopted research methodology.

Part B (Chapters 4 to 5) details the evolution of a conceptual framework that informs the development of a tentative *theory* of the phenomena under investigation. Many call this aspect of the research design the *literature review*. But in this case the conceptual framework is not something that is found readily available in the literature. It is developed here using several
disparate theories loosely coupled together, specifically for the particular study.

Part C (Chapter 6) details the refinement of the conceptual framework into a workable framework taking account of limitations in relation to what students could realistically achieve in a single semester in terms of absorbing a dialogic concept mapping process for teaching and learning; and what an instructor could achieve in a single semester in relation to timely feedback to support a learning validation process.

Part D (Chapters 7 to 17) is the core of the study. It entails the observation of a practical framework for the validation of: Assurance of Learning for the current accreditation requirements of AACSB; and also a broader Assurance of Learning process using a dialogic concept mapping process integrating curriculum management, teaching proficiency, and cognitive progression and retention.

In terms of the current definition of Assurance of Learning related to AACSB, curriculum management was validated by reviewing structure and linkage in student-developed concept maps in response to assessment tasks, tied to pre-defined learning objectives.

In terms of the broader definition of Assurance of Learning suggested in this study, curriculum management was validated by reviewing structure and linkage in concept maps of the lecture summaries while teaching proficiency was validated by reviewing structure and linkage of student-developed concept maps when compared to expert maps developed in responses to the assessment tasks. The process uncovered an anomaly observed in student responses to one of the assessment tasks, suggesting an issue with the teaching proficiency or student assimilation of the topic of ‘audit opinion’. As the issue was identified during the Unit of Study steps were taken to correct it contemporaneously. Cognitive progression and retention was validated using a more granular assessment of the quality and appropriateness of the linking phrases in the concept maps provided by students in the third phase of the assessment task. Linking phrases detailed on
expert maps for each assessment task, were classified using Biggs SOLO Taxonomy as prestructural (P), unistructural (U) or multistructural (M). These expert maps were then used in the assessment of linking phrases present in student-developed concept maps. The linking phrases were further assessed for relevance to the discipline of auditing, relevance to the assessment task and for linguistic acceptability. Observation revealed the majority of the linking phrases meeting the expected SOLO classification designated by the domain expert as well as being relevant to the discipline domain of auditing. However, a number of linking phrases proved not relevant to the assessment task and a much larger number were not linguistically acceptable.

In view of the issues uncovered with linguistic acceptability, the data were subjected to further investigation beyond the initial parameters of the study, revealing that the language issue could be related to the cultural and linguistic background of the cohort undertaking the Unit of Study.

However, the opportunity to assess the proposition that English as Second Language and Second Language writers might have been disadvantaged if assessed using the linking phrases in student-developed concept maps was available through the final examination. The final part of the dialogic concept mapping process, the final examination, entailed the optional drawing of a concept map for a subsection of one of the questions. The eighteen maps submitted were compared against a similar number of written submissions randomly selected, looking at concept selection and linkage. This showed that the students who submitted concept maps, on average, achieved a higher score in the question when compared to written responses and a higher score in the overall Unit of Study.

This study contributes to the theory of Assurance of Learning through the proposition of a broader validation process; to the theory of concept mapping through the use of dialogic concept mapping to demonstrate the contemporaneous validation of curriculum management, teaching proficiency and cognitive progression and retention; to the theory of threshold concepts through the visual observation of cognitive progression and retention as demonstrated through
attainment of a more sophisticated understanding and presentation of discipline knowledge; to the practice of assessment in a higher education context by demonstrating how the assessment of linking phrases in student-developed concept maps can be used to validate competence progression and retention using Biggs SOLO Taxonomy to assess sophistication of response and for relevance to discipline, relevance to assessment task and also for linguistic acceptability; to the practice of feedback in a higher education context through the implementation of a dialogic concept mapping process to enhance learning through the contemporaneous rectification of misconceptions; to the literature on English as Second Language and Second Language writers based on the analysis of language use in structured environments; to the literature on design-based research in respect of the implementation of a dialogic concept mapping process to provide support for the rigorous and reflective inquiry required to test and refine innovative learning environments.

This study, developed a unique data set to answer a specific question, has important implications for higher education institutions seeking accreditation with bodies like AACSB who require validation of Assurance of Learning. According to the latest interpretation of AACSB Assurance of Learning Standards (AACSB | 2013), there is a continued focus on validation of Assurance of Learning in the broader context of curriculum management and an adoption, if somewhat muted, of the acceptance of indirect measures. This study challenges the somewhat rigid process of merely aligning validation of Assurance of Learning with curriculum management and posits the question as to the whether educational institutions should expand their implementation of an Assurance of Learning process to contemporaneously assess teaching proficiency, cognitive progression and retention. It also provides insights for higher educational institutions subject to the teaching and assessment of English as Second Language and Second Language writers.
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Definitions

This study contains several terms that might not be familiar to the reader, or uses terms in a manner not previously experienced by the reader.

Table 1: Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated Concept</td>
<td>Concepts provided by the domain expert for use in the assignment but not included in the expert map in this study.</td>
</tr>
<tr>
<td>Assurance of Learning</td>
<td>Assurance of Learning, in the context of this study, refers to the systematic process of collecting data about student learning outcomes, reviewing and using it to continuously develop and improve the School's degree programs as defined by AACSB.</td>
</tr>
<tr>
<td>Biggs SOLO Taxonomy</td>
<td>Structure of Observed Learning Outcome a means of classifying learning outcomes in terms of their complexity.</td>
</tr>
<tr>
<td>Cohort</td>
<td>The group of students working together through the Unit of Study.</td>
</tr>
<tr>
<td>Concept</td>
<td>The study contains references to concepts used in the various concept maps. In order to identify and differentiate these concepts within the study text they have been shown in quotations as such ‘Audit Opinion’.</td>
</tr>
<tr>
<td>Concept Map</td>
<td>A diagram that depicts suggested relationships between concepts, typically through the use of labelled arrows and articulated in linking phrases.</td>
</tr>
<tr>
<td>Concept Mapping</td>
<td>The process of visualising relationships among different...</td>
</tr>
</tbody>
</table>
concepts within a concept map.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum Alignment</td>
<td>Alignment of curriculum materials and assessment with intended learning goals.</td>
</tr>
<tr>
<td>Curriculum Linkage</td>
<td>A concept map used in the study that shows the linkages between concepts found within the same paragraph of the lecture summaries providing an extended form of curriculum mapping.</td>
</tr>
<tr>
<td>Curriculum Management</td>
<td>Processes and organisation for development, design, and implementation of each degree program's structure, organisation, content, assessment of outcomes, pedagogy, etc. (source: AACSB).</td>
</tr>
<tr>
<td>Dialogic Concept Mapping</td>
<td>Facilitation and recording of outcomes of the cognitive processes that underpin personal understanding using concept mapping.</td>
</tr>
<tr>
<td>Discourse Pathway</td>
<td>A defined pathway on the expert maps linking to the header concept to threshold concepts, used as a basis for focusing discussion with students in this study due to time constraints.</td>
</tr>
<tr>
<td>Domain Expert</td>
<td>A specialist (usually the Unit of Study Coordinator) in a specific discipline.</td>
</tr>
<tr>
<td>Expert Map</td>
<td>A concept map created by the domain expert to represent one possible answer to an assignment.</td>
</tr>
<tr>
<td>Header Concept</td>
<td>The top concept in a hierarchical concept map in this study.</td>
</tr>
<tr>
<td>Hypermedia</td>
<td>An environment in which graphics, audio, video, plain text and hyperlinks intertwine to support a non-linear medium of</td>
</tr>
</tbody>
</table>
information presentation.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linkage</td>
<td>The linkage of concepts within a concept map, usually used with structure to provide a metric for assessment in this study.</td>
</tr>
<tr>
<td>Linking Phrase</td>
<td>The phrase used between two concepts within a concept map.</td>
</tr>
<tr>
<td>Linking Verb</td>
<td>The verb used in a linking phrase within a concept map.</td>
</tr>
<tr>
<td>Main Concept</td>
<td>Concepts used in an expert map by the domain specialist in this study.</td>
</tr>
<tr>
<td>Multistructural</td>
<td>A SOLO descriptor used to identify that more than two associated concepts were identified in a linking phrase in this study.</td>
</tr>
<tr>
<td>Ontology</td>
<td>In the context of knowledge sharing: a vocabulary for representing knowledge in a particular domain.</td>
</tr>
<tr>
<td>Other Concept</td>
<td>Other auditing concepts used by students in their assessment tasks which were not on the list provided in the question in this study.</td>
</tr>
<tr>
<td>Phrasal Verb</td>
<td>A verb in combination with a preposition or adverb or both, the meaning of which is different from the meaning of its separate parts.</td>
</tr>
<tr>
<td>Prestructural</td>
<td>A SOLO descriptor used to identify that more than two associated concepts were identified in a linking phrase in this study.</td>
</tr>
<tr>
<td>Program</td>
<td>An academic degree usually awarded in recognition of the recipient having either satisfactorily completed a prescribed course of study comprising several Units of Study or having conducted a scholarly endeavour deemed worthy of his or her admission to the degree.</td>
</tr>
<tr>
<td>Snippet</td>
<td>Part of a concept map used to focus attention. Used to identify expected outcomes of Learning Objectives within this study.</td>
</tr>
<tr>
<td>Structure</td>
<td>The selection of concepts used within a concept map usually used with linkage to provide a metric for assessment in this study.</td>
</tr>
<tr>
<td>Text Analytics</td>
<td>The visual representation of the main concepts contained within the text as well as information about how they are related.</td>
</tr>
<tr>
<td>Threshold Concept</td>
<td>A Concept within the curriculum that is simultaneously particularly fundamental to the discipline and particularly troublesome for students to learn. Used in this study as a focus for validation of Assurance of Learning.</td>
</tr>
<tr>
<td>Unistructural</td>
<td>A SOLO descriptor used to identify that only one associated concept was identified in a linking phrase in this study.</td>
</tr>
<tr>
<td>Unit of Study</td>
<td>A class (subject) in which students enrol and is part of a larger program.</td>
</tr>
<tr>
<td>Visualisation</td>
<td>A mental image similar to a visual perception limited in this study to concept maps.</td>
</tr>
</tbody>
</table>
Abbreviations

Table 2: Abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Abbreviation</th>
</tr>
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<tbody>
<tr>
<td>AACSB</td>
<td>Association to Advance Collegiate Schools of Business</td>
</tr>
<tr>
<td>AC</td>
<td>Associated Concept</td>
</tr>
<tr>
<td>AoL</td>
<td>Assurance of Learning</td>
</tr>
<tr>
<td>ACCT6007</td>
<td>Unit of Study ACCT6007 Contemporary Issues in Auditing</td>
</tr>
<tr>
<td>AQF</td>
<td>Australian Qualifications Framework</td>
</tr>
<tr>
<td>Business School</td>
<td>University of Sydney Business School</td>
</tr>
<tr>
<td>CEA</td>
<td>Course Embedded Assessment</td>
</tr>
<tr>
<td>CF</td>
<td>Conceptual Framework</td>
</tr>
<tr>
<td>CM</td>
<td>Concept Mapping</td>
</tr>
<tr>
<td>CMaps</td>
<td>Software used for concept mapping</td>
</tr>
<tr>
<td>DBR</td>
<td>Design-Based Research</td>
</tr>
<tr>
<td>DCM</td>
<td>Dialogic Concept Mapping</td>
</tr>
<tr>
<td>DP</td>
<td>Discourse Pathway</td>
</tr>
<tr>
<td>EM</td>
<td>Expert Map</td>
</tr>
<tr>
<td>ESL</td>
<td>English as a Second Language</td>
</tr>
<tr>
<td>Faculty</td>
<td>Faculty of Economics and Business</td>
</tr>
<tr>
<td>IELTS</td>
<td>International English Language Testing System</td>
</tr>
<tr>
<td>KST</td>
<td>Knowledge Space Theory</td>
</tr>
<tr>
<td>L2</td>
<td>Second Language Writers (writers in a language other than English)</td>
</tr>
<tr>
<td>LD</td>
<td>Learning Difficulties</td>
</tr>
<tr>
<td>LG</td>
<td>Learning Goal</td>
</tr>
<tr>
<td>LO</td>
<td>Learning Objective</td>
</tr>
<tr>
<td>LSA</td>
<td>Latent Semantic Analysis</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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</tr>
<tr>
<td>MC</td>
<td>Main Concept</td>
</tr>
<tr>
<td>MTE</td>
<td>Mid Term Examination</td>
</tr>
<tr>
<td>NQF</td>
<td>National Qualifications Framework</td>
</tr>
<tr>
<td>OBE</td>
<td>Outcomes Based Education</td>
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<tr>
<td>OC</td>
<td>Other Concept</td>
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<td>OL</td>
<td>Ontology Learning</td>
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<td>PF</td>
<td>Practical Framework</td>
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<tr>
<td>Program</td>
<td>A Degree Program</td>
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<td>SOLO</td>
<td>Biggs SOLO Taxonomy</td>
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<tr>
<td>SOV</td>
<td>Subject – Object – Verb</td>
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<td>SVD</td>
<td>Singular Value Decomposition</td>
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<td>SVO</td>
<td>Subject – Verb - Object</td>
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<td>TC</td>
<td>Threshold Concept</td>
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<td>TB</td>
<td>Theoretical Background</td>
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<td>UsoS</td>
<td>Units of Study</td>
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<td>WF</td>
<td>Workable Framework</td>
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<td>ZPD</td>
<td>Zone of Proximal Development</td>
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PART A: The Study
1. Genesis of the Study

The study evolved from ad hoc work undertaken between 2002 and 2009 in the Discipline of Accounting at the Faculty of Economics and Business (Faculty) at the University of Sydney. In 2010 the Faculty was renamed The University of Sydney Business School (Business School). During 2002 – 2009 several small parallel projects were undertaken examining two disparate but integrated learning processes: knowledge management using personalised digital libraries with e-portfolios and concept mapping (CM) as a form of assessment. The work was undertaken in the capstone Unit of Study (UoS) ACCT6007: Contemporary Issues in Auditing. The UoS is a case-based unit where students’ learning objectives (LOs) are achieved through exposure to auditing issues, within a setting of a profession under constant flux due to companies being in financial stress, with some eventually failing. Initial work associated with e-portfolios related to access and personalisation of relevant data comprising newspaper articles, journal articles and reports which informed the development of e-portfolios. CM was initially used in support of teaching to explain some of the pertinent factors that contribute to audit and corporate failures, and subsequently as an assessment tool requiring students to develop concept maps to explain issues surrounding their understanding of auditing within such a corporate failure environment.

Preliminary findings were documented and presented at various conferences and workshops (see Section: References). van der Laan et al. (2006) sought to draw together and formalise the various theories and ideas developed into a model for constructive alignment (see Figure 1) that:

*seeks to augment the constructive alignment model by explicitly acknowledging the institutional environment, as well as including the important components of response to reporting (for example, feedback triggering suggestions of complementary units) and consideration of external constraints on curriculum from ‘professional’ bodies. (van der Laan et al. | 2006:6)*
The model (Figure 1) commences at the level of the UoS and maps the relationship to themes or broad topics within the curriculum that reinforces learning goals aligned to both the University’s graduate attributes and Faculty attributes. The University attributes were meshed with requirements identified by professional bodies. The Faculty attributes were defined (at that time) by the ‘PRICE’ cluster of [P] Personal and Intellectual Autonomy; [R] Research and Enquiry; [I] Information Literacy; [C] Communication; [E] Ethical, Social and Professional Understanding.

On the other major branch of Figure 1, the relationship between the UoS, and assignments culminated in the use of Biggs’ SOLO Taxonomy descriptors. These were applied as a means of attributing sophistication to student-developed concept maps used to assess LOs and by inference support for Faculty attributes. Timely feedback provided a mechanism for ‘Assessment of Learning’ and
broader support for ePortfolio management through various pathways for learner
development, culminating in a theoretical improvement in student
understanding. This work provided the basis for this study.

1.1. The Opportunity

Many Business Schools have embraced the Association to Advance Collegiate
Schools of Business (AACSB) accreditation model for Assurance of Learning
(AoL). In their 2013 document *AACSB Assurance of Learning Standards: An
Interpretation* (AACSB | 2013), the focus is on curriculum management as a
broad context within which to implement AoL. The document reflects changes to
their 2007 position regarding AoL, allowing institutions a broader use of indirect
measures of assessment to validate AoL but with a caveat that “they are not
acceptable substitutes for direct assessment” (AACSB | 2013:13).

The AoL process requires a clearly articulated set of learning goals (LGs), which
when achieved are a demonstration of learning. Higher education institutions
develop mission statements, which set the stage for degree program (Program)
direction and stress continuous improvement. These are supported by a range of
learning objectives (LOs) indicating how mission statements will be achieved.
The result should be an assessment instrument to measure students’ competencies
providing evidence of student learning at the Unit of Study (UoS) level and when
reported at the Program level are used to validate AoL. Although tightly
monitored, there are many different implementations of the AoL process around
the world. UoS

The Business School has sought to develop well-defined LGs and LOs for all
Programs and the specific UoS ACCT6007: Contemporary Issues in Auditing
(ACCT6007) is identified as one within which AoL would be assessed and
reported. In all, a very comprehensive model which was well documented on the
University web site, in a format that would suggest to a prospective student (were
they to read the material) that by attending the Business School, that they would
be assured learning.
However the fine print on a separate web page (Sydney University | n.d.)\(^2\) reads:

“Assurance of Learning, or outcomes assessment, ensures that our graduates achieve the goals and outcomes we say they will achieve when we advertise our degree programs. Assurance of Learning is a means of holding ourselves accountable to delivering what we say we will deliver to students and employers, as well as a way of supporting the continuous improvement of our degree programs”.

This emphasis of *accountability for delivery* suggests a very different interpretation than most students would have as to the meaning of AoL. It is suggested here that it would perhaps be better termed *‘assurance of the opportunity to learn’*. For the mere statement and subsequent achievement of LGs cannot in itself assure learning. There are, arguably, additional elements to an assessment continuum through the life of a Program and beyond. These include, teaching proficiency, cognitive progression and finally cognitive retention as students use what they have learnt in different settings as they progress along the learning continuum initially within their Program, then their professional life and finally through later life.

Merely validating AoL in the context of curriculum management does not directly cater for the actual learning process. Students’ attainment of new knowledge is based on prior knowledge. However caution is required as this knowledge is often “erroneous, illogical or misinformed; termed alternative conceptions or misconceptions” (Lucarillio | 2011). Alternative conceptions are not unusual; in fact, they are often a norm in respect of the initial learning process. There are many reasons for alternate conceptions impinging on an individual’s learning. Often students are unaware that their knowledge is incorrect which means new knowledge is interpreted through these erroneous understandings. Entrenched misconceptions tend to be resistant to modification through normal instruction (McNeil & Alibali | 2005).

Hence, for difficult concepts in the curriculum where students often initially develop misconceptions, different teaching strategies should be invoked and AoL should not be validated without formal rectification of any underlying issues before introducing new knowledge. This rectification process is not merely achieved by identifying and replacing erroneous student knowledge. The conceptual change or accommodation must be engineered by instructors for revised concepts to be understood and embraced (Posner et al. | 1982).

It is important for instructors to know about the preconceptions of their students because learning depends on and is related to student prior knowledge (Piaget & Inhelder | 1969; Resnick | 1983). Individuals interpret incoming information in terms of their current knowledge and cognitive schema (McLeod | 2009). Learners try to link new information to what they already know (Resnick | 1983). This kind of learning is known as assimilation (Piaget & Inhelder | 1969). When new information is inconsistent with what learners already know it cannot be assimilated. Rather, the learner’s knowledge will have to change or be altered because of this new information and experience. This kind of learning is known as accommodation of knowledge or mental structures (Piaget & Inhelder | 1969).

In the early 1970s, Snyder (1971) found, quite unexpectedly, what influenced students most in their approach to learning was not the teaching but the assessment. Snyder’s work gave birth to the notion of the ‘hidden curriculum’, different from the formal curriculum articulated in Unit of Study documentation, but the one students had to discover and follow if they wanted to succeed. Once students had worked out what compromised this hidden curriculum, they could allocate their effort with great efficiency developing the art of distinguishing between what they needed to address for the assessment as opposed to what was taught in line with the published curriculum. “If you are under a lot of pressure then you will just concentrate on passing the course. I know that from bitter experience. One subject I wasn’t very good at I tried to understand the subject and I failed the exam” (Gibbs et al. | 1992:101).
There are many forms of assessment and students tend to gain higher marks from coursework assignments than they do from examinations (Chansarkar & Raut-Roy | 1987). Students consider coursework to be fairer than examinations, as it affords them the opportunity to present a broader range of their abilities and allows them to organise both their study and response patterns to suit their personal goals (Kniveton | 1996). Gibbs and Simpson (2004) found that examinations are very poor predictors of any subsequent performance but replacing them with more innovative assessment models is sometimes difficult. Qualitative studies have emphasised the importance of understanding the way students respond to innovations in assessment (Sambell & McDowell | 1998).

Within the broader assessment framework, Hattie and Timperley (2007) show clearly that the most powerful single influence on a student’s learning is feedback and Black and William (1998) emphasise the extraordinarily large and consistent positive effects that feedback provides.

From a teaching perspective, staff under enormous time pressure and operating in Business Schools, often with high student staff ratios, find it difficult to provide comprehensive and useful feedback. Hounsell (1987) found that even where feedback was provided it was often not read at all or not understood properly. In this respect Wojtas (1998) reported that feedback was often seen as merely the correction of errors or worse, simply knowledge of results.

To be useful feedback needs to be regular, and based on relatively small chunks of learning content. If students do not receive feedback in a timely manner then they will have moved on to new content and feedback will become irrelevant and unlikely to result in any additional appropriate reflective activity, directed by the feedback. Cooper (2000) reported that feedback for a stage of an assignment provided prior to undertaking subsequent stages of the assignment would enable the student to improve the quality of work for those stages. This was found to be extremely beneficial and was shown to improve almost all students’ performances, but particularly the performance of some of the weaker students. However Sadler (2010) noted that students are likely to need to be taught how to use feedback to develop their meta-cognitive control.
To that end any validation of the AoL process would benefit from a process linking teaching, assessment and feedback through a constant iterative dialogue between students and teaching staff. The usefulness of concept mapping (CM) in curriculum mapping (Ferry et al. | 1988), teaching (Edmondson & Smith | 1996), to enhance understanding (Darmofal et al. | 2002), as scaffolds for cognitive processing (O'Donnell et al. | 2002), learning empowerment (Novak | 2002), assessment (Mintzes et al. | 2000; Novak | 1998), feedback (Novak & Gowin | 1984) and as a form of visualisation (Novak et al. | 2003) has been well documented and will be referred to throughout this study. It is envisaged that teaching, assessment and feedback could be moulded into an iterative assessment process developed on work related to dialogic concept mapping (DCM), as described by Hay (2008). Such a process could then be used to validate a broader representation of AoL. This will be explored in later chapters.

Many of the CM studies detailed throughout this study relate to single mapping instances covering a specific discipline. DCM provides for the visual demonstration and assessment of change in understanding across a continuum. It requires concepts that are introduced and assessed early, to be continually revisited and reassessed to show competence progression and retention. In a previous unpublished study, van der Laan et al. (2005) established that it would be difficult for an instructor to provide suitable and timely feedback on a series of student-developed concepts maps covering large parts of the curriculum within the context of a single UOS. Importantly, Meyer and Land (2006) identified certain concepts in various disciplines as threshold concepts (TCs) in the sense that they need to be mastered before further learning could be undertaken in that discipline. These concepts were akin to a conceptual gateway, requiring the learner to traverse through a liminal space prior to becoming expert in that discipline. The dialogue between instructor and learner related to TCs offers a fresh way of looking at both curriculum management within a discipline (Land et al. | 2005) and validation of learning through assessment (Meyer & Land | 2010; Cousin | 2010).
Fouberg (2012) recognised that the information collected on how students experience and manage TCs could influence pedagogic practices. Therefore the implementation of a dialogic concept mapping process embracing teaching, assessment and feedback that focuses on threshold concepts and is linked to learning objectives could provide a mechanism with which to validate AoL. This provides the foundation for the primary proposition of this study.

**Primary Proposition:**

*The validation of Assurance of Learning as defined by the AACSB and in its broader notion defined in this study would benefit from some form of iterative visualisation. An example is the use of a dialogic concept mapping process focused on threshold concepts providing, through observation, a contemporaneous insight into curriculum management, teaching proficiency and cognitive progression and retention.*

Consequential sub-propositions are included here to relate to the conclusions in chapter 17:

a. The validation of Assurance of Learning through the demonstration of *curriculum management*, using dialogic concept mapping, can be achieved by mapping major areas of the curriculum and ‘curriculum linkages’ to ensure that teaching is both sequenced and undertaken;

b. The validation of Assurance of Learning through the demonstration of *teaching proficiency*, using dialogic concept mapping, can be achieved through the identification of gaps in student’s understanding of threshold concepts and allowing the contemporaneous rectification of any misconceptions; and

c. The validation of Assurance of Learning through the demonstration of *cognitive progression and retention*, using dialogic concept mapping of threshold concepts, can be achieved by the integration of assessment and feedback at the macro and micro level using standard methodology of
structure and linkage as well as enhanced methods using Biggs SOLO taxonomy and enhanced linking phrase analysis.

The above propositions suggest the need for an extensive study managed through design-based research in respect of the implementation of a dialogic concept mapping process. It would provide support for the rigorous and reflective inquiry required to test and refine innovative learning environments including the definition of a conceptual framework, the development of a workable framework and the observation of a practical framework.
2. The Purpose, Scope and Limitations of the Study

2.1. The Purpose of the Study

The purpose of this study is to question the conventional wisdom regarding the validation of the Assurance of Learning (AoL) as currently represented by AACSB. The AoL process was examined through the development and subsequent observation of the implementation of a dialogic concept mapping process to demonstrate curriculum management, teaching proficiency and cognitive progression and retention within an auditing knowledge space focusing on threshold concepts (TCs).

2.1.1. Dialogic Concept Mapping

Dialogic concept mapping is developed primarily from the work of Hay (2008:1) and suggests that: “it is about facilitating and recording the outcomes of the cognitive processes that underpin personal understanding”.

Figure 2: Dialogic Concept Mapping
Source: Retrieved from Hay (2008:1)
This facilitation and recording is managed through a process (see Figure 2) whereby:

*the person that learns is shown in one continuous cycle of dialogue.* Sometimes, this is with an actual person (i.e. a lecturer, teacher or peer as ‘other’), but more often, it is with a text (or textbook), a field of study, a learning community, a professional group or a scientific paradigm. Concept mapping (A–F) is used iteratively to facilitate this dialogue. The act of expressing and concretising personal understanding (speaking/writing) enables comparison with ‘the other’ whether feedback is provided by a teacher, a peer group or the listening/reading self in dialogue with alternative or ‘authorised’ forms of knowledge (Hay 2008:2).

### 2.1.2. Threshold Concepts

The idea of focusing the mapping on threshold concepts is taken from the work of Meyer and Land (2003:1) where they suggest that:

*in comprehending a threshold concept there may thus be a transformed internal view of subject matter, subject landscape, or even world view. This transformation may be sudden or it may be protracted over a considerable period of time, with the transition to understanding proving troublesome.*

However once understood the TC becomes a platform of prior knowledge on which the learner can assimilate new knowledge.

### 2.1.3. Validation of Assurance of Learning

Validation of a broader representation of Assurance of Learning relates to the view that the current focus of the AACSB on curriculum management is too
limiting. It should be expanded to include validation of teaching proficiency, cognitive progression and retention.

2.2. The Scope of the Study

Due to the broad nature of the study it is broken down into four parts comprising:

2.2.1. Part A: The genesis and attributes of the study

Part A recounts some of the developmental work completed prior to commencing this study in July 2009. It formed a basis for the preliminary investigation.

The notion of ‘disjointed’, as used here, does not suggest that the study is not a true chronological representation of the work undertaken but more that the observation process was disjointed and disrupted due to an early decision that theory would follow observation. Then reflection would guide the development of a conceptual framework, pragmatism would advise on the refinement to a working framework and finally observation would occur on the resultant practical framework.

It was not the intention to become immersed in the theory of the use of concept maps in assessment, but to implement a process to demonstrate the use of dialogic concept mapping as a basis for validating Assurance of Learning. There were several practical limitations in that the observation had to be undertaken within an acceptable timeframe, defined as within a Unit of Study over a single semester, while ensuring students were not disadvantaged, nor were there any encroachments on other AoL initiatives employed within the University of Sydney Business School.
2.2.2. Part B: Evolution of a ‘conceptual’ framework

A conceptual framework (CF), that is a system of concepts, assumptions, expectations, beliefs, and theories to support and inform research (Miles & Huberman | 1994), is a key component of the overall design of this study. When brought together these individual components “inform the design; assess and refine goals; develop realistic and relevant research questions; select appropriate methods; and identify potential validity threats to any conclusions” (Miles & Huberman | 1994: 34).

A major part of the CF is the formulation of the research problem, often seen as a key task in overall research design. Many call this aspect of research design the literature review but Maxwell (2006:28) states that “this can be a dangerously misleading term” and it is important not to simply “summarize some body of theoretical or empirical publications”. The CF presented here is not something that is found in the literature but is contemporaneously developed using several disparate complimentary theories loosely coupled together for this exercise.

The genesis of this CF is the result of work completed prior to the formal commencement of the study which was used to develop the preliminary idea for the use of Biggs’ SOLO Taxonomy (SOLO) as a metric to validate Assurance of Learning (AoL) through the use of concept maps in assessment. Miles and Huberman (1994:18) defined a generic CF as a visual or written expression that “explains, either graphically or in narrative form, the main things to be studied—the key factors, concepts, or variables - and the presumed relationships among them”.

The initial theories used to develop the CF are presented as an overview of a broad investigative space. Additionally the various theories identified would need to be restricted within the limits of any critical bounding assumptions of the study as yet not fully understood. In fact, the most productive CFs are often those that integrate different approaches, lines of investigation, or
Theories that no one had previously connected and are usually developed in an integrated manner (Strauss | 1987).

The initial overview of the investigative space, developed as a precursor to the study, was broken down into modules. A dialogic concept mapping (DCM) process was used making explicit ideas about relationships among the different concepts. The concepts were segmented in categories: Learning Approaches and Strategies; Meaningful Learning; Visualising Meaningful Learning; Constructive Alignment and Technology Infrastructure (see Chapter 4). The reader of these concept maps should note that there was no necessity to make the maps too elegant a visual equivalent of what Becker (2007:28) called “classy writing with which you are trying to impress people rather than develop and communicate your actual ideas”.

Having developed the DCM, the foundations of the initial CF emerged from a simple process of building on what was of interest and excluding what was not of interest to the researcher. The resultant, somewhat disjointed, theoretical concepts were then brought together and reassessed to understand what aspects would need to be revisited and where, if any, further research was needed to fill any gaps (see Chapter 5).

The outcome of this was a clear statement (see Chapter 5) as to the purpose of the CF and broad indicators as to the initial theories, mechanisms, metrics and rubrics (see Figure 3) that would need to be assessed and integrated prior to its finesse into a workable framework and finally the practical framework that is observed.

The CF (see Figure 3) is presented as a process mapped against methods, metrics and instruments required to assess student-developed concept maps for relevance of discipline and assessment task and finally linguistic acceptability. A knowledge continuum linking expected knowledge as defined in the Unit of Study (UoS) outline; prior knowledge gained by students in a previous UoS; presented knowledge delivered during formal teaching activities, learnt knowledge representing a student’s cognitive
progression; adjusted knowledge representing correction of initial misconceptions or the development of a broader understanding of discipline issues as additional material was introduced and assimilated; and finally retained knowledge representing cognitive retention was envisaged. This process was seen as cyclical within a UoS and throughout a business degree (Program).
The CF (see Figure 3) shows a process whereby:

- the CF is encapsulated in a DCM framework embracing both teaching and assessment;
- the CF is conceived at the Program level but implemented at the UoS level due to time and access limitations;
- the assessment continuum requires a multi-phased assessment within a single UoS;
- current AoL requirements validating attainment of learning objectives (LOs) are supported by linking each LO to snippets from concept maps developed by students in various assessments;
- concept mapping (CM) is used as a basis of validating curriculum alignment as needed for AoL;
- the use of threshold concepts (TCs) in CM assessments in the early stages of a UoS raise ontological issues requiring students to be assisted with the knowledge about the language of the UoS;
- ongoing assessment of TCs using concept maps would provide a focus on competence progression;
- CM when used as the instrument of assessment would require timely and informative feedback loops for both lecturer in terms of their proficiency, and student in terms of their comprehension or expression;
- the assessment rubric would be both quantitative - using a concept map structure, in order to meet current AoL requirements and also qualitative - using an abridged Biggs SOLO Taxonomy (SOLO), to further address the primary and sub-propositions;
- English as Second Language, although not well understood at this time, would play a part in the overall analysis due to the historic nature of the UoS cohorts;
- time limitations would not allow any assessment of expected knowledge but it was considered within the CF; and
time limitations would not allow any assessment of retained knowledge but it was considered within the CF.

Quantitative Analysis could be based on:

- concept selection and linkage as suitable metrics for all stages;
- concept map structure as a suitable assessment instrument; and
- comparison of student-developed concept maps against an expert map as a suitable rubric where necessary.

Qualitative Analysis could be based on:

- LO verbs as a baseline for expected knowledge understanding that it might be difficult to get access to previous UoS administrators;
- linking verbs and phrases as a relevant metric for other phases;
- a mixed assessment instrument using SOLO descriptors and manual assessment of relevance for domain and assessment task; and
- SOLO is a suitable descriptor for rubrics in all phases.

Language Analysis could include:

- linking phrase and verb analysis as a relevant instrument and metric.

The representation of the CF in this manner, identifying which key variables influence the phenomena of interest, and how those key variables might differ and under what circumstances, provides a framework that permits a move from simply describing a phenomenon observed to generalising about various aspects of that phenomenon.
2.2.3. Part C: Development of a ‘workable’ framework

The conceptual framework template was subsequently refined into a workable framework (WF) taking account of limitations in relation to what: students could realistically achieve in one semester in terms of absorbing a dialogic concept mapping (DCM) implementation for teaching and learning; and what a lecturer could achieve in a single semester in relation to timely feedback to support a learning validation model.

The major practical limitations imposed on this study related to access. Each observation phase was limited to a single Unit of Study (UoS) and it was not possible within current arrangements for the same students to be observed over more than one UoS. Access to undertake a pilot study was provided along with access being granted to observe students and lecturers’ use of concept maps in two separate sessions of the UoS ACCT6014 Designing Accounting Information Systems. The UoS had a well-defined incremental teaching structure based around the Software Development Lifecycle which lent itself to a form of DCM and it had a manageable cohort of around 35 students. It was agreed that this was purely an observational pilot and as the interaction with the researcher and students would be ad-hoc, there would be no formal collection of data or publishing of results except as basic generalised statements for use in the study.

The observations were undertaken in two separate occurrences of that UoS. Initially the focus was on the students’ capacity to absorb concept maps in both a teaching and assessment mode while minimising issues of cognitive overload (Sweller | 1988). Second the focus was on the use of concept mapping in iterative assessments and the appropriate marking and feedback mechanisms that could be employed.

- Semester 2: 2010 Student Mapping Response (see Annexure B)

The students undertook a series of small non-related concept mapping (CM) tasks throughout the semester, which considered
issues of prior knowledge, concept selection, concept map structure, linking verb selection using various types of individual and group assessments.

Anecdotally most students found the process of CM in such a structured environment both helpful and informative, reinforcing linkages between new concepts as they were taught. The verb selection used in linking phrases was adequate but many students tended to regurgitate the verbs used in teaching artefacts directly in their assessment tasks. In initial group work there was an obvious reticence from many individuals to promote their work and in some cases dominant individuals convinced the group to adopt their solutions even when it was obvious that some felt they were incorrect. This common issue of dominant individuals was rectified through more informative and timely feedback and in subsequent group work there was more informed debate resulting in more rounded solutions. Feedback was delivered via expert maps (EMs) and these were well received and snippets of these maps were visible in student work as the overall exercise progressed.

The outcomes of these observations were that:

- the concepts required for the assessment task should be made available and students asked to select from a list;
- EMs should be provided as part of the teaching or assessment feedback loop, with the understanding that they represented only one possible solution.

• Semester 1: 2011 Feedback Mechanisms (see Annexure C)

The students undertook a small iterative assessment over three phases. Unbeknown to the students the three phases were tightly linked and created to assess their cognitive progression in understanding a single threshold concept (TC). Students were
instructed to select concepts from a given list and marking was limited to a quantitative model which only considered concept map structure comparing concepts and concept links against an expert map (EM).

The feedback mechanism was based on work undertaken by Cathcart *et al.* (2010) using an abridged form of Knowledge Space Theory (see Section 5.3.3) using CM. All student maps were plotted over the EM as a background for comparison as a peer group. Students were given assistance through a series of informal workshops where these comparative concept maps were discussed in some detail. The informal feedback obtained from the students was positive as shown by the numerous extended discussions undertaken with a range of students, generally wanting to question differences in their maps to the peer group representation, indicating that this was the most valuable aspect of the exercise.

Further analysis was undertaken with the instructor in relation to the verbs used in the linking phrases. This was shared with the students as a means of supporting English as Second Language (ESL) students, but it was not used in any formal assessment. The exercise was undertaken with a view to understanding how a qualitative model examining linking phrases could further refine the assessment framework.

The outcomes of these observations were that:

- students had to be guided to ensure that they used the TC in their concept maps;
- the importance of the TC had to be disguised from the students so they did not focus solely on its relevance to any answer; and
- prior knowledge assessment related to any pre-requisite UsoS was not possible due to time constraints.
These observations were then used to construct a process map of the workable framework (WF). The WF (see Figure 4) was again presented as a process to assess student-developed concept maps for relevance of discipline and assessment task and finally linguistic acceptability. A knowledge continuum was reduced to cover prior knowledge to adjusted knowledge confined to a single Unit of Study (UoS) and embracing lectures, assessments and feedback. This process was seen as cyclical within a UoS representing a multi-phased assessment separated by lecture sessions and supported by timely feedback loops.

Figure 4: A Workable Framework
The WF shows a process whereby:

- expected and retained knowledge is excluded due to time constraints;
- prior knowledge is limited to previous phases of a multi-phased assessment;
- early stages of assessment are limited to quantitative analysis using concept map structure and linkage analysis;
- taught knowledge would be assessed by reviewing concept maps developed from lecture summaries;
- learnt knowledge would be assessed by using instruments providing a mix of quantitative (structure and linkage) and qualitative Biggs SOLO Taxonomy (SOLO) descriptor and phrase relevance to subject and question; and
- snippets of maps to be associated with all learning objectives (LOs) for Assurance of Learning (AoL) analysis under current requirements.

Quantitative Analysis could be based on:

- structure and linkage with all three phases;
- structure and linkage of snippets associated with LOs limited to Phase 1 and 2;
- structure and linkage of snippets and whole map associated with LOs identified in Phase 3; and
- structure and linkage of complete maps associated with LOs related to the examination, acknowledging that it would only relate to a subset of the whole cohort.

Qualitative Analysis could be based on:

- the use of SOLO descriptors to assess sophistication of linking phrases based on the inclusion of associated concepts;
- the use of linking phrases for domain and assessment task relevance;
- verb analysis limited to extended concept map analysis if required; and
an overall mark (grade) based on both concept mapping and non concept responses associated with LOs related to overall UoS.

Language Analysis could include:

• the recording of linking verbs in Phases 1 and 2 for analysis in relation to developing a template for the assessment of linking phrases in Phase 3; and

• the assessment of linguistic acceptability of linking phrases in Phase 3, to identify and assist with English as Second Language and Second Language writer issue.

2.2.4. Part D: Observations on the ‘practical’ framework

The practical framework (PF) underpins the main data collection and analysis. After developing the workable framework a larger cohort of over 100 students was observed during the second semester 2011 of Unit of Study (UoS) ACCT6007: Contemporary Issues in Auditing. The reason for this was twofold: first, there was intimate knowledge of the UoS as it had been used in all the work prior to the commencement of this study (see Chapter 1); second, the UoS co-ordinator (hereafter referred to as the domain expert) was well versed from a teaching perspective in terms of setting up and marking an assessment task using concept mapping (CM).

The WF was used to inform preliminary work undertaken, with the domain expert, in relation to the PF. Three main areas were considered: the development of teaching and assessment artefacts; the process of analysis; and the process of validating Assurance of Learning (AoL).

Teaching and assessment artefacts included the:

• identification of the two assessable threshold concepts (TCs) of ‘auditor independence’ and ‘true and fair view’ that would be used to provide focus and validate AoL;
• development of a three-phased assessment model with phase 1 assessing ‘auditor independence’; phase 2 assessing ‘true and fair view’; and phase 3 assessing ‘audit quality’, and requiring students to integrate aspects of their answers from phases 1 and 2;
• development of an examination phase assessing ‘auditor independence’ but where the use of CM by the students was optional providing additional input to the AoL validation model but more importantly providing extended analysis allowing comparison of written and mapped responses;
• development of expert maps (EMs) for each phase of the assessment showing header concepts, main concepts and the expected location of associated concepts incorporated within linking phrases;
• development of concept maps of six lecture summaries to be distributed to students after the lecture and discussed prior to the following lecture or in consultation periods; and
• identification of discourse pathways in the lecture summary maps and EMs that identified the TCs. They were to be used for discussing the lecture summaries in class and consultation sessions and the EMs as part of the feedback loops.

The analysis process included the:

• development of an excel worksheet supporting the analysis of concept map structure using concept selection and linkage;
• development of feedback mechanisms using collaborative concept mapping for peer review; and
• development of the overall curriculum management model using curriculum linkage mapping.

The process for validation of AoL included the:

• linking the learning objectives (LOs) to ‘snippets’ of each EMs used in each phase of the assessment task.
Figure 5 below represents the process for a multi-phased assessment task limited to taught, learnt and adjusted knowledge cycling over three main assessment phases, the mid-term examination and the final examination. It also identifies the quantitative analysis for phases 1 and 2 and the final examination and the additional qualitative analysis assessing relevance to discipline, assessment task and linguistic acceptability.
Figure 5: A Practical Framework
At the start of the UoS students were provided with an overview of the dialogic concept mapping (DCM) process and an introduction to concept mapping (CM) (see Annexure A). The DCM process included:

- multi-phased CM assessment task and optional examination question; and
- five LOs associated with overall assessment;

Phase 1 comprising:
- three lectures (1-3) with concept map summaries;
- an assessment task related to the TC of ‘auditor independence’;
- feedback based on quantitative analysis of map structure using comparative concept mapping; and
- validation of AoL based on LO for Phase 1;

Phase 2 comprising:
- three lectures (4-6) with concept map summaries;
- an assessment task related to the TC of ‘true and fair view’;
- feedback based on quantitative analysis of map structure using comparative concept mapping; and
- validation of AoL based on LO for Phase 2;

Mid Term Examination comprising:
- concept map of a possible answer to one question;

Phase 3 comprising:
- an assessment task related to ‘audit quality’ integrating both previously introduced TCs;
- feedback based on quantitative analysis of map structure using comparative concept mapping;
- validation of AoL based on LOs for Phase 3;
• analysis of linking phrases based on SOLO descriptors;
• analysis of linking for relevance and linguistic acceptability; and
• validation of AoL based on LOs for Phase 3.

Final Examination
• an optional concept map question;
• analysis based on quantitative analysis of map structure collaborative mapping;
• analysis of written and mapped responses; and
• validation of AoL based on LO for the final examination.

Quantitative Analysis
• structure and linkage to be assessed in all three phases;
• structure and linkage of snippets associated with LOs extended to all phases;
• structure and linkage of the whole map associated with LOs identified in Phase 3; and
• structure and linkage of the whole map associated with LOs related to examination acknowledging that it would be related to a subset of the whole cohort.

Qualitative Analysis
• use of the SOLO descriptor to assess depth of answers with inclusion of associated concepts;
• use of linking phrase for subject and question relevance;
• verb analysis to be noted to allow extended analysis if required; and
• an overall mark was provided, including non concept material associated with LOs related to UoS grade.

Language Analysis
grammatical adequacy would be recorded in Phase 3 and used as benchmark for final examination phase if any students responded with concept map answers; and

verb usage in linking phrases for TCs would be recorded for phases 1 and 2 of the assessment. If time permitted they would be used to assess adequacy in integration with associated concepts in phase 3.

2.3. Caveats regarding the Study

Although the research was well prepared and executed according to a structured project plan over the four year period certain limitations were identified.

In terms of the quality of the findings:

- dialogic concept mapping (DCM) was a new process to all parties involved (researcher, instructor and student);
- access to students was limited to thirteen weeks within a single Unit of Study (UoS) which constrains the observation of all of the idiosyncrasies of the students’ concept mapping (CM) process or the lecturers assessment practices;
- there was only one instructor involved in the preparation of the expert maps and the assessment of the student responses making both subjective; and
- the assessment continuum, best defined at the program level could only be assessed at a the UoS level.

However the DCM process did invoke a well-defined structure to the assessment task ensuring that the knowledge continuum was supported with contemporaneous feedback mechanisms that provided the ability to support the main proposition being:

- the demonstration of validation of Assurance of Learning (AoL) as defined by the AACSB was related to the achievement of learning
objectives (LOs) defined within context of a single UoS, and reported to become input to a much broader assessment of AoL at the Program level; and

- the demonstration of validation of a broader AoL comprising curriculum management, teaching proficiency, competence progression and retention as suggested in this study was related to multi-phased assessment within a single UoS where the cohort was expected to be heavily weighted to English as Second Language students and issues related to Second Language writers.
3. Research Method

An understanding of the conditions of learning, cognition, knowing and context involves the development of technical tools, and theories that can be used to support learning (Barab & Squire | 2004). To achieve this, learning scientists actively engage in the development of frameworks consistent with emerging pedagogical theories (Cobb et al. | 2003). By necessity these frameworks are designed and systematically changed by the researcher, requiring a methodological toolkit for deriving evidence-based claims from these contexts. One such methodology is design-based research (Brown | 1992).

3.1. Design-Based Research

Design-based research (DBR) is commonly used in learning sciences where interventions are conceptualised and then implemented iteratively in natural settings. Barab et al. (2004:9) suggests that DBR has the “intent of producing new theories, artefacts, and practices that account for and potentially impact learning and teaching in naturalistic settings”. Cobb et al. (2003:9) stated

"Prototypically, design experiments entail both “engineering” particular forms of learning and systematically studying those forms of learning within the context defined by the means of supporting them. This designed context is subject to test and revision, and the successive iterations that result play a role similar to that of systematic variation in experiment.

DBR is often viewed as ‘non-scientific’ by both the positivist or post-positivist researchers who tend to favour quantitative approaches and the interpretivist / constructivist researcher who tends to favour qualitative methods (Creswell | 2003)."
Proponents of these two paradigms tend to focus on the differences between their philosophies rather than on the similarities, as espoused by Howe (1988) in his *Incompatibility Thesis* which rules out any form of mixed method. Distinctions are highlighted in terms of ontology, epistemology, axiology, rhetoric, logic, generalisations and causal linkages (Johnson *et al.* | 2004). However, Rossman *et al.* (1985) suggest that combination is possible and look to differentiate on the basis of the extent of co-existence possible, ranging from the low end of purists, through situationalists to pragmatists. This was heartening to this researcher. The pragmatic paradigm provides an opportunity for "multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis” (Creswell | 2003:11).

The outcomes presented here show a predisposition towards DBR, sometimes referred to as development or design research (van den Akker | 2006), design experiments (Brown | 1992; Collins | 1992), or formative research (Newman | 1990). This approach has a number of defining characteristics including:

- addressing complex problems in real contexts in collaboration with practitioners;
- integrating known and hypothetical design principles with technological affordances to render plausible solutions to these complex problems;
- conducting rigorous and reflective inquiry to test and refine innovative learning environments; and
- defining new design principles.

(Adapted from Reeves | 2006:58)

A DBR method assists with the problem of methodological alignment by ensuring that the research methods used actually test what we think they are testing (Hoadley | 2004). van den Akker (1999:7) identifies DBR as being suitable for “complex, innovative tasks”, supporting an iterative approach involving a range of prototypes that incrementally meet the research requirements.
Figure 6 produced from Reeves (2006) diagrammatically captures the features of DBR.

Estes et al. (1999:7) note that

*In applying design-based research to educational technology, the fundamental purpose of science is to generate new knowledge, while the fundamental purpose of technology is to solve practical problems, using whatever knowledge is available and useful.*

For the purposes of this study, the appeal of this approach is that it enabled the establishment of design principles applicable to resolving a practical educational problem.

As an ethnographic research method, observation also has a long history allowing researchers to undertake a study within a well-defined context. Observation often requires the researcher to spend considerable time in the field with the possibility of adopting various roles in the research in order to gain a more comprehensive understanding of the people (and actions) being studied (Creswell | 1988). “A variety of techniques are used to collect data. Gaining access to the group and leaving the field are two important factors that need consideration. Other areas of concern involve ethical, as well as validity and reliability issues” (Guba & Lincoln | 1994:12).
A DBR process is often considered too long for a PhD project, but Herrington et al. (2007) have argued that it is possible noting that the research is likely to continue beyond the degree program and should be regarded as a work in progress. The methodology of DBR (Swan | 2010) being used in this project involves a systematic series of interventions to transform the validation of Assurance of Learning through a collaborative and iterative approach in the design of new assessment framework. Such real time interventions lead to further refinement of theories and approaches as revised plans are further tested and the emerging results reveal ways in which assessment methods may be continually adapted to become more effective.

3.2. Benefits and Limitations

Adopting design-based research (DBR) often causes a dilemma. On the one hand, design considerations ideally require an understanding of a large number of phenomena and variables impacting on those phenomena; on the other hand, to produce effective research, a researcher is required to focus on specific questions. Furthermore, the day-to-day needs of real-world practice place constraints and demands on both design and research activities (Creswell & Plano Clark | 2011).

This can be addressed by using design needs and contextual demands as a way of determining the specific key questions of interest, and using engineering techniques such as “rapid prototyping” to address design issues and practical issues that are scoped out of the research (Joseph | 2004).

The word ‘disjointed’ used in this study serves an important purpose. DBR initially supported the development of a research pathway from the initial conceptualisation of a conceptual framework (CF). Once developed pragmatism would advise on the refinement to a working framework and finally observation would occur on the resultant practical framework.
CF as defined by Maxwell (2006:39) “is primarily a conception or model of what is out there that you plan to study, and of what is going on with these things and why ... a tentative theory of the phenomena that you are investigating. The function of this theory is to inform the rest of your design – to help you to assess and refine your goals, develop realistic and relevant questions, select appropriate methods and identify potential validity threats to your conclusions”

According to Maxwell (2006) there are four sources used in the construction of a CF and he addresses these as:

- Experiential Knowledge where Strauss (1987:11) argued that experiential data should not be ignored because of the usual canons governing research which would possibly regard it as biased but better “mine your experience, there is potential gold there!”;
- Existing Theory where Becker (1986) warned that the existing literature and the assumptions embedded in it can deform the way you frame your research causing one to overlook important ways of conceptualising the study or key implications within the results;
- Prior Theory and Research where LeCompte et al. (2003:239) stated “theorizing is simply the cognitive process of discovering and manipulating abstract categories and the relationships among those categories”. Pilot studies serve some of the same functions as prior research but normally focused to precisely test relevant ideas and methods; and
- Thought Experiments where Lave and March (1975) used the phrase “speculative model building” to describe the process whereby plausible explanations are sought to answer ‘what if’ questions encouraging creativity and a sense of discovery affording one the “opportunity to make explicit the experiential knowledge they already possess” (Maxwell | 2006:6).
This research embraces all of these ideas and the reader will often be engaged in the thought experiments undertaken by the researcher. As William James observed:

“See the exquisite contrast of the types of mind! The pragmatist clings to facts and concreteness, observes truth at its work in particular cases, and generalises. Truth, for him, becomes a class-name for all sorts of definite working-values in experience. For the rationalist it remains a pure abstraction, to the bare name of which we must defer. When the pragmatist undertakes to show in detail just why we must defer, the rationalist is unable to recognise the concretes from which his own abstraction is taken. He accuses us of denying truth; whereas we have only sought to trace exactly why people follow it and always ought to follow it. Your typical ultra-abstractions fairly shudders at concreteness: other things equal, he positively prefers the pale and spectral. If the two universes were offered, he would always choose the skinny outline rather than the rich thicket of reality. It is so much purer, clearer, nobler.”

William James (1907), Pragmatism and Other Writings.

The next section Part B provides details of initial theoretical background underpinning the study followed by a brief review of additional theories culminating in the evolution of a CF.
PART B: Evolution of a Conceptual Framework
4. Theoretical Background

The genesis chapter of this study outlined the preliminary work that had been undertaken. An overview of the major areas of interest was developed in order to establish a theoretical framework and to identify additional issues that might need to be addressed (see Chapter 5).

The analysis presented in later chapters makes extensive use of dialogic concept mapping as a means of identifying and explaining concepts and linkages and was intended as a tool which could be used to quickly refine and focus one’s attention to areas of possible interest.

4.1. Background

“Knowledge cartography (mapping) is a specific form of information visualisation seeking to represent spatially intellectual worlds that have no intrinsic properties.” (Okada et al. | 2008:xv). Different genres of knowledge mapping (visualisations) have evolved over the years, shaped by the skill of the user and the problem being investigated. Mind mapping from Buzan in the early 1970s; concept mapping from Novak around 1972; argument and evidence mapping from Wigmore in the early 1990s; issue mapping derived from Rittle’s work on Issue-Based Information System (IBIS) in the 1970s; and dialogue mapping by Conklin in 2006. All these models, are supported by software and have developed with the rapid growth of the internet allowing the learner or educator to “capture, position, iconify, link and annotate hyperlinks within a visual space” (Conklin | 2006:35) as they develop, navigate and manage their personal knowledge domains. Such systems support the crafting of maps of information, resources, concepts, issues, ideas and arguments. They provide “clarification regarding legitimate relationships, provoking, mediating and capturing constructive discourse in support of narratives pertaining to an individual’s personal and collective sensemaking” (Okada et al. | 2008:22).
These visualisations transfer knowledge or reinforce prior knowledge to support a learner’s reconstitution of explicit information into a meaningful form.

As noted, one genre is concept mapping (CM): a type of knowledge visualisation involving the representation of concepts and their interconnections. Concept maps have very specific rules associated with their creation in their broadest form – facilitating the measurement of learning quality, in support of meaningful learning (Novak & Cañas | 2006a).

Often linked to the ‘constructivist’ view of learning, CM emphasises issues of individual student difference and makes visible the quality of learning. As a consequence learning can be measured, overcoming some of the criticism of the constructivist model in its inability to evaluate learning (Novak & Cañas | 2006b). As a teaching tool, concept maps allow learners to gain experience in processing and developing information and beliefs, irrespective of their learning style.

When used within an individual Unit of Study within an academic degree, CM can provide an effective means of assessment and self-assessment based on measurable change within a personal knowledge domain. This can be achieved through analysis of learner-developed concept maps based on prior knowledge, allowing for the early representation of learning pathways. When supplemented by the provision of instructor-developed maps, providing expert constructs and pathways, CM can be used to correct misconceptions and support the assimilation of new knowledge (Cliburn | 1990; Novak & Cañas | 2004).

Formal iterative assessment of concept maps as suggested by Shalevson et al. (1993) along a continuum, using a range of quantitative and qualitative measures can enhance the educator’s ability to provide high quality, timely and effective feedback. Such feedback can support a learners’ development of meaningful learning.

This development of meaningful learning provides a mechanism for analysing competence progression evaluated using rubrics, which can measure learning
outcomes providing a systematic way of describing how a learner’s performance develops.

In order to explore these ideas a baseline theoretical framework was developed integrating five learning theories: Learning Approaches and Strategies; Toward Meaningful Learning; Visualising Meaningful Learning; Constructive Alignment; and Technology Infrastructure. These are explored individually as shown (see Figures 7, 9, 11, 14, 16) in detail below and linked explicitly in an iterative framework as shown in Figures 8, 10, 12, 15, and 17.
4.2. Learning Approaches and Strategies

Students have different learning approaches and strategies that need to be understood when developing learning artefacts, implementing assessment frameworks or engaging with new technology. Learners tend to process material either at a surface (rote) or deep (meaningful) level and cultural issues play an important part in their individual preferences. Assessing the level of understanding prior to starting a Unit of Study is difficult in the current university environment due to limitations in authentic validation techniques for knowledge progression and more importantly retention (see Figure 7).

There are numerous models of learning styles, which are based on conflicting assumptions. This has led to a proliferation of terms and concepts, many of which are used interchangeably within the research (Coffield et al. | 2004). Some models correctly acknowledge that different disciplines require different teaching, learning and assessment methods (Entwistle et al. | 2001; Alexander | 2000).

When faced with this variety of learning styles it has been demonstrated instructors become confused (Cassidy | 2003). Where instructors of an individual Unit of Study are faced with several hundred students for only a few weeks, the lack of clarity, or abundance of choice is often viewed as disempowering (Coffield et al. | 2004).

During the 1970s, a body of research on learning explored learning approaches and strategies – as opposed to styles – taking into account the effects of previous experiences and contextual influences. Pask (1976:x) argued that there are identifiable differences between students’ strategies, so that some learners: “adopt a holist strategy building a broad view of the task linked to other topics and to real-life experience; others adopt a serialist strategy building a detailed
view of activities, facts and experimental results with limited external connections”.

Marton and Säljö (1976) suggested learners either processed material using a surface-level (rote learning) strategy, or using a deep-level (meaningful learning) strategy and suggested that some learners could not embrace both strategies when required. Drawing on further work of Entwistle (1988), Sternberg (1999) and Vermunt (2006), models for approaches to learning, strategies, orientations and conceptions of learning were developed in the literature. The emphasis was to encourage a broad approach to pedagogy that encompasses subject discipline, institutional culture, students’ previous experience and the way the curriculum is organised and assessed, to capture a more rounded picture of students’ approaches to learning (Ramsden | 1992).

However, even with a more well-defined strategy, not all learners have the necessary task management skills to engage in any particular model (Vygotsky | 1978; Riding & Rayner | 1998) and the instructor (or indeed any interactive technology) needs to support the learner to take control of their learning (Leung | 2003; Stary & Totter | 2006).

One model for prior learning assessment uses latent semantic analysis (LSA), extracting and representing the contextual-usage meaning of words by statistical computations (Landauer et al. | 1998). LSA is used to assess prior knowledge of learners through analysis of their learning artefacts sometimes embedded in (e)portfolios (Koper & Specht | 2007). Domain experts are used for validation of these models and the results are used for the creation of a personalised learning pathway or an individualised curriculum.

In the pursuit of new knowledge, the meta-cognitive learning strategies used by learners to achieve their desired outcomes are not innate but rather need to be developed by the learner and learning is not necessarily sequential (Jarvis | 2006). The change in knowledge formation can be measured, which supports the assessment of personal learning progression (Kalz et al. | 2008).
The logic of the current trend toward establishing models for lifelong learning suggests that learners can become more motivated to learn by knowing more about their own strengths and weaknesses. This allows instructors to respond directly to them as individuals in the pursuit of meaningful learning and knowledge retention (Osborne & Thomas | 2003).

Figure 7: Learning Approaches and Strategies

These theoretical ideas are visualised in Figure 7 while Figure 8 starts to reflect the integration of the five different learning theories identified in the baseline theoretical framework.
Figure 8: Conceptual Framework | Learning Approaches and Strategies
4.3. Toward Meaningful Learning

Ausubel’s (1963) assimilation theory of cognitive learning has been demonstrated to facilitate meaningful learning. Meaningful learning requires the progression of the learner from merely memorising facts or ‘rote learning’ to understanding and applying concepts or ‘meaningful learning’. Ausubel (1960) believed ‘advance organisers’ used to assist learners in assimilating new information and bridge the gap between what is already known and what is to be learned. Organisers are particularly useful when learners do not already possess the relevant concepts (ontologies) needed in order to integrate new information into their cognitive systems.

The assimilation of new knowledge is dependent on prior knowledge (Sheppard & Gilbert | 1991) and the ability to grasp key or threshold concepts (TCs) (Meyer & Land | 2003). Within a degree program many Units of Study (UoS) require prerequisite knowledge, but often little detail is known about the learner’s knowledge retention. Early assessment using prepared iterative visualisations in support of prerequisites and TCs could seamlessly support knowledge verification and comprehension within the new learning domain (Eppler | 2000).

Further, when commencing a UoS, learners have little prior knowledge of the new topic and may not have the meta-cognition to ask serious questions or make sense of the information being provided (Gijselaers | 1996). Personal learning

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3 Devices used in the introduction of a topic which enable learners to orient themselves to the topic, so that they can locate where any particular bit of input fits in and how it links with what they already know (Ausbel | 1963).
environments based on ontology-based visualisations that integrate prerequisite knowledge for personalised learning may assist in mitigating the learner’s development of immature, incomplete or incorrect knowledge models.

For learners with low prior domain knowledge, studies (De Jong & van der Hulst | 2002; Puntambekar et al. | 2003) have shown a positive effect of visual hierarchical structures on both navigation of the subject domain and learning. Visual representation of the ontology for the whole UoS structure and links to core knowledge artefacts reduces the problem of learning disorientation (Ruttan | 2009) providing superior representation of the topic, concepts and their relationships.

Figure 9: Towards Meaningful Learning

These theoretical ideas are visualised in Figure 9 while Figure 10 reflects the integration of the first two different learning theories identified in the baseline theoretical framework.
Figure 10: Conceptual Framework | Towards Meaningful Learning
4.4. Visualising Meaningful Learning

Visualisations (such as concept maps) can be used to assess a learner’s prior knowledge and the integration of new knowledge. Visualisations developed by a learner in support of their integration of new concepts into their current understanding can be assessed and used to measure competence progression (See Figure 11).

Similar to the literature on learning styles, concept mapping (CM) emphasises issues of individual student learning diversity but it has two specific advantages. First, it can provide a representation of the quality of the learning that individuals achieve. Second, it is a practical method for teaching possibly negating traditional learning style teaching models which fail to inform instructors how to teach different students effectively. As such CM has the potential to close the “theory – practice gap”, as it facilitates personalised “meaning-making” within learning (Jarvis | 2006:84).

CM has its origin in the learning movement called constructivism (Novak | 1964). When used by instructors to visualise the networks of knowledge from which their narrative sequences are constructed, it has an important role to play in the teaching-learning interface. Visualisations using CM can demonstrate that a topic in the curriculum is not a hierarchy of sequential ideas, as presented with tools like PowerPoint, simply to be learnt by rote, but one of many different and competing explanations and pathways (Hay & Kinchin | 2006). Concept maps can also facilitate the integration of different experts’ views assisting the learner to understand the broader framework of a particular discipline.

To encourage meaningful learning the instructor needs to gain insights into what the learner already knows (Schwartz et al. | 2006) to capture and measure a baseline of knowledge and provide pathways to correct initial misconceptions.
Once a baseline of knowledge is established, it is possible to build on current knowledge, which is consistent with a constructivist view of learning.

Despite its advantages, the introduction of a new modality such as CM often has a negative impact on the learner, through elevated cognitive load, which in turn stimulates split attention. The new sources of information must be integrated into the student’s learning environment mitigating the necessity for unnecessary mental integration (Oliver & Aczel | 2002). Cognitive load theory\(^4\) outlines the beneficial effect of removing redundant information (Sweller | 1988).

Making knowledge visible so that it can be accessed, discussed, valued, and managed is a long-standing objective of knowledge management (Sparrow | 1998). Visualisations, which scaffold different forms of reasoning about content, require learners to invoke spatial attributes in recall, supporting knowledge construction and integration through cognitive amplification (Leung | 2000). Unfortunately the use and management of visualisations in supporting such knowledge integration within a learning environment is difficult due to the lack of a unified methodology and standard ontology (Treuer & Jensen | 2003; Lanzenberger | 2008).

When used for semantic scaffolding in hypermedia\(^5\) learning environments, learners with superior prior knowledge profit more as they cope better with the additional processing demands. Learners with inferior prior knowledge are more likely to be cognitively overloaded, as they have less working memory capacity available for additional processing (Schnotz & Kürschner | 2009).

The strength of educational hypermedia systems lies in the presentation of the content in a way that shows the numerous and multiple interrelations between

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\(^4\) Cognitive load theory has been designed to provide guidelines to assist in the presentation of information in a manner that encourages learner activities that optimize intellectual performance (Sweller | 1988)

\(^5\) Hypermedia is used to describe an environment in which graphics, audio, video, plain text and hyperlinks intertwine to support a non-linear medium of information presentation. (Schnotz & Kürschner | 2009)
concepts, reflecting the conceptual organisation of the content (Sasot and Suau | 2000). The subsequent linking of several (sequential) visualisations in the form of a dialogue as suggested by Hay (2008) enables the unique contextual linkages required to support a learner’s seamless passage through various learning cycles. The sequential movement through a learning cycle, with progression towards modes of higher abstraction has been termed the course of optimal (cognitive) development (Biggs & Collis | 1989).

Dialogic concept mapping, a form of adaptive navigation, can assist learners to develop personalised pathways in support of personal information management and enhancement (Hay | 2008). Personalised views serve to provide focus, protecting users from complexity while identifying forward and backward linkages. Where possible it can support generalised curriculum sequencing using a student’s prior knowledge to provide interpretable pathways with particular emphasis on competence progression (Brabrand & Dahl | 2009).

In a learner-centric domain, facilitating students’ acquisition of valid conceptual frameworks in support of their domain specific learning spaces is difficult (Levin & Bruce | 2001) and often learners develop immature, incomplete or incorrect models. To assist in modifying these models learning can be conceived as not merely an event of the replacement of old ideas with new ones, but the organisation, refinement and differentiation of information among contexts (Caravita & Halden | 1994). The necessity to manage and reflect on the pathway to change is important and technology can be used as a means of managing integrated visualisations to assist the learner in the management, classification and organisation of content within a specific domain.

To support the principles of constructivist learning, students need time to reflect on what they have learnt. Cognitive progression and retention involves moving information from the short-term memory to the long-term memory (Lutz & Huitt

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6A ‘Learning Cycle’ relates to the repeated unistructural, multistructural, relational cycles (U-M-R) developed in the formation of higher understanding (Stice | 1987).

7In learner-centered teaching, the focus is on the student as learner, on improving student learning and success, rather than on the transmission of information (Levin & Bruce | 2001).
Such transfers require attention, organisation, repetition, and assisted recall. Managing the visiospatial aspects of knowledge can be supported through (e)portfolio technology. (e)portfolios are digital collections, with classification based on a subject specific ontology (theme), of what a person has learned or produced over time, including information on the pathways (process) (Kalz et al. | 2008).

Personalised pathways supported by visualisation, and organised into thematic (e)portfolios assist the learner to understand and manage their knowledge development process and assist in their focus and reflection on areas of concern. Additionally they support knowledge boundary management whereby a learner, by necessity, is introduced to a small part of the overall Unit of Study schema prior to seeing and understanding the whole picture and any backward and forward linkages. Further, a review of the key concepts immediately at the end of the learning session is important in order to fix information in the long-term memory, allowing abstract terms to be attached to concrete activities (Stoyanov & Kommers | 2006). Students learn words, not ideas (Piaget | 1954) and activities such as concept mapping (Novak | 1998), can be used at the end of a session to review key points and assess learning.

These theoretical ideas are visualised in Figure 11 while Figure 12 reflects the integration of the first three different learning theories identified in the baseline theoretical framework.
Figure 11: Visualising Meaningful Learning
Figure 12: Conceptual Framework | Visualising Meaningful Learning
4.5. Constructive Alignment

Biggs SOLO Taxonomy can be applied to visualisations and used to measure prerequisite knowledge, an expectation of a learner’s base knowledge and a learner’s assimilation of new knowledge (see Figure 13).

The theory of constructive alignment is based on the principles of constructivism. (Biggs | 1999). Constructivism, derived from the field of cognitive psychology, views knowledge as personal and that meaning is actively constructed by learners through active engagement with the subject matter (Biggs | 2003). It is a systems theory, in that the entire teaching context is perceived as a ‘system’ for which understanding the individual parts and their interactions is required in order to understand and make predictions about the entire system (Biggs | 2003).

Prawat and Floden (1994) suggest that the weakness of the constructivist approach is its inability to evaluate learning. However Bednar et al. (1991) assert evaluation is possible, first as to whether learners can use tools to solve problems and second through reflection of the processes involved that allow conclusions regarding learning to be reached.

Concept mapping (CM) coalesces with and supports the constructivist approach by allowing instructors to use a map as a basis to challenge and assess a learner’s construct of their own idiosyncratic understanding of domain specific concepts. Instructors recognise that students have difficulty remembering salient points in learning artefacts, therefore it is important students’ take away an understanding of themes and concepts and their relationships (Russo et al. | 1995). Further, in an educational setting, concept maps have been widely employed to support different pedagogical practices such as: graphical knowledge visualisation tools, assessment tools to evaluate learners' understanding of a knowledge domain and to identify misconceptions. Concept maps can also be used as cognitive tools for
individual students to externalise, refine and adjust their thoughts in the process of knowledge construction (Cheung | 2006).

Novak (1998) asserts that the continuum of learning from rote to meaningful can not only be measured but also assessed using concept maps. Novak and Gowin (1984) provided a quantitative model based on counting the concepts, links etc. Dorough and Rye (1997) expanded this model to incorporate relative weightings associated to different aspects of the map. Ruiz-Primo and Shavelson (1996) described the use of expert maps as a basis for scoring concept maps. Rice et al. (1998) developed a scoring method that linked concept map scores to achievement of instructional objectives. Many of these analytical techniques used for assessment assumed a rigorous hierarchical model of concepts. Ruiz-Primo and Shavelson (1996) questioned the necessity for such a hierarchical structure proposing spider and chain maps as acceptable alternatives.

Table 3: Morphological types of concept map
Source: Adapted from Hay et al. (2008)

<table>
<thead>
<tr>
<th>Structure</th>
<th>SPOKE</th>
<th>CHAIN</th>
<th>NET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchy</td>
<td>Single level</td>
<td>Many levels, but often inappropriate</td>
<td>Several justifiable levels</td>
</tr>
<tr>
<td>Additions</td>
<td>Additions to central concept do not interfere with associated concepts</td>
<td>Cannot cope with additions near the beginning of the sequence</td>
<td>Additions / deletions may have varying influence as 'other routes' are often available through the map</td>
</tr>
<tr>
<td>Deletions</td>
<td>Have no effect on overall structure</td>
<td>Disrupt the sequence below the deletion</td>
<td></td>
</tr>
<tr>
<td>Links</td>
<td>Often simple</td>
<td>Often 'compound', only making sense when viewed in the context of the previous link</td>
<td>Often employ technical terminology to enhance meaning</td>
</tr>
</tbody>
</table>

Hay et al. (2008) further developed this idea categorising the main morphological types of concept maps as spoke, chain or net and differentiated them in terms of their complexity, resilience in accommodating additions where visible changes in the map were deemed to be a measure of cognitive change (see Table 3).
Turns et al. (2000) also proposed the use of concept maps to assess learning based on the grading of different characteristics of the map, such as width, depth, and connectivity. Safayeni et al. (2005) suggests that concept maps as defined by Novak cannot adequately represent forms of conceptual knowledge that have dynamic relationships; and proposes a ‘Cyclic Concept Map’ supporting the representation of functional relationships among a constellation of concepts.

In addition to these various overlapping methodologies, some researchers (Biggs | 2003; Kennedy | 2006; Lawless | 2006; van der Laan et al. | 2006) have attempted to develop comparative marking models based on Biggs SOLO Taxonomy (SOLO).

SOLO describes a hierarchy where each level of knowledge construction becomes a foundation on which further learning is built (Biggs | 2003). This provides a possible approach to evaluating the effectiveness of learning. If evidence of attainment of higher level of knowledge construction can be found then it suggests that the learning activity is effective at encouraging the construction of knowledge. However this will not be consistent across all academic disciplines, as within a teaching environment, academic departments use of SOLO descriptors differs not only at the level of expected responses but also in the usage and distribution of verbs as used in learning objectives (Braband & Dahl | 2009).

In CM it is difficult to identify and grade the different SOLO levels of outcome which students achieve. However, since the maps being analysed are on the same topic, reflecting prior and post teaching activities, some criteria can be applied to measure the quality of the change that has taken place. Hay (2007) developed a framework for assessing such changes. However an issue with this approach is that judgements need to be made regarding the context in which the

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8 The Cyclic Concept Map is considered to be an appropriate tool for representing knowledge of functional or dynamic relationships between concepts as opposed to a concept map which is viewed as an appropriate tool for representing hierarchical or static knowledge (Safayeni et al. | 2005).
learning situation is embedded, particularly if technology plays an integral part in the implementation.

SOLO is a conceptual framework for exploring a student’s cognitive growth, by supporting the analysis of the relationship between expert cognitive structure and ‘actual responses’ to learning tasks and how they change over time. This provides a model for investigating and describing the levels of complexity exhibited in cognitive functioning (Chick | 1998) inferring a hierarchy of responses that reflect learning (Biggs & Collis | 1989). Additionally Biggs (2003:41) observes: “SOLO describes a hierarchy where each partial construction (level) becomes a foundation on which further learning is built” and as McPhan (2008:25) notes it has the potential to “distinguish qualitatively different levels of response to a task along a developmental continuum”.

The SOLO model differentiates level of response to a task in a qualitative framework structured along a developmental continuum. In coding a response, the model first considers, *modes* of abstraction of thinking (McPhan | 2008).

A consideration of increasing complexity gives rise to the second feature of the model, namely levels of responses. There are five levels of response (Biggs & Collis | 1982:20).

- **Prestructural (P)**: indicating an inability to engage often demonstrated through a restatement of the question, or a focus on irrelevant, incidental data. This reflects an incapability of response to the stimulus;
- **Unistructural (U)**: The use of only one relevant element of data from the stimulus item. Generally shows a desire for early closing and lack of attention to inconsistencies that may result from the response;
- **Multistructural (M)**. The use of multiple, non-integrated data elements. Response consists of a number of discrete closures but their internal linkages are not addressed and show variability in recall;
- **Relational (R)**. Response reflects the ability to integrate the elements and operations of the question in a way that enables an overview of the stimulus item. Supports ability to check for internal inconsistencies; and
• **Extended abstract (EA).** The use of external data elements addressing new and more abstract features. Could relate to unistructural of a higher order.

Of the five SOLO levels, three constitute a learning cycle within a particular mode of abstraction, namely, unistructural, multistructural and relational, whilst the other two, pre-structural and extended abstract, lie outside this mode (Biggs & Collis | 1982). Biggs and Collis (1991) proposed a model that brings together successively the cyclical nature of learning (levels) and the hierarchical nature of cognitive development (modes). Inherent in the learning cycle is a sequence from low competence (novice learner) to expertise (Biggs & Collis | 1989) with each level being an indicator of how far learning has progressed towards competence.

In 1988, the SOLO model was modified to incorporate learning progression at a micro level within a mode of abstraction and development across modes (Collis *et al.* | 1998; Biggs & Collis | 1989) (see Figure 13).

![Figure 13: UMR Cycle of Learning](image)

*Source: Adapted from (Pegg and Tall | 2005)*
In addition, Campbell et al. (1992) proposed that there may be a number of U-M-R cycles in a given mode, and that satisfactory performance at the relational level of one cycle allows progression into the next. Mastery of a relational concept at one level allows it to become a single, straightforward unistructural concept to be used in developing more complex multistructural and relational results.

These theoretical ideas are visualised in Figure 14 while Figure 15 below reflects the integration of the first four different learning theories identified in the baseline theoretical framework.
Figure 15: Conceptual Framework | Constructive Alignment
4.6. **Personal Knowledge Management**

*Personal knowledge management is a collection of processes that an individual uses to gather, classify, store, search, retrieve, and share knowledge in their personal domains and a way in which these processes support individual learning.*

The use of technology to communicate, exchange information, and construct knowledge is often associated with the constructivist approach to learning where learners are expected to manage their learning tasks and engage in interaction with their peers and various learning artefacts. In order to achieve this engagement learners require well-defined guidelines and skills (Vrasidas & McIsaac | 1999). Jonassen (1992) argued that an emphasis of constructivism is to identify tools necessary for learners to manage their personal knowledge domains.

In order to implement a learner-centric model in support of personal knowledge management, Barreau (2006) suggests two general needs for technological tools related to search and reminding. Search has a complex mix of requirements based on metadata and full text. Reminding, in digital environments, is about triggering memory, managing tasks, and learning from experience. There is also a requirement to allow the construction of personal views of information reflecting an individual’s perspective (Maier *et al.* | 2006) and support for personal information enhancement with associated navigation (Murthy *et al.* | 2006).

Additionally, semantic data organisation using ontologies (such as metadata) that represent meaningful associations and uniform representation now play an important role in the features offered by such technological tools (Sauermann | 2005). Metadata are used to characterise information to facilitate the integration of heterogeneous information items (Mika | 2006).
A basic problem with these tools is the lack of a user-friendly interface that conforms to the different interoperability standards. Ontology-based applications are often associated with high set-up and maintenance costs and with complicated user interfaces that are not suitable for novice users. To support a learner–centric model necessary for this study, the technology infrastructure to be employed is based on concept mapping software (CMaps) from the University of Florida, an open source tool.

A general problem with integrating any software application into a Unit of Study (UoS) is the capability of all students to use the technology. The use of CMaps can be taught in about 20 minutes and most people find that another 30 to 40 minutes is sufficient to make satisfactory maps (Hay & Kinchin | 2008).

When implementing any technology solution in support of achieving other goals such as meaningful learning, it is important that an evaluation is performed as to whether the acceptance of the technology played any part in the outcome of the issue being analysed. There are numerous evaluation frameworks (Venkatesh et al. | 2003), but few look at the issue from a learner’s perspective. Some early models looked at the relationships between perceived ease of use, usefulness and a learner’s behavioural intentions towards the system. The disadvantage of subjective ratings is the instability of the individual’s frame of reference. This frame can change in the course of learning due to adaptation processes or as a response to motivational and emotional changes, which decrease reliability (Schnotz & Heii | 2009).

Further when managing issues related to the implementation of new technology in an educational setting, several factors related to teaching need to be considered: organisations can be resistant to change; the changing role of the instructor; the requirement for the instructor to learn to tutor in the context of new pedagogical models; and the effect of any additional workload (Koper | 2004). Considering these aspects will be critical in evaluating the impact of the technology implementation.
These theoretical ideas are visualised in Figure 16 while Figure 17 reflects the integration of the all five different learning theories identified in the baseline theoretical framework. The bold blue lines accentuate the cross links between the different learning theories.
Figure 17: Conceptual Framework | Personal Knowledge Management
4.7. **Review of Theoretical Background**

The theoretical background covers a broad range of integrated issues that required filtering into a coherent base for the study. The major constraint was that final observations would have to be limited to a single Unit of Study due to logistical issues with access to both students and instructors; and to make sure there was limited impact on current assessment models.

The initial review undertaken did not focus on whether any particular interpretation or statement in the development of the theoretical background was correct or incorrect but raised methodological, theoretical and practical issues in respect of limitations in terms of the proposed research site and access.

On review of the five interrelated theoretical building blocks the following observations were made and Figure 17 was modified to remove areas identified as not practical to pursue. Figures 18 to 22 show the main areas of interest to be included in the conceptual framework in black and red and the areas to be excluded in grey.

- From the literature on Learning Approaches and Strategies (see Figure 18)

  included:
  - the analysis of prior knowledge as a platform for the development and integration of new knowledge supporting a learning continuum framework; and
  - the linking of assessments to learning objectives (LOs).

  excluded:
  - issues related to learning styles, learning approaches and strategies;
  - any extension of analysis into lifelong learning; and
development of e-portfolio structure while acknowledging that the output of an assessment task could be in an electronic format.

From the literature on Towards Meaningful Learning (see Figure 19) included:

- did acknowledge that assessment was undertaken throughout the University degree program but would not have time to undertake a longitudinal based study of that magnitude;
- accepted that any formal data capture and analysis would probably need to be undertaken within a single Unit of Study (UoS) so as to limit the impact on teaching staff;
- acknowledged that if we were to impose a new framework of assessment on the students that it would need to be undertaken in parallel with existing assessment regimes and as such had to be aware of issues related to cognitive overload;
- was cognisant that domain specific ontologies was an important constraining aspect of knowledge assimilation within a single UoS and that it would play an important role if we continued to use the ACCT6007 Contemporary Issues in Auditing as our UoS as it was a capstone unit with some very specific terminology;
- recognised that we needed to initially assess what form of meaningful assessment could be undertaken within a single UoS; and
- acknowledged that we needed to develop a suitable custom assessment framework.

excluded:

- the development of personal organisers.

From the literature on Visualising Meaningful Learning (see Figure 20) included:

- issues related to competence progression as part of an assessment model which would entail revisiting prior
knowledge, attained within the UoS, through the overall assessment regime;

- in view of time limitations should limit study to one visualisation technique if we intend to collect user data;
- determined concept mapping as both a teaching and assessment framework with an emphasis on assessment;
- in the teaching environment would need to embed concept maps in the teaching of subject matter without disturbing the current teaching platform based on lectures and the use of PowerPoint presentations;
- the embedding of concept maps in teaching would necessitate the management of ‘expert maps’ and care would need to be taken that these were not merely reproduced by students in any assessment task as a form of rote learning; and
- needed to be aware of the issues related to ‘cognitive overload’ in the delivery of lecture summaries and concept maps in addition to Powerpoint presentations.

excluded:

- theoretical issues related to cognitive development
- theoretical issues related to learning cycles

- From the literature on Constructive Alignment (see Figure 21) included:
  - was interested to develop on the work on constructive alignment and the use of Biggs SOLO Taxonomy;

excluded:

- issues related to constructivism.

- From the literature on Technology Infrastructure (see Figure 22) included:
  - interested in developing a stand-alone framework for assessment that could be expanded along the ‘assessment
continuum’ linking prior knowledge, new knowledge and retained knowledge;
excluded:
  o not interested in assessing use of technology in education; and
  o not interested in developing / analysing a system to support an all-encompassing framework for personal knowledge management.

Once the overall initial framework was adjusted the residual issues were presented in an amended framework (see Figure 23 in the next subsection).
Figure 18: Review | Learning Approaches and Strategies
Figure 19: Review | Towards Meaningful Learning
Figure 20: Review | Visualising Meaningful Learning
Figure 21: Review | Constructive Alignment
Figure 22: Review | Personal Knowledge Management
4.8. Summary

On completion of the review of the theoretical framework (TF) it became evident (see Figure 23) that the broad research area of interest was related to:

the semi-automated assessment of an individual’s cognitive progression and retention using comparative concept mapping supported by a marking rubric which includes Biggs SOLO Taxonomy, while ensuring that students were not cognitively overloaded and that teaching supported discipline specific ontological support.

Figure 23: Conceptual Framework | First Amendment

The statement above was understood to be too general and the ultimate articulation of a conceptual framework (CF) for assessment would require further theoretical review in order to convey a definitive statement as to what was to be assessed, the process of assessment and how learning was to be supported. These issues are covered in Chapter 5.
In refining the TF it was also necessary to view a proposed CF in terms of the current broader teaching and learning environment and with particular emphasis on accounting education. The overall milieu of teaching and learning has expanded in recent years, incorporating enhanced library facilities, e-books and physical textbooks with integrated web sites. Visualisation can play an important role in this new environment supporting curriculum management and assisting students to focus on key themes, or threshold concepts (Meyer & Land | 2003), and the understanding of important conceptual linkages. Concept maps have been used in this mode in the past in several disparate disciplines including: nursing (Daley | 1996; van Neste-Kenny et al. | 1998); medicine (Edmondson | 1995); teacher training (Martin | 1994); science (Starr & Krajcik | 1990) and accounting (Chiou | 2008; Simon | 2007).

There is considerable literature (Mass & Leauby | 2005; Protzman & Ravel | 2006; Shimerda | 2007; Simon | 2007) on the use of concept mapping (CM) support of accounting education and assessment. Visualisations in the form of student-developed concept maps have been shown to be well accepted from the learner’s perspective in a financial studies environment (Simon | 2007) and the parameters for a learner-centric model in support of meaningful learning have been investigated (Esslemont et al. | 2007c). Within an assessment framework embracing dialogic concept mapping (Hay | 2007) the resultant series of visualisation would be akin to an assessment continuum reflecting how a students’ personal knowledge domain had been developed, changed and potentially validated as one moved forward. If similar maps were used for teaching they could be used to ensure curriculum and content coherence and support closing the theory - practice gap identified in professional education (Roseman et al. | 2004).

Chapter 5 presents several theoretical issues that were considered for incorporation into the CF.
5. Defining the Conceptual Framework

In defining the research areas requiring additional review in order to articulate a conceptual framework (CF) an overriding practical requirement was that any major observations of student work would have to be undertaken within the confines of a single Unit of Study (UoS) without adding significantly to the overall teaching and assessment load.

To that end it was decided that rather than introduce a new assessment regime the study would support the Sydney University Business School’s (Faculty) current obligations under accreditation for The Association to Advance Collegiate Schools of Business (AACSB). As an accreditation body, AACSB has released guidance in relation to the standards for Assurance of Learning (AoL) (AACSB | 2013). These standards are designed to support both accountability and continuous improvement, the latter of which focuses on measuring learning to evaluate an educational institutions success in achieving learning goals (LGs).

AACSB state that their accreditation process ultimately improves the quality of business programs and that the process "has a continuous positive effect on ongoing curricula development, program design, and delivery methods", and further, that for schools that have attained accreditation state that "it enhances our ability to effectively compete with other schools for quality students" (AACSB | n.d.)⁹. AACSB acknowledge the major focus is on curriculum management at the entire degree (Program) level but validation is reported through historic analysis with little regard to engaging with, and correcting contemporaneous issues related to student learning.

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The Faculty, as demonstrated in the fine print on their web page (Sydney University | n.d.)\(^{10}\), interpret their obligations regarding AoL as:

“Assurance of Learning (AoL), or outcomes assessment, ensures that our graduates achieve the goals and outcomes we say they will achieve when we advertise our degree programs. AoL is a means of holding ourselves accountable to delivering what we say we will deliver to students and employers, as well as a way of supporting the continuous improvement of our degree programs”.

This emphasis of accountability for delivery suggests a very different interpretation than most students would have as to the meaning of AoL. Here it is suggested that their interpretation would perhaps be better termed ‘assurance of the opportunity to learn’, for the mere statement and subsequent achievement of LGs, cannot in itself assure learning. There are, arguably, additional elements to an assessment continuum through the life of a Program and beyond. These include, teaching proficiency, cognitive progression and finally cognitive retention as students use what they have learnt in different settings as they progress along the learning continuum initially within their Program, then their professional life and later life. In embracing this broader view of AoL the conceptual framework (CF) would also need to cater for additional feedback to further assess a broader definition of curriculum management, teaching proficiency and cognitive progression and retention (see Figure 24).

Further, if the assessment process was to be undertaken using a dialogic concept mapping process, the study would need to address issues uncovered in work undertaken prior to the start of the formal study (see Section Genesis). There it was recognised that the postgraduate conversion student cohort at the Faculty comprised a high percentage of students from overseas and that their grasp of

\(^{10}\)Assurance of Learning Obligations: Retrieved [1 May 2013]  
discipline specific English had been observed to be relatively weak. However preliminary research (Chularut & DeBacker 2004) demonstrated that concept mapping can benefit English as Second Language (ESL) students allowing them to optimise their learning by adopting concept mapping as a learning strategy. In order to assess the impact of ESL the CF would have to be honed into a workable framework after undertaking a series of small pilot projects observing concept mapping within a cohort and the feedback mechanisms that could be employed (see Chapter 6).

![Conceptual Framework](image)

**Figure 24:** Conceptual Framework | Review

To finalise the CF additional analysis was undertaken in respect to issues (see Figure 24) related to Assurance of Learning, dialogic concept mapping, assessment, threshold concepts, curriculum management, teaching proficiency
and cognitive progression and retention was undertaken. It is presented in a simple question and answer format with conclusions, enabling a decision to be made regarding their ultimate inclusion or exclusion form the practical framework (see Chapter 7).

5.1. **Assurance of Learning**

*This section considers Assurance of Learning as defined by the AACSB and the broader definition as suggested in this study.*

Assurance of Learning (AoL), as defined by the Association to Advance Collegiate Schools of Business (AACSB) to refer to assessment is unfortunately often conflated with terms like assessing graduate capabilities/attributes; quality assurance, quality enhancement (Lawson | 2012) when discussing the broader concept of assuring learning. AoL processes have been implemented in numerous Business Schools throughout the world as part of the accreditation process, designed to validate an organisation’s accomplishment of its educational aims at the core of its different programs. Often these educational aims are couched in terms of Learning Outcomes (LOs). These LOs are also used in a broader context of broader quality assurance frameworks within the higher education sector both in Australia and internationally.

The Australian Qualifications Framework (AQF) is Australia’s National Qualifications Framework (NQF). The AQF is the national policy for regulated qualifications in Australian education and training. It incorporates the qualifications from each education and training sector into a single comprehensive national qualifications framework. The AQF articulates the pathways between qualifications in the various sectors and between education and work. The AQF like all NQFs provides the basis of educational quality assurance (Hancock *et al.* | 2010).
Further, at the discipline level in Australia, the Learning and Teaching Academic Standards for Accounting Project from The Australian Learning and Teaching Council (Hancock et al. | 2010), developed for the higher education community, describes the minimum learning outcomes for various accounting programs. The working party embedded the AQF standards in the local context whilst also referring to various international standards.

In 2010 the Australian Government created a new Higher Education Quality and Regulatory Framework including the establishment of the Tertiary Education Quality and Standards Agency (TEQSA). TESQA is the national body for regulation and quality assurance for tertiary education against agreed standards (Hancock et al. | 2010).

By the beginning of 2012 there were some 138 countries planning or implementing NQFs (Tuck | 2007). This was seen as a response to globalisation in the education sector and a desire to enhance national competitiveness (Raffe | 2012) while providing a platform of the mobility of labour through the provision of transferable qualifications. In the European Union all 27 countries adopted NQFs which formed the basis of a broader European Qualifications Framework (EQF) and the Bologna Qualifications Framework for the European Higher Education Sector. Although proving highly influential (Lester | 2013) in its primary role as a translation device and as a reference point for compatibility between sectoral qualifications, it has “limitations in referencing or aiding the design of individual qualifications” (Lester | 2013:9).

Raffe (2012:7) noted “NQF’s vary with respect to their objectives, their intended change processes and consequently their design and implementation”. This diversity of NQFs has several implications and although learning outcomes are of central importance in the literature (Sursock & Smidt | 2010) they “play a modest role in many NFQ’s” (Raffe | 2012:9). Further many NFQ’s internationally use different change processes to achieve their stated objectives. Therefore, in order
to address generalisation issues this study was focused on AoL as defined by AACSB, which is a more mature and widely implemented framework within Business Schools.

5.1.1. Assurance of Learning from the Perspective of the AACSB

Arguably, Assurance of Learning (AoL) is one of the leading concepts in business education. It requires an assessment process to validate student attainment of learning objectives (LOs) throughout a learning continuum (AACSB | 2013).

To obtain accreditation by the AACSB, educational institutions are required to demonstrate constructive alignment (Biggs | 2003) of their Program learning goals (LGs), with the achievement of identified student learning outcomes that “reflect broad educational expectations . . . [and] reflect the major intellectual and behavioural competencies a program intends to instill in their students” (AACSB | 2007b:4).

However, LGs are broad statements and, taken alone, are not suitable for student assessment. LGs must be translated into one or more LOs which can describe a measurable attribute of the overall LG. For each LO, an assessment process is required to support evaluation of student performance in respect of that objective. This in turn should provide a reasonable basis for concluding whether a student’s performance regarding achievement of a particular LO is acceptable under an AoL process (McConnell et al. | 2008).
Educational institutions seeking accreditation from AACSB are provided with considerable latitude in defining LOs and selecting assessment frameworks to measure these objectives (Shaftel & Shaftel | 2007). Ammons and Mills (2005) suggest a process for assessing AoL by linking LOs to specific learning activities or artefacts that in turn can be assessed to show evidence of understanding and proof of AoL.

Many educational institutions use Course Embedded Assessment (CEA) techniques as part of their assessment framework (McConnell et al. | 2008). CEA techniques have been shown to be an effective method to assess student learning providing direct, timely information regarding the achievement of LOs, while also allowing instructors to implement changes and improve instruction and hence student performance within the same academic year. “When successfully implemented, CEA can be part of a culture that supports and improves teaching, learning, and program outcomes” (McConnell et al. | 2008:31).

This of course begs the question – what is a successful CEA implementation and are there supplementary mechanisms that can assist in the assessment of student learning and more importantly assist in supporting a student along the continuum of learning?

McDaniel et al. (2005:3) found concept mapping to be a “valid and reliable tool for designing, monitoring, and communicating curricula-related information to accrediting bodies and certification boards in higher education”. Hay (2007) showed that concept mapping when implemented over a Program can provide longitudinal measures of student learning quality in higher education. Additionally Rice et al. (1998:1125) found that the bulk of the research on concept mapping “supports their value in assessing more complex learning outcomes” while also demonstrating clearly that “concept maps can be scored for declarative knowledge of the sort commonly assessed with multiple choice tests”.

Part B | Defining the Conceptual Framework
**5.1.2. Assurance of Learning from the Perspective of this Study**

LeClair (2012) demonstrated that AACSB research reveals three major opportunities to broaden our view of assurance of learning. First Assurance of Learning (AoL) could be recast to fit more appropriately within a broader curricula management system. Second AACSB should encourage more holistic approaches to assessment embracing indirect measures providing contextual information in support of curriculum change. And finally there is an opportunity to broaden the international acceptability of AoL by embracing national requirements for accountability, assessment, and program review aiming to close the theory-practice gap.

In order to determine whether learning objectives (LOs) are attained one needs to understand how students manage their learning outcomes throughout a Program of learning. Current Programs like Master of Commerce (MCom) or Master of Professional Accounting (MPAcc) are composed of several Units of Study (UsoS) integrated in terms of learning goals (LGs) to ensure constructive alignment. These LGs are less structured in terms of assessing student attainment of specific LOs and silent with regard to the necessity for correction of misconceptions developed over a continuum of learning.

There is no ‘holy grail’ assessment process and most educational institutions use a mix of summative and formative assessments. In order to minimise the 

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**Conclusion:** Assurance of Learning at the Unit of Study level can be validated using dialogic concept mapping where the learning objectives are linked to aspects (snippets) of student-developed concept maps provided in response to assessment tasks.
impact on the UoS and ensure that students are not impacted by cognitive overload (Sweller et al. | 1998) and the introduction of new technology or processes such as the implementation of a dialogic concept mapping (DCM) process would require the embedding of the research in the process in line with design-based research.

Concept mapping has been shown to promote the development of a deeper, more meaningful understanding of content. To employ maps in teaching would require their progressive linking during the UoS to the extant LOs. The concept maps used for assessment would also need to be assessed against prior knowledge while being assessed against specific LOs to gauge the cognitive progression of the student and to validate AoL. The assessment framework at the Program level would also need to be bounded by a measure of expected knowledge gauged from the LOs of any pre-requisite UoS and the overall Program curriculum.

In order to ensure uniformity in analysing the concept maps across the continuum of expected, prior and learnt knowledge it would be beneficial to implement a standard assessment rubric to assess the maps quantitatively for structure and content and then qualitatively at a higher level through the integration of Biggs SOLO Taxonomy descriptors to assess the ‘quality’ of learning through analysis of the linking phrase.

The assessment model would need to be iterative, cycling through individual or group assessments, correction through expert intervention and feedback. This cycle would mitigate the free-rider issue in group assessment; providing an opportunity for reflection and feedback as well as providing the student with the opportunity to take responsibility for their own learning, through a process of self and peer assessment to complete the learning cycle (Willey & Gardner | 2008).

In order to assess teaching proficiency the DCM process would have to support the contemporaneous assessment of student-developed maps.
Comparative analysis of a composite of the cohort’s maps can be presented as an overlay with the expert maps (EM) as a background template. This would also support effective and timely feedback.

An assessment framework embracing DCM in the broader AoL model as discussed above would require the domain expert to ensure that:

- LOs were defined and attached to concept map snippets to allow assessment and validation of the current AoL process;
- curriculum linkage maps were developed based on lecture summaries to allow curriculum mapping;
- curriculum profiles were developed to show sequencing and cover of specific curriculum concepts;
- EMs were created for each phase of the assessment task to allow assessment of teaching proficiency through comparative mapping;
- instruments to assess cognitive progression based on the assessment of student-developed concept maps for structure (concepts and linkages) were identified;
- instruments to assess cognitive retention based on iterative processes for assessing and validating prior knowledge were identified;
- a process for the collection, analysis, and dissemination of assessment information for contemporaneous analysis was developed and implemented; and
- a process for the provision of contemporaneous feedback was developed and implemented.

**Conclusion:** A broader definition of Assurance of Learning encompassing curriculum management; teaching proficiency and cognitive progression and retention can be validated using a dialogic concept mapping process employing comparative analysis and contemporaneous feedback.
5.2. **Dialogic Concept Mapping**

This section considers the dialogic concept mapping process for its suitability in the assessment of changes in understanding of threshold concepts, which can be used to validate cognitive progression and retention.

5.2.1. **Concept mapping as an instrument of assessment**

*Can a dialogic concept mapping process be used as an instrument of assessment?*

All assessment techniques have limitations and concept maps are no different. The amount of training provided to both instructor and student can have a significant impact on the quality of the resulting concept maps and, therefore, their usefulness as an assessment technique. When first introduced, assessments based on concept maps, can often take more time than other assessment techniques in terms of their creation and their evaluation. Mayer (1997) hypothesised that the specific macrostructure signalled by a map might guide the knowledge construction of less knowledgeable students but conflict with the cognitive structures already established in more knowledgeable students.

However Hay (2007) has shown that the learning curve for the introduction of concept mapping is easily managed within a short time frame and most students are not disadvantaged in any way. Additionally it assists many students with different learning styles. The process of constructing a concept map assists students in building a deeper, more meaningful understanding of content (Novak & Gowin | 1984). As such they are a visual representation of a student’s mental framework of a knowledge space at a particular point in time, providing a reader of student-developed concept maps with an alternate view of a student’s knowledge domain (Suen *et al.* | 1997).
Further concept maps are normally portrayed in a hierarchical format but impose no conventional reading order. Hence their integration into a dialogic concept mapping process can trigger meta-cognitive engagement encouraging deep learning strategies through the act of processing meaning (Novak & Gowin | 1984) which is a prerequisite to cognitive progression and retention.

Many studies have been undertaken by researchers with different concept mapping (CM) tasks and analytical techniques to develop CM assignments that provide effective assessment of student knowledge. Quantitative scoring frameworks have been offered by Novak and Gowin (1984). McClure et al. (1999) considered techniques that involved assigning a numerical quality rating to each proposition in a concept map. Qualitative scoring frameworks suggested by Kinchin et al. (2000) analyse concept maps based on structure classifying them as ‘spoke’, ‘chain’, or ‘net’. Williams (1998) focused on concept manipulation, Henderson et al. (1994) and Starr and Krajcik (1990) analysed how concept maps developed over a continuum exhibit progressive differentiation. This was extended by Fellows (1993) who examined how maps display changes in conceptual understanding over time. Foos (1995) analysed the use of summaries in the form of concept maps to boost recall of summarised ideas. This allowed the information to be reviewed quickly in a concise format providing learning support similar to other concise summary formats such as lists and indented outlines (O’Donnell et al. | 2002).

Overall, extant research indicates that concept maps facilitate learning in a variety of instructional conditions including different domains and educational levels (Nesbit & Adesope | 2006). One of the main benefits of concept maps is highlighting the learning domain’s macrostructure (O’Donnell et al. | 2002).

By providing a response to an assessment task as a concept map, a visual representation of a mix of correct information, misconceptions and inconsistencies can be revealed. The maps can then be analysed for gaps that are apparent in a student’s knowledge. Such gaps may not only be
representative of missing concepts, they may also suggest that relationships have not yet been made between concepts in a student’s cognitive structure or that incorrect conceptual relationships have been developed. This review of understanding might also identify teaching issues whereby the linkage between concepts had not been well expressed and hence not well understood by the student cohort, providing both a mechanism for measurement and improvement of learning quality (Radix & Addool | 2013) and as an indicator of teaching proficiency based on measures of student outcomes “wherein the learner actually acquires, to some reasonable and acceptable level of proficiency, what the teacher is engaged in teaching” (Fenstermacher & Richardson | 2005:191).

Concept maps lend themselves to many forms of automation. Concepts, links, and linking terms can be counted in various ways to assess structural complexity of a students’ knowledge (Kinchin et al. | 2000; Ruiz-Primo et al. | 2001). Structured or closed-ended CM tasks where the student is provided with a predefined list of concepts are relatively easy to assess and can be scored using various software applications (Herl et al. | 1996). However, open-ended CM, where participants may use any concepts and linking terms in their maps, is proposed as the gold standard for capturing students’ knowledge structures (McClure et al. | 1999; Ruiz-Primo et al. | 1999; Yin et al. | 2004). But automatically scoring open-ended concept maps is considerably more difficult as shown by Clariana et al. (2005) who piloted a technique for scoring them using the software ALA- Mapper.

**Conclusion:** A dialogic concept mapping process is suitable for use in a multi-phased assessment task and hence can be used to assess cognitive progression. However, consideration needs to be given as to the form of concept mapping employed due to the time constraints imposed through the requirement to have the data collection within a single Unit of Study. The ultimate form of concept map assessment and feedback was determined after several pilot studies (see Chapter 6).
5.2.2. Threshold Concepts as an authentic assessment target

*Are changes in understanding of threshold concepts a viable metric for validating cognitive progression and retention?*

Threshold concepts (TCs) are defined as “concepts that bind a subject together, being fundamental to ways of thinking and practicing in that discipline,” (Land *et al.* | 2005:53). They differ from core or main concepts, the conceptual building blocks of disciplinary knowledge, in that understanding a TC can fundamentally change one’s understanding of a discipline in ways that understanding a core concept does not. Meyer and Land (2006:6) deem TCs to be:

- **transformative:** in that, once understood, their potential effect on student learning and behaviour is to occasion a significant shift in the perception of a subject, or part thereof;
- **irreversible:** in that the change of perspective acquired is unlikely to be forgotten, and often difficult to unlearn;
- **integrative:** in that it exposes the previously hidden interrelatedness of something;
- **bounded:** in that the conceptual space will have boundaries within the subject discipline or between inter-disciplinary areas; and
- **troublesome:** in that often the discursive practices within a discipline make familiar concepts strange and subsequently conceptually difficult to assimilate leading to unwitting reinforcement of misconceptions. In auditing, the use of the terms like ‘true and fair view’ has been shown to be problematic and this issue is compounded when combined with English as Second Language (ESL) students. (adapted from Meyer & Land | 2006)
Meyer and Land (2006: 16) argue that students who have difficulty understanding particular TCs find themselves in a “state of liminality, a suspended state in which understanding approximates to a kind of mimicry or lack of authenticity”. When learners in this state encounter TCs they are not yet prepared to assimilate, they experience disjunction; this disjunction is exactly the place where engaged pedagogical interventions can be transformative.

Concept mapping (CM) is a method to visualise the structure of knowledge (Kinchin | 2013). Since the knowledge expressed in the maps is mostly semantic, concept maps are sometimes called semantic networks. Often it is claimed that CM bears a similarity to the structure of long-term memory (Lupion Torres et al. | 2009). Instead of describing all concepts and their relations in text, one may choose to draw a map indicating concepts and relations in a graph or network. Visual representation has several advantages (Eppler | 2006). Visual symbols are quickly and easily recognised, and this can be demonstrated by considering the large amount of logos, maps, arrows, road signs, and icons that most of us can recall with little effort. Visual representation also allows the development of a holistic understanding that words alone cannot convey, because the graphical form allows representations of parts and whole in a way that is not available in sequential structure of text (Lawson | 1994).

When progressively mapping TCs within a knowledge space it can be considered ‘akin to a portal opening up a new and previously inaccessible way of thinking about something’ (Meyer & Land, 2003:5) representing a statement of understanding, or interpreting, or viewing something without which the learner cannot appropriately progress (Meyer & Land | 2003; 2006). The consequence of articulating a TC space is a transformed internal view of discipline matter and hence a broader landscape. This transformation is seldom sudden but with the use of dialogic concept mapping could be both guided and assessed over a defined period of time. This would allow
immediate identification and management of misconceptions supporting the transition to understanding of discipline specific troublesome concepts. Such a transformed view or landscape may represent how people think in a particular discipline, or how they perceive, apprehend, or experience particular phenomena within that discipline. In selecting the TCs to be monitored and assessed within a knowledge domain it is important to ensure that the transformed understanding itself does not lead to a narrow or dominant view of understanding. This aspect of TC selection is outside the scope of this study but would play an important role in curriculum management at the Program and Unit of Study level.

5.3. **Demonstration of Curriculum Management**

This section considers curriculum management, the cornerstone of the AACSB validation process for Assurance of Learning. In the broader Assurance of Learning process it also encompasses many administrative processes including curriculum alignment and curriculum mapping.

The definition of ‘curriculum’ is difficult and contested in educational literature (Burton & McDonald | 2001). For the purpose of this study we will use curriculum management as defined by the AACSB on its website (AACSB | n.d.\(^{11}\)) which refers to an educational institution’s “processes and organization for development, design, and implementation of each degree program's structure, organization, content, assessment of outcomes, pedagogy, etc.” It is an iterative process involving the determination of learning goals (LGs) and the design and ongoing revision of program content, pedagogies, and structure to achieve the LGs.

\(^{11}\) Curricula Management Retrieved [1 May 13] from:

Since the LGs are established ‘within and across the curriculum’ context, the next step is to ensure that the curriculum addresses the LGs (Fogarty | 1991). Ideally this occurs in a number of Units of Study (UoS). That is, there should be clear evidence that the work students are doing in one or more UoS directly supports student achievement of the LGs. The more places in a curriculum that support one or more LG, the greater the probability of student success. For example, goals that address oral presentation skills, critical thinking skills, problem-solving skills, etc. can be addressed in a variety of UoS regardless of the content area. The alignment of LG and curricula is critical. If LGs are adopted but are not addressed in the curricula, any value in the outcomes assessment process will be diminished (Driscoll & Wood |2007).

Curriculum management inputs come from developments in business practice, requirements of professional bodies and are influenced by Assurance of Learning (AoL) results. AoL refers to processes for demonstrating that students achieve learning expectations for the Programs in which they participate. At the UoS level learning expectations are stated in terms of learning objectives.

Curriculum management encompasses the many administrative processes and procedures involved in maintaining accurate, up-to-date information about curricula offerings. Two such processes are curriculum mapping and curriculum alignment.

### 5.3.1. Support for Curriculum Mapping

*Can dialogic concept mapping be used in support of curriculum mapping?*

Curriculum mapping, when referring to the alignment of learning standards and teaching is the process of indexing the proposed content to be taught to identify and address possible academic gaps, redundancies, and misalignments. Curriculum mapping can help both staff and students by
displaying key elements of the curriculum, and the relationships between them. Students can identify what, when, where and how they can learn. Instructors can be clear about their role in the big picture. The scope and sequence of student learning is made explicit, links with assessment are clarified and curriculum planning becomes more effective and efficient.

Curriculum mapping improves the quality assurance process with curriculum management (Willett | 2008). It is often undertaken using computer-based solutions (Willett | 2008; Prideaux | 2003) but this does not appear to be driven by educational beliefs or philosophies but by a premise that using technology will improve the process (Harden | 2001).

The resultant ‘curriculum maps’ are normally presented as a visual representation of this experience. This mapping process spatially represents different components of the curriculum so the relationships and connections are easily seen (Harden | 2001). Curriculum maps are functional tools representing operational processes behind what is happening in a program while linking different aspects of a curriculum (Harden | 2001). These are not new ideas, Novak used concept mapping to achieve similar ends (Novak | 1964). Sherborne (2008:1) states that “concept mapping could help curriculum developers and teachers at various stages of the process. The ability of maps to focus on key ideas and their connections may help curriculum designs to survive better the translation into classroom experience, and promote collaborative working methods”.

**Conclusion:** Dialogic concept mapping can be used in support of curriculum mapping, thus providing both student and instructor a visual overview of concepts, sequencing and linkages related to the learning artefacts used in the relevant Unit of Study and in associated Units of Study.
5.3.2. Support for Curriculum Alignment

Can dialogic concept mapping be used in support of curriculum alignment?

The importance of the alignment of curriculum, assessment and instruction, which has been shown to enhance learning outcomes (Squires | 2013), is well understood in higher education (Biggs | 1996). However there are many forms of the curriculum. The planned or ‘intended curriculum’ related to standards and teaching plans; the ‘performed (taught) curriculum’ related to instruction and assessment; and finally the ‘hidden curriculum’, different from the intended curriculum articulated in Unit of Study (UoS) documentation, but the one students have to discover and pay attention to if they wanted to succeed (Synder | 1971).

Consistent with the principle of constructive alignment (Biggs | 1996), Engelland (2004) suggests educators need to evaluate whether students have learned what was intended. By seeking to understand student learning in a contemporaneous manner, instructors receive diagnostic information that can result in actionable changes within a single UoS. Concept mapping used in education for decades (Buzan & Buzan | 2013) and popularised in academia through the work of Novak and Gowin (1984) is a tool that may be used to gauge students' understanding because they make the knowledge construction process visible (Ligorio | 2001).

Creating concept maps fosters instructors’ thinking about the relationship of concepts and topics within a UoS. This information is useful for the instructor but is also very important for students. A combination of concept maps developed by the cohort provides a common visible object for discussion (Hmelo-Silver | 2004) and reveals not only UoS organisation but can be a powerful tool for memory development as well as understanding. Dialogic concept mapping provides an iterative process for checking alignment (Hay |
2008) as students develop an enduring understanding of the foundational or threshold concepts, concepts of significance which are continually revisited in lectures while becoming familiar with additional concepts that have a supporting role at the periphery of the concept map.

**Conclusion:** dialogic concept mapping of threshold concepts can provide a contemporaneous mechanism for assessment and feedback necessary to ensure curriculum alignment especially with the performed (taught) curriculum thus supporting assessment of teaching proficiency.

### 5.3.3. Knowledge Space Theory in Discourse Pathways

Can the constructs of knowledge space theory be used to provide guidance on the use of discourse pathways within a concept mapping assessment task?

Knowledge Space Theory (KST) is a mathematical theory representing the state of a student’s knowledge space, at a precise point in time using a series of assessments (Doignon & Falmagne | 1999). Providing a theoretical framework for structuring knowledge domains and for representing the knowledge of learners, KST reduces the number of possible questions asked of a learner to an optimal set based on a surmise relation stemming from the observation that some pieces of knowledge may imply other pieces of knowledge (Steiner et al. | 2009).

A plausible prerequisite diagram of mastery dependencies as shown in Figure 25 suggests that mastery of problem $b$ is, for instance, a prerequisite for the mastery of problem $e$. In other words, the mastery of problem $e$ implies that of problem $b$.

**Figure 25:** KST Prerequisite Diagram
Source: Adapted from Steiner et al. (2009)
KST provides a theoretical framework within which the knowledge or competence state of a learner can be determined through an efficient adaptive assessment procedure, presenting the learner with only a subset of all possible problems. When aligned to assessments, linking expected knowledge, prior knowledge, taught knowledge, learnt knowledge, adjusted knowledge and retained knowledge can be viewed as representing a continuum. As a student masters dependent concepts, moving further along the continuum or pathway of prerequisites the deeper is the understanding of the discipline matter.

The term discourse pathway is introduced by this study to allow the visualisation of a pathway of prerequisites, represented on an EM developed as a template to assess student-developed concept maps. Further, using a structured assessment framework should ensure that assessment continued to revisit threshold concepts allowing real time, within a Unit of Study, analysis and confirmation of cognitive progression and retention. The use of concept maps within such a framework can also support a representation of the learner’s current state of knowledge in relation to the expert framework offered by the instructor. Such a comparison would provide a personalised learning pathway for the student; ensure validation of cognitive progression; minimisation of misconceptions; and support cognitive retention and recall.

Cathcart et al. (2010) used a modified KST framework to analyse concept maps reporting that it proved useful in the comparative analysis of students’ concept maps when reviewed against their instructor’s expert concept maps. Cathcart generated composite maps for each lecture topic and systematically summarised the knowledge spaces represented by the students’ concept maps in comparison to the instructor’s expert concept map. Then by calculating the frequency, with which the propositions from the instructor’s concept map appeared on student’s concept maps, Cathcart was able to systematically highlight the differences in knowledge structures between the students and the instructor. As such “despite the uniqueness of each concept mapping
lecture topic, we were able to compare students’ knowledge spaces across time, because some of the same concepts appeared in several of the assigned concept maps for different lecture topics” (Cathcart et al. | 2010:955).

A learner's knowledge is often the key aspect towards which personalised eLearning systems attempt to adapt. However, the assessment of knowledge usually involves tedious and time consuming questionnaires or making stereotypical assumptions about what a student knows. KST (Doignon & Falmagne | 1999; Albert & Held | 1999) could offer a means of efficiently and effectively determining the current knowledge of a learner and then tailoring subsequent personalised knowledge delivery based on validated cognitive progression. Since KST supports a generalised assessment procedure, it should be applicable to assessing student knowledge in any discipline.

**Conclusion:** the constructs of Knowledge Space Theory offers a framework within which to develop a grading metric based on the assumption that assessment tasks related to concepts identified further along the discourse pathway can be based on an assumption of an understanding of pre-requisite concepts and linkages encountered previously on the discourse pathway.

**5.4. Demonstration of Teaching Proficiency**

This section considers teaching proficiency, in the broader Assurance of Learning process as defined by this study, to observe if it can be assessed through the contemporaneous analysis of student-developed concept maps focusing on structure when compared to the expert maps.
5.4.1. Validating the taught curriculum

In validating the taught curriculum, La Marca et al. (2000) emphasised that assessments must allow students to demonstrate their knowledge and skills with respect to the expectations set in the curriculum framework allowing appropriate interpretations of their performance.

Historically, methods for measuring and assessing what is taught have been relatively weak, due in part to the high cost related to obtaining accurate and reliable data, typically collected through classroom observation (Rowan et al. 2004). Curriculum management provides a measure as to whether students are offered the opportunity to learn. This is defined as whether or not students are scheduled as per the curriculum to study a particular topic or learn how to solve a particular type of problem presented by an assessment (Floden et al. 2002). Instructional alignment connecting topic coverage, instructional segments, and levels of cognitive complexity of instructional segments provides further alignment process, but again, it does not provide a measure of teaching proficiency.

A dialogic concept mapping (DCM) process overcomes these limitations by support for the assessment of student-developed concept maps submitted in response to assessment tasks. This provides the instructor the opportunity to assess the cohort’s understanding and representation of the context of the assessment task. Comparison to the expert map prepared for the assessment task provides a mechanism by which the instructor can identify differences in expected representation and actual cohort knowledge representation.
The DCM process therefore can provide a measure of teaching proficiency. First it identifies areas where the cohort’s knowledge representation is not as expected, and second, it provides context allowing the instructor to assess the extent of any misunderstanding. In a concept mapping response differences could relate to missing concepts or missing or incorrect linkages. When linked to the discourse pathway (see section 5.3.3) the instructor can also assess the possible consequences in relation to the broader knowledge domain.

**Conclusion:** a dialogic concept mapping process implementing a multi-phased assessment using expert maps can provide a mechanism for assessing teaching proficiency in relation to content coverage and cognitive assimilation.

### 5.4.2. Understanding the language of the subject

If a dialogic concept mapping process were used in a multi-phased assessment task, how would the teaching process cater for the early part of the Unit of Study when students do not have a good understanding of main concepts and linkages?

When students undertake a Unit of Study (UoS) it is important to cater for the fact that everyday language use is different from discipline-specific language (Coyle *et al.* | 2010) or the language which is used in textbooks, which predominantly approximates to discipline-specific language. Over time, researchers have accumulated a body of evidence that links students’ word knowledge to their academic success. To learn specialised words, such as the discipline-specific vocabulary students must know the context associated with the word (Armbruster & Nagy | 1992).

Vocabulary learning is an indispensable process, especially for English as Second Language learners, in order to acquire proficiency and competence in the target language. Word power facilitates fluent speaking and effective
writing. It supports a learner’s acquisition and presentation of knowledge (Nagy et al. | 1985). Students learn words incidentally through reading (Kim & White | 2008) and through exploring word meanings and nuances in writing and discussion. They also learn from listening to texts read aloud, especially when teachers scaffold this learning through elaboration, example, and definition (Beck et al. | 2002; Bauer | 2000). Discipline vocabulary is generally not specifically taught in higher education institutions, but there are a number of teaching strategies that could be employed mainly related to opportunities to experience words in context, and opportunities to use the words in discussion (Stahl & Fairbanks | 1986).

Learning a discipline is always inextricably linked with learning its language. Concept mapping can be helpful in promoting an understanding and integration of new discipline-specific vocabulary (Moreira | 1985). A good concept map should consist not only of concepts with simple labels, but linkages showing the relations between them (Novak & Cañas | 2006a). A concept can contain links to external resources and possible clarifying texts. If the concept is itself a complex concept, which would benefit from a concept map to explain itself, this is implemented by cross-linking the concept to other concept maps or subsections of a map.

However, drawing concept maps early in a UoS would necessitate ensuring that relevant concepts were not only understood and could be used in context, but more importantly could be recalled in unstructured or structured settings. A learning strategy based on concept mapping stimulates a student’s prior knowledge. “In classrooms with students from linguistically diverse backgrounds, instruction should explicitly activate this knowledge” (Cummins et al. | 2005:38).

The dialogic concept mapping process is a mechanism that allows instructors to reinforce discipline vocabulary. This also supports students to iteratively create and modify concept maps as new material becomes more understood and integrated into their personal knowledge domain. Further if the
assessment uses structured or closed-ended concept mapping (see Section 5.2.1) where list of concepts are provided for selection in student-developed maps, a student’s response will be focused, without being too prescriptive.

**Conclusion:** A dialogic concept mapping process provides a suitable platform to introduce discipline-specific language.

### 5.4.3. English as Second Language (ESL)

*Will the implementation of a dialogic concept mapping process be useful or disruptive for English as Second Language students?*

When used in teaching and knowledge assimilation, concept mapping may help English as Second Language (ESL) students to tie new information from the text at hand to prior knowledge assisting the assimilation of difficult vocabulary. Drawing from social constructivism theory and Vygosky’s (1962, 1978) zone of proximal development, many researchers view language not merely as a tool for social interaction but playing a crucial role in the development of cognition (Klein | 2006). Wallace (1992) argues that in order to interact efficiently with text, the ESL reader needs access to content as well as context, drawing on appropriate schematic knowledge to reach satisfactory interpretation of the text. Concept maps support these necessary schemas offering visual connections between multiple concepts.

If ESL is an issue currently within the Faculty, it might be accentuated when assessing students’ work at a micro level in terms of linking phrases in concept maps. When assessing student writing, Burt and Kiparsky (1975) provide a meaningful distinction between ‘global’ errors (ones that seriously obstruct communication causing native speakers to misunderstand a message) and ‘local’ errors (ones that are isolated sentence elements that make a
structure in a sentence awkward, without hindering the comprehension of the message). These results suggest difficulties may arise when assessing individual phrases and that a manual marking process is required to allow a subjective assessment of such errors.

In a dialogic concept mapping process the advantages of studying worked-out maps in comparison to map construction, as reported by Hauser et al. (2006) can be catered for by providing concept maps for lecture summaries and expert maps for assessment tasks.

**Conclusion:** English as Second Language students will benefit from concept mapping used in a dialogic concept mapping process but any feedback and marking mechanism will need to cater for local errors as expected in linking phrases.

### 5.4.4. General Feedback

**How can a dialogic concept mapping process support contemporaneous feedback mechanisms?**

The potential of feedback in promoting effective student learning has been well articulated by various researchers (Hattie & Timperley | 2007; Shute | 2007). Feedback plays a critical role in helping students close the gap between current and expected understanding, by clarifying misconceptions and identifying flaws in learning strategies and skills (Sadler | 1989). It also contributes to student self-regulation through the provision of focused, almost personalised, learning artefacts aligning personalised learning strategies to task demands and progress (Pekrun et al. | 2002). In its most productive forms, feedback goes beyond the development of students’ knowledge or skills in the “direction of nurturing students’ capabilities for independent judgment, problem-solving, self-appraisal and reflection” (Yang & Carless | 2013:286).
Feedback is, however, frequently reported by students to be inadequate in helpfulness, timeliness, consistency, specificity and clarity (Bailey & Garner | 2010). The structural limitations of mass higher education are also a barrier to the development of effective feedback processes (Hounsell et al. | 2008). These compound the difficulties faced by instructors, but they are often complicit through their inattention to the complexities of the feedback process. Feedback remains a perennial source of discontent amongst students because they seek timely and helpful dialogue about their progress (Yang & Carless | 2012).

However recent research (Artino | 2008) has found that the effectiveness of instructional materials, in this case feedback, is dependent on the expertise of the learner. There is an interaction between prior knowledge levels of learners and the amount of information included in instruction. In some circumstances, information that is essential for a novice has been found to be redundant for those with more expertise. This interaction is called the expertise reversal effect because, with increasing levels of expertise, strategies that are effective for novices have been shown to be ineffective for more knowledgeable students (Kalyuga et al. | 2003). As a rule, inexperienced learners need much more guidance than more experienced learners in any particular domain (Mayer | 2001; Renkl & Atkinson | 2003). Worked examples, for instance, are very effective for novices but as expertise develops (resulting in more sophisticated personal schemas), a problem-solving approach may be superior (Kalyuga et al. | 2001). This would suggest that there is not a ‘one size fits all’ feedback mechanism.

Often it takes days or weeks for instructors to complete the evaluation of student-developed concept maps; therefore, the students often cannot receive feedback immediately (Ingeç | 2009). Denton et al. (2008) indicated that instructors confront a number of challenges if they wish to return meaningful and contemporaneous feedback to individual students. Therefore, providing such feedback for complex learning tasks such as the development of concept
maps has become an important and challenging issue (Denton et al. 2008; Hwang et al. 2010).

When feedback mechanisms are considered specifically in relation to a dialogic concept mapping (DCM) process, not only does it have to be relevant and timely but it must be sympathetic to integration with student-developed concept maps. Further the timing of the provision of feedback during a multi-phased assessment is vitally important and should not only be presented sequentially during the assessment task but validated in subsequent parts of the overall assessment task. The feedback should be in relatively frequent and manageable chunks so that the requirements for improvement are both understandable and achievable (Brookhart 2007). van Merriënboer et al. (2003) have argued that sequential order is particularly important in areas of high element (many concepts) interactivity.

It is also important to focus on what is being assessed and what feedback might entail in a DCM process. When students use concept maps to answer an extended response question in higher education it would be unusual for there to be a single acceptable response. Quality feedback generally does not involve comparison with peers, but instead helps students to understand their own performance in relation to the learning goal. However in this particular study an additional feedback mechanism based on the ‘peer group’ or the whole cohort may be beneficial, showing a student’s position relative to the cohort and focusing on group based tutoring to answer general rather than specific questions.

Formal peer assessment, assessment of students by other students, was deemed innovative (Li et al. 2010). In the DCM process the assessment can be related directly to other students’ responses presented as a composite map of all responses overlaid on the expert map developed by the instructor. This would mean instructors would set the criteria, but students can be involved through their own responses in the final judgements made of other student’s work providing evidence of achievement (Biggs 1999).
This format could work well for assessing concept map structure but would need tailoring for assessment of linking phrases. There are obvious benefits in this model as instructors can focus on managing the processes rather than assessing large numbers of students directly (Boud | 1990).

**Conclusion:** a dialogic concept mapping process can support timely and effective feedback for concept map structure through the use of composite maps of the cohorts’ responses to assessment tasks.

### 5.4.5. Visual Feedback Mechanisms

_A dialogic concept mapping process is by default a visual process and, therefore, feedback mechanisms integrated within the process should also be visual. In assessing concept maps, various marking regimes have been used in prior research (Gouli et al. | 2003; Gurlitt, J & Renkl | 2010; Hay & Kinchin | 2008; Ruiz-Primo | 2004). This study uses a concept map structure (concept selection and linkages) for assessing learning objectives and linking phrase analysis for assessing relevance to the discipline, assessment task and finally for linguistic acceptability related to the broader Assurance of Learning._

The visual presentation of structure from the student-developed concept maps provides a form of a peer group composite map presented on the expert map (EM) as a background. This EM background would highlight the discourse pathway shown in as a heavy red line and data can be inserted in the concept and linking phrases to reflect the number of respondents selecting the concept and the relevant link (see Figure 26).
The resultant composite map benefits from a colour coded scheme highlighting the header concept bordered in grey with number of students selecting the concept shown as A, threshold concept bordered in maroon with the number of students selecting the concept shown as B; main concepts bordered in red with the number of students selecting the concept shown as C; associated concepts bordered in blue; and other concepts bordered in yellow.

**Figure 26:** Dialogic Concept Mapping Visual Feedback

The number of linkages between the various main concepts (D) on the discourse pathway; (E) on alternate pathways between main concepts; and (F) linking other concepts can be inserted in the linking phrase location. The more advanced analysis of linking phrases for relevance to the discipline and assessment task and finally for linguistic acceptability can be best presented in a tabular format.

**Conclusion:** visual feedback mechanisms are valid for use in a dialogic concept mapping process but their selection will depend on the complexity of the information to be provided.

### 5.5. Demonstration of Cognitive Progression and Retention

This section considers mechanisms by which to demonstrate cognitive progression and retention, the correction of misconceptions and the use of Biggs SOLO Taxonomy as a metric for assessing both relevance and complexity within a dialogic concept mapping process.
Ausubel (1963), Gagné (1965), Bruner (1965) and Glaser (1984) provide a continuum in the psychological analysis of cognition related to discipline-matter learning. Knowledge is often presented in an unstructured, non-linear way and a high level of competence can only be achieved when it is integrated with prior knowledge appearing organised and coherent. Without clear definitions of how students represent knowledge and develop competence, arriving at valid inferences about students’ thinking processes, including misconceptions, strengths, and abilities, and effective support for student learning, is questionable (Shavelson | 2009).

Biggs SOLO Taxonomy describes differences in cognitive activities within and among individuals and assumes major stages or levels of development are part of a process of continuously developing relational and abstract understandings. When applied to the assessment of linking phrases within a dialogic concept mapping process it offers a measure of cognition in both the general discipline when viewed in expert maps and context when assessed in student-developed concept maps offered as responses to assessment tasks.

**5.5.1. Cognitive progression as a yardstick.**

*Can a dialogic concept mapping process that is used to assess also be used in support of learning progression?*

By its very nature, learning involves progression. Learning is envisioned as a development of progressive sophistication in understanding and skills within a domain. To assist in its development instructors need to understand the defined pathways along which students are expected to progress. These pathways or progressions should ground both instruction and assessment. Yet, despite a plethora of standards and curricula, it would appear that many
instructors are unclear about how learning progresses in specific domains (Sikorski & Hammer | 2010). Implicit in progression is the notion of continuity and coherence. Learning is not viewed as a series of discrete events, but rather as a continuum that connects knowledge, concepts and skills within a domain.

Recent work by Sikorski and Hammer (2010) has underscored the importance of clarity for instructors about sequencing the various learning objectives within a Unit of Study (UoS). At present, learning progression theory posits that students’ understanding develops along a logical pathway, characterized by more complex understanding building on simpler ideas. By providing a sequence for learning that undergirds instruction, instructors see connections both in the short and long term. Instructors can normally identify the core principles for assessment and could also draw appropriate inferences about what the student did or did not understand from relevant assessments. However, once assessed Heritage et al. (2009) found instructors had difficulty determining what feedback to give the students to move their learning forward.

Learning or cognitive progression within the higher education environment is often measured at several levels, at the program level against the attainment of broad learning goals; at the UoS level based on an aggregate of students passing or failing, often tied to a more focused attainment of learning objectives (LOs); and at the individual student level, reflected in an individual pass or fail score with additional qualifiers such as credit, distinction, and high distinction and based on a range of assessment techniques.

Progression would suggest that any framework should reflect and measure learning against a well-defined expected level of knowledge as a continuum including expected knowledge, prior knowledge, learnt knowledge, adjusted knowledge throughout the learning period and finally after completion of the UoS or the start of the next UoS, retained knowledge.
In providing such a seamless link between UoS a degree program can be viewed as requiring an assessment continuum. This is akin to a knowledge value chain where LOs at the UoS level are achieved not merely through passing an embedded final examination, but subjected to “continuous review” to help identify and correct misconceptions, allowing a student to move to more advanced UoS with a solid grounding in prerequisite knowledge.

Historically, assessment within a UoS was generally limited to material presented during that UoS. Today, there is greater interest in measuring the retention of knowledge over time. As Berenson et al. (2008:54) states “[i]n developing a retention assessment program, three questions must be addressed: (1) How do we know if students have learned? (2) How do we know what students have learned? (3) How do we know what students have retained?”

When considering an assessment framework it is important to recognise that there are significant variations from student to student as to which parts of the core content have been learnt and can be recalled, learnt and forgotten, never learnt or, most importantly, misunderstood but forming the basis for new knowledge assimilation. Keller et al. (2007) expresses this phenomenon as differential learning and suggests that in order to try and assess all of the above leaning outcomes any framework should assess continually and over the continuum of learning.

That is not to say that current assessment models do not have a solid basis for acceptance, but more to suggest that supplementary assessment techniques can be used to develop and assess a more meaningful understanding of what students have actually been taught, have learnt and finally retained (Freeman & Urbaczewski | 2001). This assessment continuum would then benefit from the integration, into current assessment frameworks, of a measurement rubric that was generic in nature and allowed ease of assessment of both the LO at the program and UoS level and the final classification of achievement obtained by each student.
However in a challenge to conventional learning progression theory, Shavelson (2009:8) points out students may not learn that way, and in fact, “their learning might be complex and idiosyncratic”. In a cognitive and instruction approach to learning progression, Shavelson (2009:18) posited that learning is better characterised as “wandering through a complex memory network composed of bits and pieces of information”.

**Conclusion:** a dialogic concept mapping process can be used to support and assess learning or cognitive progression whether it is structured as suggested by Heritage or disjointed as suggested by Shavelson.

### 5.5.2. Misconceptions and Prior Knowledge

*Can a dialogic concept mapping process be used to assess prior knowledge and identify and correct misconceptions?*

As concept mapping is an active learning process allowing new knowledge to be related to and integrated within a student’s existing knowledge structures, it lends itself to support an iterative assessment framework. A student’s initial concept maps can be assessed and then updated as new learnt knowledge is assimilated. In turn this can support meaningful learning in that a deliberate effort is made by the student to link new knowledge with higher-order, more nuanced concepts within their individual cognitive domain (Novak | 2002).

Such an iterative framework embracing a dialogic concept mapping process may even be able to support the whole knowledge continuum linking expected knowledge from prior learning experience, actual prior knowledge and finally acquired and retained knowledge during and after completing a new learning experience.
In the University of Sydney Business School, learning objectives (LOs) and subsequent assessments tasks are Unit of Study (UoS) specific, with the linkage between different UoS providing a pathway to a defined degree (Program) of study such as Master of Commerce (MCom) or Master of Professional Accounting (MPAcc).

Assessment within a UoS is a mixture of qualitative and quantitative assignments. A final examination is often used and generally it is worth over 50% of the final mark for the UoS. If a student does poorly but passes the UoS, there are limited formal mechanisms to ensure that misconceptions (faulty extensions of productive prior knowledge) developed during a UoS and expressed in the final examination are identified to the student or corrected prior to the student moving on to a more advanced UoS.

The issue of misconception in prior knowledge should be of concern to the instructor, and just as important to other faculty in the overall Program where a UoS uses the competencies learned in any pre-requisite UoS (Baker | 1994; Ammons & Mills | 2005). If the misconceptions are persistent and allowed to mature over the learning Program they develop a resistance to change and are likely to have severe consequences for the student and their employer (Clarke | 2009).

Research demonstrates that instructors need to identify and directly address misconceptions in order to facilitate learning (Donovan & Bransford | 2005). Garnett and Treagust (1992) suggested that instructors should regularly diagnose misconceptions in prior knowledge before proceeding with new teaching. Correcting misconceptions is not merely a process of replacement of misconceptions with new expert knowledge as this oversimplifies the changes involved in learning or relearning complex subject matter. “The goal should not be to exchange misconceptions for expert concepts but to provide the experiential basis for complex and gradual processes of conceptual change” (Smith et al. | 1993:154).
The presence of misconceptions at a UoS level might not in itself compromise any Assurance of Learning (AoL) process focused at the Program level, but it does concern professional organisations whose expectations are that students will be well rounded in basic concepts at a micro level, and that these concepts will be reinforced and developed as a student progresses along a continuum of learning (Bruce | 1996). In some disciplines like Information Systems, they have begun to address validation in the form of AoL at a lower level providing guidelines concerning LOs at the UoS level (AIS | 2002).

Prior knowledge relates to a knowledge space, which is present before undertaking new instruction and gaining new knowledge (Gurlitt & Renkl | 2010). The assimilation theory of meaningful learning (Ausubel | 1968) places prior knowledge at its core. Schneider et al. (1989) showed that prior knowledge compensated for low aptitude, while high aptitude could not compensate for low prior knowledge. Dochy (1992) concluded that a learner’s prior knowledge is a major factor in any variance in learning outcomes, emphasising that more attention should be paid to this aspect of learning. Although Ausubel (1968) emphasised the importance of prior knowledge, he did not provide educators with simple functional tools to assess and activate prior knowledge (Novak & Gowin | 1984). Another issue with prior knowledge is to establish whether students have misconceptions or merely lack the ability to recall retained knowledge (Hailikari et al. | 2008).

In the theory of multimedia learning Mayer (1997) proposed that meaningful learning occurs when students select, organise, and integrate relevant visual and verbal information. Kintsch (2001) in his construction–integration theory of text comprehension believes that word decoding is followed by the subsequent construction of propositions stated in the text and finally links are formed between nodes in the knowledge space. Kintsch (2004) suggests that prior knowledge is activated automatically through words and propositions in the text, suggesting that there is some value in ‘prior knowledge activation’ in
the sense that it increases the \textit{a priori} activation of specific nodes in the knowledge space.

Students need to understand the knowledge space they are expected to develop, particularly in introductory courses that typically cover a broad range of material in a short time period. The lack of ability to quickly discern if material is important in a knowledge space inhibits long-term learning and is especially important for English as Second Language students. (Meuter | 2009). As Dudley and Marlow (2005) observe, learning the language in any discipline, is the first step in mastering the knowledge space of a UoS and hence is a major component in the introductory UsoS in any Program.

Based on Ausubel’s theory of assimilation, Novak and Gowin (1984) recommended concept maps as a means for students to articulate their prior knowledge before studying new materials. Additionally Gouveia and Valadares, (2004) demonstrated concept maps at the UoS level as being valuable in identifying misconceptions and in restructuring learning artefacts.

**Conclusion:** a dialogic concept mapping process can be used to assess prior knowledge from a prerequisite Unit of Study throughout a Program of learning. It can also be used within a single Unit of Study to assess prior knowledge by using a multi-phased assessment task.

### 5.5.3. Biggs SOLO taxonomy as an assessment rubric

Can Biggs SOLO Taxonomy be used as a rubric to assess cognitive progression and retention in a multi-phased assessment task based on a dialogic concept mapping process?

Biggs’ Structure of Observed Learning Outcomes (SOLO) Taxonomy as a conceptual framework for exploring a student’s cognitive growth supports the
analysis of the relationship between cognitive structure and actual responses to learning tasks and how they change over time. This makes it possible to infer a hierarchy of responses that reflect learning (Biggs | 1999).

At the degree (Program) and Unit of Study (UoS) level learning objectives (LOs) are typically expressed in behavioural terms and there have been several studies undertaken in an attempt to provide qualitative approaches to the examination of such LOs. One such model proposed by Biggs was SOLO which classifies learning outcomes in terms of their complexity (Level 1 = Prestructural; Level 2 = Unistructural; Level 3 = Multistructural; Level 4 = Relational; Level 5 = Extended Abstract), supporting the ability to then assess a student’s work in terms of its quality and attainment of a higher level of understanding.

Brabrand and Dahl (2008) undertook a study in Denmark applying SOLO to the verbs in the different LOs of over 550 syllabi from the science faculties at two universities with a view to providing a quantitative value conversion from the qualitative base of the taxonomy. In analysis of the verbs in the LOs related to expected knowledge, the SOLO classifiers unistructural (U) and multistructural (M) were identified with mostly quantitative outcomes and the SOLO classifiers relational (R) and extended abstract (EA) were identified as more qualitative in nature. The SOLO classifier prestructural (P) was not included as it was felt that no teaching activity would be deliberately set at this level.

In terms of achieved knowledge McPhan (2008:8) used SOLO classifiers as “an informing framework to interpret variations in structural complexity of student concept maps”. The concept maps were assessed and categorised placing increasingly complex maps within a progression sequence with a view to supporting knowledge assimilation at higher levels.

As advocated by proponents of Outcomes-Based Education; in particular, constructive alignment (Biggs | 2003), a suitable framework for learning
validation in a student-centred environment is one that continually validates learnt knowledge; is integrated with prior knowledge; and further presents the student an opportunity to correct misconceptions during the UoS or as a precursor to more advanced UoS. To develop such a framework would require an instrument to assess student learning with embedded support from a domain expert to ensure that students’ manage the formal representation of a whole body of knowledge, while providing a representation of their personal current state of knowledge. SOLO can then be used to assess the quality of LOs in respect of expected knowledge, prior knowledge, learnt knowledge, adjusted knowledge and retained knowledge with a view to measuring cognitive progression and in turn validating Assurance of Learning.

In establishing the LO within the assessment framework, McConnell et al. (2008) suggests that the type of verb used in the statement of the LO is important. Unfocused verbs like understand, appreciate, study, identify, express, illustrate, classify which tend to state what a student will do are inferior to action verbs like analyse, construct, evaluate, critique, discuss, substantiate, interpret that describe specific abilities or knowledge expected of the student and what they will learn. A good source of actions verbs is Bloom’s Taxonomy (Bloom | 1956) which also offers appropriate verb choices for different levels of learning.

However, Bloom’s learning levels were not developed with university teaching in mind and his taxonomy was not created to develop learning objectives, but to be able to select representative tasks for an examination (Biggs & Collis | 1982:13). Biggs (1988) in further developing constructive alignment developed Biggs’ Structure of Observed Learning Outcomes (SOLO) Taxonomy of learning modes and responses that support the formulation of LOs using “action verbs”, clearly stating what levels of knowledge the students should have by the end of a higher education UoS or
program. Having these outcomes made explicit makes it easier to explain to the students what they are supposed to achieve from a UoS.

Alternatively SOLO can be used to classify linking phrases in terms of their complexity depending on the inclusion of associated concepts. The inclusion of a single associated concept can be defined as unistructural (U) and more than one associated concept as multistructural (M).

Conclusion: A dialogic concept mapping process that supports a student’s cognitive progression and supports the analysis of the relationship between cognitive structure and actual responses to learning tasks using Biggs SOLO Taxonomy can provide a mechanism to infer a hierarchy of responses that reflect learning.

5.5.4. Mapping from Written Texts

Are there alternatives to the dialogic concept mapping process to assess a corpus of student written texts within the confines of a single Unit of Study?

When automating the analysis of a large corpus of texts used over a degree (Program), products like Leximancer, a content analysis tool developed at the University of Queensland in Brisbane, transforms lexical co-occurrence information from natural language into semantic patterns by calculating the frequency and co-occurrence of important concepts within text documents. The system goes beyond keyword searching by discovering and extracting thesaurus-based concepts from the text data, with no requirement for a prior dictionary. These concepts are then coded into the text, using the thesaurus as a classifier resulting in a conceptual map used to explore instances of the concepts and their interrelations. (Smith & Humphreys | 2006)
More complex semantic relationships are then developed by analysing direct concept linkages and any co-occurring words. The unstructured, qualitative textual data provides analysts the ability to progressively increase the depth, rigour and objectivity of their analysis. Indirect links between concepts can also be assessed by comparing concept thesauri providing details of possible significant semantic relationships between concepts even when there are, in the main, only indirect relationship between them. Ranking concepts informs about the strength of association and semantic similarity between concepts. Representation in the form of a visualisation where concepts with weak semantic relations are shown far apart on the concept map while concepts with strong semantic relations are shown close to each other in the form of clusters providing useful interpretation of the corpus. Lower level analysis into its thesaurus of words or chunks of text then supports various linguistic analytical techniques such as discourse analysis.

Alternatively, as long ago as 1936, Eckart and Young introduced a technique termed Latent Semantic Analysis (LSA), a method to discern underlying semantic information from a given corpus of text, and to subsequently represent the contextual meaning of the words in the corpus as a vector in a high-dimensional semantic space (Landauer et al. | 1998). LSA “assumes some underlying or latent structure in word usage that is partially obscured by variability in word choice” (Rosario | 2000:2). This is an issue that is evident in linking verb selection in concept mapping (Nosratinia et al. | 2013) especially for English as Second Language students. As such, LSA is a powerful method for word sense disambiguation (Katz & Goldsmith-Pinkham | 1998) well suited for use on a corpus of text.

Landauer et al. (1998) define the theory of LSA as relating to the extraction and representation of contextual-usage and meaning of words and passages by statistical computations applied to a large corpus of text where similarity of the meaning of words can be extracted. Landauer et al. (1988:3) states that:
word and passage meaning representations derived by LSA have been found capable of simulating a variety of human cognitive phenomena, ranging from developmental acquisition of recognition vocabulary to word-categorization, sentence-word semantic priming, discourse comprehension, and judgments of essay quality.

Either of these systems could be used to analyse student written responses to assessment tasks. Alternatively, students could create concept maps for the assessment task and they could be assessed using either manual intervention or an automated system. As there is only a single Unit of Study under analysis here, it is quite possible to develop a spreadsheet or database to analyse student-developed concept maps. A program like CMaps, an open source package from The Institute for Human and Machine Cognition, The University of Florida, used extensively in our prior work (see Section: Genesis), has several output formats including XML that could easily be parsed to accommodate suitable analysis (Hansen | 2005)

**Conclusion:** there are numerous alternatives for analysing student-developed written texts but they tend to lend themselves to larger studies and larger corpus of texts. They would not be suitable in analysing concept maps where there is limited text. In this study, constrained to a single Unit of Study with around 100 students, student-developed concept maps integrated into a dialogic concept mapping process can be analysed using XML output with some minor development.

### 5.5.5. Developing Linking Phrases

If the student cohort is comprised mainly of English as Second Language students, how might that affect the design of the practical framework with regard to the qualitative assessment rubric?
The linking phrase is an important part of the general concept mapping process. Here it is the linchpin for more advanced analysis, initially assessed for context, as defined by the inclusion of associated concepts in student-developed concept maps; then analysed for relevance to discipline, relevance to an assessment task and linguistic acceptability.

In non-traditional concept mapping, in languages other than English, the linking phrase can cause problems due to differences in the fundamental word order, the attaching of suffixes to words and using postpositions rather than prepositions (Kilic | 2003). In the English language the basic word order is subject–verb–object and the relationship between two concepts can be expressed by writing the verb and a preposition together allowing a sentence to be correctly established as the a concept map is read. However in many other languages the basic word order is subject–object–verb supporting postpositions and suffixes rather than prepositions and adjectival pronouns. Therefore, in order to impart flow when the concept map is read and for English as Second Language students to easily develop linking phrases additional skills are required as the phrase itself is often very brief, focused and tense dependent, if it is to impart flow when the concept map is read.

Cañas et al. (2008) reviewed two construct-a-concept-map techniques: construct-a-map with created linking phrases (developed by the student); and construct-a-map with selected linking phrases (developed by the instructor). The construct-a-concept-map used here more accurately reflects differences of students’ knowledge structures eliciting higher order cognitive processes (Ruiz-Primo et al. | 2001). However, due to the range and diversity of students’ self-created linking phrases the assessment process can be burdened with scoring difficulties.
Outcomes of Review

The conceptual framework (CF) (see Figure 27) for this study, defined in line with the principles of design based research, integrated aspects of the divergent literature on curriculum management, teaching proficiency and cognitive progression and retention as outlined above. The outcomes allowed to CF to be finalised based on the following criteria:

- threshold concepts to be used as a means of focus for assessment;
- SOLO descriptors to be used to identify linking phrase complexity and relevance;
- linking verbs will be documented in Phases 1 and 2;
- an abridged KST process will be used for peer group presentation;
- linguistically incorrect phrases will be noted; and
- teaching proficiency to be assessed contemporaneously.

Conclusion: it is difficult to pre-judge the effect of English as second Language on the quality of linking phrase. It should have little effect on the assessment of the inclusion of associated concepts within a linking phrase used to assess context, but could be expected to impact linking phrase assessment for relevance to domain and assessment task. To assist with this analysis an additional metric of linguistic acceptability of linking phrases can be collected.

5.6. Outcomes of Review

The conceptual framework (CF) (see Figure 27) for this study, defined in line with the principles of design based research, integrated aspects of the divergent literature on curriculum management, teaching proficiency and cognitive progression and retention as outlined above. The outcomes allowed to CF to be finalised based on the following criteria:
Finally a CF process map was developed (Figure 28) showing the overall process framework detailing the qualitative, quantitative and linguistic metrics, instruments and associated rubrics.
The CF (see Figure 28) is presented as a process mapped against methods, metrics and instruments required to assess discipline and assessment task relevance and linguistic acceptability. A knowledge continuum from expected
knowledge as defined in the Unit of Study (UoS) outline\(^\text{12}\); prior knowledge gained by students in a previous UoS; taught knowledge delivered during formal teaching activities, learnt knowledge representing cognitive progression; adjusted knowledge representing correction of initial misconceptions or the development of a broader understanding of discipline issues as additional material was introduced and assimilated; and finally retained knowledge representing cognitive retention. This process was seen as cyclical within a UoS and throughout a business degree.

Where relevant, phases of the process incorporate:

- quantitative metrics based on concept map structure assessed against expert maps;
- qualitative metrics based on Biggs SOLO Taxonomy;
- linking phrase assessment based on relevance to the domain and assessment task; and /or
- assessment of linguistic acceptability of linking phrases.

\(^{12}\) A Unit of study outline is the document provided to all students detailing all aspects of the Unit of Study.
PART C: Development of a Workable Framework
6. **Defining a Workable Framework**

The development of a Workable Framework (see Figure 30) was achieved by taking the baseline process identified for the Conceptual Framework (see Figure 28 above) and modifying it after undertaking two pilot studies looking at possible concept mapping processes (see Annexure B) and feedback loops (see Annexure C).

6.1. **Concept Mapping in Assessment | Observations**

Concept mapping has been well documented as a basis for assessment. However there is little documentation on the use of dialogic concept mapping as a basis for an iterative assessment and it was important to assess different concept mapping assessment techniques to evaluate their suitability for use in the study, based on known time limitations associated with the observation phase of the study.

In order to assess student responses to different concept mapping (CM) scenarios, a more manageable cohort of around 30-40 students was necessary. Access was granted to the Unit of Study (UoS) ACCT6014 Designing Accounting Information Systems. It was agreed that the pilot study would take place in Semester 2 2010 and access was conditional on the process not interfering with the current assessment process.

The aim of the pilot study was to select CM techniques considered most appropriate for large-scale assessment. Research (Ruiz-Primo | 2000:47) has shown that when using concept maps “constraints and affordances imposed by different forms of assessments affect the student’s performance”. This means that different mapping techniques may lead to different conclusions about a students’ knowledge.
In order to assess different aspects of a dialogic concept mapping process a series of small CM tasks were undertaken over the duration of the semester each considering different forms of assessment and their implementation (see Figure 29). The cohort of ACCT6014 was 35 students and approximately 60% were English as Second Language students or Second Language writers. The UoS was very structured, suited to the integration of CM. Some observations were specific to the concept mapping process (concept selection, linking phrases) and others to broader assessment issues (individual, group, open book, multi-phased).

The process employed was to engage the students in a CM exercise for the initial 20 minutes of each instruction session. There was no formal assessment of this work, merely observation and assimilation through dialogue. The outcomes of ten different observations are tabulated in Table 36 (see Annexure B).

Once the observations were completed, further research in the form of a literature review was undertaken to assimilate the observations and to ensure that the recommendations with regard to the workable framework (WF) were well grounded, despite being tempered by the nuances of the proposed study.

As the development of the WF was but an intermediate step in the progressive development of the practical framework to be used for the main observations in the major study, the various notes taken during the literature review associated with this stage have not been formally documented. However a formal protocol was established and two of the components are included in the Annexure B by way of example.

- **Unrestricted Mapping**: Students were to develop a concept map from scratch using seven concepts with no restrictions on concept selection.

- **Prior Knowledge**: Students were to develop a concept map on a subject deemed a mandatory precursor to the UoS.
6.2. Concept Mapping Observation Phases

Phases of Observations: Assessment Options

Figure 29: Concept Mapping Pilot Study Observations
6.3. **Review of Pilot Study Observations Concept Mapping in Assessments**

The various assessment tasks were assessed with a view to informing the development of the Practical Framework.

**Major Observations**

Teaching:
- concept maps of instructional sessions were well received and informative dialogue occurred when reviewed in the following session; and
- assessment feedback using expert maps was well received providing a platform for informative discussion in workshops.

Concept Selection and Structure:
- students performed better when concepts to be used in an assessment were drawn from a predetermined list; and
- students had difficulty in manipulating the number of concepts in a concept map through the creation of associated concepts.

Linking Verbs and Phrases
- students had difficulty with basic verb selection for linking phrases.

General Use of English
- obvious issues with grammar, in that it was observed that students are generally poor at writing succinct phrases.

Collaborative Tasks
- obvious dominant student syndrome visible when group discussions are part of concept map creation.

Feedback
- well received at all levels providing good engaging discourse.
6.4. **Concept Mapping in Assessment | Feedback**

The importance of effective feedback has been well documented but there is no literature on the feedback mechanisms suited to a dialogic concept mapping process. To that end a pilot project was undertaken reviewing different options with an emphasis on visual processes.

In order to assess instructor and student responses to different feedback mechanisms within a single Unit of Study (UoS), a more manageable cohort of around 30-40 students was necessary. Access was again granted to the UoS ACCT6014 Designing Accounting Information Systems. It was agreed that the pilot study would take place in Semester 1 2011 and access was conditional on the process not interfering with the current assessment process.

The cohort of UoS ACCT6014 was 35 students and approximately 65% were English as Second Language students or Second Language writers.

The process employed was to use various forms of visual feedback mechanisms using concept maps as the template. They were then reviewed through a series of discussions with;

- instructors - showing them possible feedback mechanisms focused on gaining an insight into what they felt could be implemented within a single UoS and still be relevant and acceptable to current Assurance of Learning requirements and normal student assessment; and

- students - showing them possible feedback mechanisms focused on gaining an insight into what they understood and felt they could benefit from to reinforce their understanding and correct any misconceptions in a contemporaneously manner.
The discussions were based on a series of issues identified in the development of the conceptual framework. The data came from a fairly simple multi-phased concept mapping task looking at the Software Development Life Cycle where students created individual concept maps, adding concepts each week to the main topics of ‘Initiation’, ‘Design’, ‘Development’, ‘Implementation’, ‘Maintenance’ and ‘Evaluation’. Once the concepts were completed the concept map was revisited and a range of linking verbs and phrases were added. For the sake of the exercise Project Management was selected as a threshold concept. The outcomes of these discussions and outcomes relevant to the development of a workable framework are tabulated in Table 37 (see Annexure C)

6.5. **A Workable Framework**

The two pilot studies (see Annexures B and C) were used to inform the workable framework (see Figure 30).

The workable framework as shown in Figure 30 shows a multi-phased assessment covering prior knowledge to adjusted knowledge but undertaken within a single Unit of Study (UoS). That means that the extent of any prior knowledge assessment is limited to previous parts of any multi-phased assessment task undertaken within the UoS.

The overall parameters of the framework are:

- **Methods**
  - a process covering prior knowledge to adjusted knowledge using concept maps for assessment, lectures and feedback. The concept maps would allow assessment of learning objectives using student-developed concept maps and curriculum alignment
(management) using concept maps of lecture summaries and comparative concept maps.

- **Quantitative Analysis**
  
  - concept maps would be assessed using concept selection and linkage analysis allowing structure to be assessed against the expert map for all three phases.

- **Qualitative Analysis**
  
  - linking verbs / phrases would not be used to assess prior knowledge from Phase 1 and 2 of the multi-phased assessment. However verb suitability would be assessed with a view to preparing for Phase 3 where Biggs SOLO Taxonomy (SOLO) descriptors would be used to assess phrases; and
  
  - linking phrases would be assessed in Phase 3 using SOLO descriptors (Prestructural, Unistructural, Multistructural), and also assessed for relevance to the subject and assessment task.

- **Language Analysis**
  
  - issues were expected with language but unsure how they would present. It would be possible to compare mapped and written responses in the final examination as the mapping task was optional.
Figure 30: Workable Framework | Process
PART D: Observations from the Practical Framework
7. **Practical Framework**

The practical framework was developed from the conceptual and workable frameworks and used to observe a series of teaching and assessment activities. Dialogic concept mapping resulted in a defined process with both quantitative and qualitative assessment instruments and a range of assessment metrics.

7.1. **Practical Framework | Overview**

The practical framework was used to observe demonstrated changes in a student's understanding of threshold concepts. It employed a dialogic concept mapping process to assess student-developed concept maps against expert maps supporting the current Assurance of Learning requirements as well as the broader Assurance of Learning process suggested in this study.

The practical framework was based on the development of the conceptual framework and working framework pilot study. It comprised a dialogue with the students through the use of concept maps representing lecture summaries and an integrated assignment in three phases requiring students to develop concept maps in response to separate assessment tasks. This process culminated in a written final examination where students had the option to provide their response in the form of a concept map. The student-developed concept maps were assessed against an expert map (EM) created by the domain expert.

The assessment framework supported the current requirements of Assurance of Learning (AoL) reporting whilst simultaneously offering the ability to explore support for a broader definition of AoL (discussed above) using attributes of the
concept maps (structure and linkage) and employing Biggs SOLO Taxonomy (SOLO) as a descriptor to assess linking phrases. The model also supported a review process by the domain expert assessing linking phrase relevance to the discipline and assessment task as well as an assessment of linguistic acceptability.

Ethics approval was obtained to collect data for one semester of the Unit of Study (UoS) ACCT6007. The student cohort was variable with a maximum attendance of 107 and a minimum attendance of 103. This variation was caused by students starting the UoS late or students ceasing to attend. Data was secured for all assessment phases for 100 students and this was used as the final data set.

It was acknowledged that the framework has limitations in that the assessment task had to be successfully implemented within the confines of a single UoS over one semester (13 weeks). At the same time it had to cater for requirements under the current AoL process undertaken by the Faculty of Economics and Business and for the expanded requirements of the AoL process proposed here.

The threshold concepts (TCs) ‘auditor independence’ and ‘true and fair view’ were embedded in the iterative assessment task. The idea of TCs was not articulated to the students due to a concern that they would become central in a ‘hidden curriculum’. This was achieved by identifying them in the respective assessment regime as outlined below:

**Assessment Task**

**Phase 1:** Outline how considering audit as a ‘quality control device’ impacts audit quality. In your answer make explicit reference to ‘**auditor independence**’.

**Phase 2:** Outline how the auditor’s reporting obligations impacts ‘audit quality’. In your answer make explicit reference to ‘**evidence collection and evaluation**’ and the ‘**true and fair view**’ criterion.
Phase 3: Provide a definition of ‘audit quality’. What factors or drivers might contribute to ‘audit quality’? Include Corporate Governance which is to be used as a starting point for your concept map.

There was thus an expectation that students would include ‘auditor independence’ and ‘true and fair view’ in their answers. This model was chosen as there was a well-defined learning pathway connecting Corporate Governance to both threshold concepts using different branches of the concept map.

Final Examination: The relevant question in the final examination related to: auditor independence which is said to be the cornerstone of auditing. Therefore to ensure ‘audit quality’ it is imperative for auditors to remain independent. Outline how the existence of a lack of ‘auditor independence’ is argued to impact ‘audit quality’.

This was a question that could either be answered by normal text response or by a concept map. This was included to allow observation of the difference, if any, between written and mapped responses.

Mid Term Examination

Mid Term Assessment: No concepts maps were required of the students, however, concept maps of possible answers were discussed with students during feedback. These were not provided in hardcopy to the students and covered the following questions:

Question 3: ‘Auditor independence’ is the cornerstone of auditing. ‘Auditor independence’ has been described as comprising two facets independence in mind and independence in appearance. Explain briefly the two notions of ‘auditor independence’ and how they interrelate.

Question 4: The accounting standards provide detailed guidance to preparers of financial statements especially where the calculation of material amounts are based on management estimates. Indicate circumstances under which the
Directors’ compliance with the accounting standards would cause the auditor to question whether the disclosures in the financial statements provide a ‘true and fair view’ of an entity’s financial position and financial performance?

The study required embedding of the researcher and the technology of concept mapping within the UoS as it was imperative to ensure that students were not in any way disadvantaged in terms of being assessed for the UoS in more traditional ways.

Lecture summaries provided to the students as text and concept maps were introduced as a teaching artefact and some students had difficulty in understanding how to use them. Benefitting from the pilot, this issue was minimised by providing tutorial assistance after each lecture and ensuring that the concept map of the previous lecture summary was reviewed in class by the instructor as a precursor to starting a new lecture. The concept of a discourse pathway (DP) showing how TCs are linked to other concepts was also introduced to assist the student in the development of a more comprehensive understanding of the subject matter. DPs were used in feedback workshops where the comparative maps of the various assessment tasks were discussed. Finally, concept maps were used to introduce students to the linking verb and phrase without being too prescriptive as to its selection, stressing that the choice was dependent on the question.

For each phase of the assessment task an expert map (EM) (see Figure 31) was created by the domain expert with a view to identifying header concepts (HCs), TCs and main concepts (MCs) that one would expect students to select from the list provided and the placement of alternate concepts (ACs) into relevant linking phrases. A DP was also identified to explain in brief how a student having linked concepts together could develop a dialogue using the linking phrases while developing a point of view, expressing facts or stating arguments.
Linking phrases were allocated appropriate SOLO descriptors: prestructural (P), unistructural (U) and multistructural (M). From previous work (see Chapter 1) it was acknowledged that the more advanced levels within SOLO, namely relational (R) and extended abstract (EA) were not expected in the assessment tasks. It was acknowledged that the process of attributing SOLO descriptors to linking phrases was very subjective but it did provide a means of differentiation to be used for assessing student concept maps for completeness and for awareness of context.

The EM shown in Figure 31 shows how the HC, TCs, MCs are displayed in the EMs provided for each assessment task. The DP is shown using a bold red line between MCs and ACs are inserted in the relevant linking phrase locations.

**Figure 31**: Expert Map Example with Expected Biggs SOLO Classification
7.2. **Practical Framework | Process**

The practical framework was used to observe a structured process developed on the concept of dialogic concept mapping; comprising instruction on enabling technology; embedding of concept maps in teaching artefacts; integrated assessments using concept maps and provision of a robust mechanism for feedback.

Figure 32 below and elaborated hereafter in chapters 7 to 16 had several types of discrete activities always meshed with timely feedback and discussion. This comprised:

- an introduction to concept mapping (CM) based on an hour lecture and workshop on CM and an introduction to the software CMaps;

- the provision of lecture summaries, comprising concept maps provided and discussed for each of the six lectures. This was broken down into two distinct phases, lectures 1 to 3 and then lectures 4 to 6;

- an iterative assessment in three phases (previously noted), where students created concept maps in response to tasks developed around the threshold concepts of ‘auditor independence’ and ‘true and fair view’. The student-developed maps were then assessed on structure against an expert map created by the domain expert. Additionally, in Phase 3 of the assessment, linking phrases were assessed against Biggs SOLO Taxonomy (SOLO) descriptors, discipline and assessment task relevance as well as for linguistic acceptability;

- a Mid Term Examination where a sample response using CM was provided and discussed as feedback; and

- a final examination where students were offered the option to submit a concept map as a response to an assessment task.
Figure 32: Practical Framework | Schema
The dialogic concept mapping (DCM) process (see Figure 33) as defined in the study above had two distinct aims. First, it was to provide validation of Assurance of Learning (AoL), as defined by the AACSB, using concept mapping related to snippets of concept maps. These snippets were associated with learning objectives (LOs) and the process focused on concept map structure (concept selection and linkages). This process was not new in that there is a considerable body of research identified (Cañas et al. | 2004) on the use of concept mapping (CM) in assessments.

Second it was to provide evidence as to whether validation of a broader AoL process to include curriculum management, teaching proficiency and cognitive progression and retention was demonstrable. This was to be achieved using a DCM process that segmented the learning process into distinct, but interwoven stages namely, taught knowledge, learnt knowledge and adjusted knowledge.

**Taught Knowledge** was to be observed and validated through a process of curriculum management. The teaching material was to be presented as a series of concept maps of lecture summaries created by the domain expert. These maps were to be used to ensure that specific concepts were introduced and also to provide through the use of curriculum linkage analysis and understanding of that context in which the concepts were introduced.

**Learnt Knowledge** was to be observed and validated through a process of iterative assessments undertaken to allow student-developed concept maps to be compared to an expert concept map created by the domain expert. The concept maps were to be quantitatively assessed for structure (concept selection and linkages) in the first two phases of the DCM process in order to provide a baseline of understanding of two threshold concepts (TCs) ‘auditor independence’ and ‘true and fair view’. In the third phase of the DCM process
the concepts maps were to be quantitatively and qualitatively assessed. The qualitative analysis was to monitor associated concepts (ACs) selection through review of Biggs SOLO Taxonomy descriptors identifying their placement on the expert map (EM). Further the linking verbs in the student-developed concept maps, of concepts linked only to the TCs, were to be assessed for relevance to the discipline and assessment task. Finally, linking phrases were to be assessed for linguistic acceptability.

**Adjusted Knowledge** was to be observed and validated by the continuous assessment of the TCs after the implementation of feedback using comparative concept map analysis. These comparative concept maps were to be used to explain differences in student-developed maps and the EM. A Final Examination phase was used to assess students’ understanding of one of the TCs. This also allowed comparison of the progress of students using CM for this assessment against those choosing to provide a written response.

When all above learning stages are viewed together the DCM process provides a basis of ensuring the curriculum is taught, that the teaching is understood and that the student has assimilated and retained that knowledge. Feedback then allows misconceptions to be identified and adjusted in a contemporaneous manner.
Figure 33: Practical Framework | Process
8. Introduction to Concept Mapping

Concept maps are graphical tools for organising and representing knowledge supporting the visual illustration of the relationships between concepts and ideas. Generally beginning with an idea (or header concept) they branch out to include other main concepts showing how the header concept can be broken down into specific topics. The main concepts are then connected using linking verbs or phrases that might also contain associated concepts embedded in the text.

One of the powerful uses of concept maps is not only as a learning tool but also as an evaluation tool encouraging students to use meaningful-mode learning patterns (Novak and Cañas | 2006a). Concept maps are also effective in identifying both valid and invalid ideas held by students and to review both positive and negative teaching outcomes as delivered by teaching staff. (Novak and Cañas | 2006b)

The software CMaps from the University of Florida (available from http://cmap.ihmc.us/download/) was provided to all students. Previous experience (including the pilot) showed that a one hour workshop with individual student follow up, as required, was sufficient for introduction to the technology required for the assessment task.

The workshop was practical in nature and students were introduced to concepts, linking verbs and phrases. They were also provided with a document (see Annexure A) that explained some of the ‘rules’ of concept map presentation to ensure uniformity of presentation allowing ease of assessment and feedback. These rules had been tested in prior work and in defining the workable framework (see Annexure B).

Students were introduced to the assessment framework comprising the expert map and the assessment process. Students were advised that concepts would be provided
and they would have to select a fixed number of main concepts to answer the question. They were further introduced to the terminology used in the maps related to header concepts, main concepts, associated concepts and other concepts.

Time was spent demonstrating to students how to develop linking phrases from linking verbs and how to embed ACs within a linking phrase allowing more of the concepts identified in the question to be used, providing a more rounded complete answer (see Figure 34).

![Figure 34: Linking Phrase Development](image)

Figure 34 represents the migration in linking phrases between two main concepts from a state of no linking phrase, to a simple verb (SOLO prestructural), to a phrase containing a single associated concept ‘planning’ (SOLO unistructural) to a phrase containing multiple associated concepts ‘planning’, ‘scheduling’, ‘budgeting’, ‘cost control’, ‘funding’ and ‘manpower resources’ (SOLO multistructural).

Finally the students were introduced to the discourse pathway, as a simple aid to discussion that would be used by the instructional staff to review aspects of the maps in upcoming workshops. Care was taken to ensure that the process did not in any way inhibit students in their ability to adequately express themselves in their responses.
Dialogic Concept Mapping Framework | Phase 1

The aim of this phase of the Dialogic Concept Mapping Framework was to provide a baseline of the cohort’s knowledge space of the threshold concept ‘auditor independence’.

Students were provided with a range of learning artefacts comprising PowerPoint presentations; lecture summaries; and a concept map of each lecture summary (see Figures 35, 36, 37). Curriculum management was observed and validated by tabulating the concepts used in the lecture summaries (see Table 5) ensuring that all concepts to be used in the assessment task for this phase (see Figure 39) had been introduced. Further the context within which each concept had been addressed in the lectures was also reviewed in a curriculum linkage map (see Figure 38).

In this Phase students had to create a concept map using seven concepts from the list provided in the assessment task (see Figure 39) and make explicit reference to the threshold concept ‘auditor independence’. Student-developed concept maps were assessed against an expert map (see Figure 40) created by the domain expert. The assessment was based on concept map structure (a combination of concept selection and linkages). Figure 41 maps the concepts linked to the threshold concepts, and indicates the number of students selecting the main concepts and the number of links between the main concepts on the discourse pathway.

Assurance of Learning, as defined by the AACSB, was validated against the attainment of a learning objective (see Table 6) by assessing a snippet of the cohort’s maps against the expert map (see Figure 42). The outcomes of this assessment are shown in Table 7.
9. Lectures 1 to 3

Students were given a PowerPoint presentation prior to all lectures and then a lecture summary of approximately three pages and a concept map of the lecture summary immediately after the lecture. Lecture summaries were discussed in class prior to the start of the following lecture and used by the domain expert to ensure curriculum alignment by identifying when concepts were introduced and if they were to be used in any subsequent assessment. They were also the basis for the curriculum linkage concept map recording explicit links between concepts inherent within the lecture summaries. This process was undertaken for lectures 1 to 3 and then again for lectures 4 to 6 (see Chapter 11).

9.1. Lectures 1 to 3 | Overview

The first part of the Unit of Study (UoS) was a series of three lectures each of three hours duration. The material covered is outlined below in Table 4:

Table 4: Lectures 1 to 3 | Overview

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>27th July</td>
<td>The Audit (Figure 35)</td>
<td>Auditing: its function, business, legal and economic contexts;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modern approaches to auditing; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional structure and its implications.</td>
</tr>
<tr>
<td>3rd August</td>
<td>Audit as a Quality Control (Figure 36)</td>
<td>Auditing as a ‘quality control’ mechanism;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legal Liability of auditors; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expectations and performance gaps.</td>
</tr>
<tr>
<td>10th August</td>
<td>Audit Quality (Figure 37)</td>
<td>Auditing and corporate governance;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corporate audit committees; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Independence - of the auditor, audit judgment and ethics.</td>
</tr>
</tbody>
</table>
The concept maps of the lecture summaries included some linking phrases, generally limited to the higher levels within each branch of the concept maps. The maps were discussed with the students prior to subsequent lectures as a method of reviewing and reinforcing previous week’s material. Threshold concepts (TCs) were highlighted and the discourse pathway (DP) identified and used in the ensuing discussion offering students an understanding of how to read the concept maps and then integrate them with their other learning artefacts.

**Figures 35: The Audit**

The header concept (HC) is ‘audit’ and the concept map has branches covering ‘business climate’ which includes the TC of ‘auditor independence’; ‘assurance framework’ which includes the TC of ‘true and fair view’; standards and approaches; and ‘auditor’. There are no cross links between the different branches as expected in early lectures within a UoS where students are being introduced to concepts.

**Figure 36: Audit as a Quality Control Device**

The HC is ‘auditor liability’ and the concept map has branches covering ‘quality control’; ‘auditor practice’; ‘legal relationships’; ‘fraud’ which includes the TC of ‘true and fair view”; and ‘future of auditing’. There are no cross links between the different branches as expected in early lectures within a UoS where students are being introduced to concepts.

**Figure 37: Auditor Independence**

The HC is ‘auditor’s responsibilities’ and the concept map has branches covering the TC of ‘auditor independence’; ‘audit report’ which includes the TC of ‘true and fair view’; and ‘regulatory framework’. There are limited cross links as students begin to be introduced to the linkages between major concepts introduced on different branches reflected in previous lectures.
Figure 35: Lectures 1 to 3 | Lecture Summary | The Audit
Figure 36: Lectures 1 to 3 | Lecture Summary | Audit as a Quality Control Device
Figure 37: Lectures 1 to 3 | Lecture Summary | Auditor Independence
9.2. Lectures 1 to 3 | Curriculum Alignment

Curriculum alignment ensures that topics (concepts) were covered during the teaching process. The tabular representation shows sequence and coverage across a predefined timeframe verifying concepts used in assessments have been introduced in the period prior to the assessment. This process was undertaken for lectures 1 to 3 and then again for lectures 4 to 6 (see Chapter 11.2).

Table 5: Lectures 1 to 3 | Curriculum Alignment

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Threshold Concept</th>
<th>Teaching</th>
<th>Summary</th>
<th>Summary</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>10th Aug</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 1</td>
<td></td>
<td></td>
<td>27th July</td>
<td>3rd August</td>
<td>10th August</td>
</tr>
<tr>
<td>√</td>
<td>Accounting Standards</td>
<td>Assurance Engagement</td>
<td></td>
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<td></td>
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<tr>
<td>√</td>
<td>Assurance Engagement</td>
<td></td>
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<tr>
<td>√</td>
<td>Assurance Framework</td>
<td></td>
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<tr>
<td>√</td>
<td>Audit Committee</td>
<td></td>
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<tr>
<td>√</td>
<td>Audit Opinion</td>
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<tr>
<td></td>
<td>Audit Planning and Strategy</td>
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<td></td>
<td>Audit Quality</td>
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<tr>
<td>√</td>
<td>Audit Report</td>
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<tr>
<td>√</td>
<td>Audit Risk</td>
<td></td>
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</tr>
<tr>
<td>√</td>
<td>Auditing Standards</td>
<td></td>
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<tr>
<td>√</td>
<td>Auditor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>√</td>
<td>Auditor Independence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>√</td>
<td>Auditor Liability</td>
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<tr>
<td>√</td>
<td>Auditors Reporting Obligations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>√</td>
<td>Auditors Responsibilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>√</td>
<td>Business Climate</td>
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<tr>
<td>√</td>
<td>Communications to Users</td>
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<tr>
<td>√</td>
<td>Corporate Governance</td>
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<tr>
<td></td>
<td>Corporations Act</td>
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<tr>
<td>√</td>
<td>Ethics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>√</td>
<td>Evidence Collection and Evaluation</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>√</td>
<td>Expectations Gap</td>
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<tr>
<td>√</td>
<td>Financial Reports</td>
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<tr>
<td>√</td>
<td>Fraud</td>
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<td></td>
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<tr>
<td>√</td>
<td>Management</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>√</td>
<td>Professional Judgement</td>
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<tr>
<td>√</td>
<td>Quality Control Device</td>
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<tr>
<td>√</td>
<td>Stakeholders</td>
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<tr>
<td></td>
<td>True and Fair View</td>
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</tbody>
</table>

Table 5 shows that all concepts identified in the assessment task Phase 1 (see Figure 39) were introduced in the lecture notes and lecture summaries. In the first column of the table a √ reflects an associated concept that was offered for selection in the assessment and a √ reflects a main concept that was used in the expert map. The introduction of two threshold concepts of ‘auditor independence’ and ‘true and fair view’ was also confirmed.
Curriculum linkage maps were developed for this study, to identify whether two concepts had been explicitly linked (mentioned in the same paragraph) in the lecture summaries provided as written text. The visualisation of such links, overlaid on the expert map for the assignment (see Figure 38) provides the domain expert with a singular view of how different concepts have been introduced and how they have been presented in context. The iterative update of such maps through a dialogic concept mapping process could include material from other learning artefacts providing a meaningful representation of context. This process was undertaken for lectures 1 to 3, for lectures 4 to 6 (see Chapter 11) and again for lectures 1 to 6 (see Chapter 14.4).

A curriculum linkage map for lectures 1 to 3 was created to provide an understanding of which links had been introduced explicitly between concepts through the formal lecture process is shown in Figure 39 below. It is a visual comparison of the expert map (EM) for the Assessment Phase 1 (see Figure 40) and a modified EM showing explicit links.

In the EM, the discourse pathway (DP) was shown by a heavy red line between the main concepts (MCs). The curriculum linkage map shows explicit links along the DP as heavy blue lines and links that are not explicit in the lecture summaries remain red. Other links between MCs and associated concepts are shown as normal blue lines. Links that were not explicit in the lecture summaries (e.g. ‘professional judgement’ to ‘quality control device’) are shown as dotted grey lines. Finally explicit links between MCs found in the lecture summaries, representing alternate pathways, but not in the EM (e.g. ‘corporate governance’ to ‘auditor independence’; ‘auditor independence’ to ‘audit report’; and ‘corporate governance’ to ‘auditor’) are added as green lines. These links were addressed with the domain expert who acknowledged that the visualisation of
this aspect of teaching was beneficial also to the instructor as it highlighted, in a contemporaneous manner, issues worthy of reflection. On review the domain expert acknowledged that overall the missing links were not an issue as it was expected that students would infer similar linkages through a broader engagement with other learning artefacts. This is in line with the theory of dialogic concept mapping (see Figure 2) in its broadest interpretation as the student would normally have their own concept maps which would be updated as they encounter new links within other learning artefacts.
Figure 38: Lectures 1 to 3 | Curriculum Linkages
9.4. Lectures 1 to 3 | Student Feedback

Feedback is an important part of the dialogic concept mapping process and was undertaken initially by reviewing the concept maps of the lecture summaries at the start of the subsequent lecture. As the time allocated was usually around five minutes the discourse pathway was used as a focal point for discussion. If students required additional feedback they had access to private consultation time with the domain expert. This process was undertaken for lectures 1 to 3 and for lectures 4 to 6 (see Chapter 11.4).

In conjunction with each week’s lecture, consultation was provided to students on general technical issues related to concept mapping (CM). Eight students sought additional information via email queries regarding the use of the CM tool for the assessment task and they were provided with additional one-on-one assistance. This assistance was limited to the use of the tool and related to drawing curved lines and use of colour.

Subject specific issues related to the lecture summaries were handled directly by the domain expert. Four students took advantage of this in respect of the lecture on 3rd August, six students in respect of lecture on 10th August. The main issues were related to linkages and the complexity of some of the linking phrases.
10. Assessment Phase 1

The assessment task was based on prior observation and in the development of the workable framework. Students were required to use a defined number of concepts and could select them from a given list or use their own selection. Additional concepts could be used in the linking phrases allowing students to present a more comprehensive response. This process was used in Assessment Phase 1, Assessment Phase 2 (see Chapter 12) and Assessment Phase 3 (see Chapter 14). A different process was used for the Final Examination (see Chapter 15) as no list of concepts was provided. Student-developed concept maps were assessed against an Expert Map developed by the domain expert and the results analysed focusing on concept map structure and on the representation of predefined Threshold Concepts. Each assessment phase has a concept map snippet associated with a Learning Objective and these were used to validate Assurance of Learning.

Outline how considering audit as a 'quality control device' impacts audit quality. In your answer make explicit reference to auditor independence.

In your Concept Map you are restricted to use of ONLY 7 concepts.

- Corporate Governance
- Audit Committee
- Auditor Independence
- Expectation Gap
- Fraud
- Auditor Liability
- Accounting Standards
- Ethics
- Audit Risk
- Management
- Stakeholders
- Assurance Engagement
- Quality Control Device
- Professional Judgment
- Auditing Standards
- Audit Report
- Auditor
- Business Climate

Figure 39: Assessment Phase 1 | Assessment Task
The assessment task specified student responses include the threshold concept ‘auditor independence’ although they were not told of its importance in the overall assessment. They were advised that they could include other concepts (OCs) of their choosing if they so desired, but they were not to exceed seven concepts in total in their final response. The embedding of associated concepts and OCs within the linking phrase was stressed as a way to provide a more comprehensive response.

10.2.  Assessment Phase 1 | Expert Map

The expert maps were created by the domain expert and contained header concepts (related to the question), main concepts (expected in student-developed maps) and associated concepts (allocated to linking phrases between main concepts). The associated concepts were allocated SOLO descriptors (prestructural, unistructural or multistructural) signifying the expected complexity of the linking phrase. A discourse pathway, linking some of the main concepts was added as a mechanism to focus discussion regarding the expert map and to provide a baseline for assessment of structure. Threshold concepts were identified on the discourse pathway. This process was undertaken for Assessment Phase 1 (see Figure 40), Assessment Phase 2 (see Figure 48); Assessment Phase 3 (see Figure 55); and the Final Examination (see Figure 65).

The expert map (EM) (see Figure 41) was created by the domain expert and the linking phrases were assigned a Biggs SOLO Taxonomy descriptors: prestructural (P); unistructural (U); or multistructural (M), in respect of the level of complexity - defined by the number of associated concepts and other concepts embedded in the linking phrase. It was stressed to students that the EM was merely one of several, possible appropriate responses to the assessment task.
Figure 40: Assessment Phase 1 | Expert Map

10.3. Assessment Phase 1 | Threshold Concept Analysis

The purpose of the analysis was to provide a baseline of the cohort’s understanding of threshold concepts, so any detailed analysis was limited to the links to and from the threshold concept of ‘auditor independence’. This process was undertaken for Assessment Phase 1 (see Figure 41); for the TC ‘true and fair view’ in Assessment Phase 2 (see Figure 49); and for the TC ‘evidence collection and evaluation’ in Assessment 2 (see Figure 50).

Figure 41 below reports the outcome of analysis of the cohort’s maps showing the linkages to the threshold concept (TC) of ‘auditor independence’. The
number of times concepts and links A-B or B-A were selected by students are shown in the diagram in the linking phrases location and the number of students selecting each header concept, TC and main concepts (MCs) are shown under each concept.

Figure 41: Assessment Phase 1 | Auditor Independence

The discourse pathway (DP) shown in red in Figure 41 was relatively well represented with the cohort (100 students) selecting the MCs ‘corporate governance’ 64 times; ‘auditor’ 85 times; ‘auditor independence’ 94 times; ‘professional judgement’ 78 times; ‘audit report’ 77 times; ‘quality control device’ 73 times; and ‘stakeholders’ 62 times. The linkages within the DP were varied with most being selected by over 50 students. Two concept links on the
DP were below expectations ‘quality control device’ to ‘shareholders’ 42 times and ‘corporate governance’ to ‘auditor’ 36 times. The latter could be explained as there was an alternate pathway ‘corporate governance’ direct to ‘auditor independence’ selected 68 times. The domain expert concluded that the data showed that the cohort had a reasonable understanding of the TC at this stage of the Unit of Study.

Figure 41 was discussed at length with the students during feedback on Assessment Phase 1. The domain expert felt that for a small portion of the responses, there was too frequent and often ill-advised use of other concepts (20 in total) and during the review session students were advised to concentrate on concepts identified in the assessment task and to use them to develop the core of their response. The analogy presented was that they should consider that they were asked to limit their responses to 200 words, which would suggest that they should be careful in their selection of concepts. Approximately 5% of students verbally expressed some difficulty in understanding the overall process and why their concept selection was not appropriate.

The student-developed concept maps were also assessed using a specially developed model, allowing for the allocation of different weightings for concept selection, linkages, verb selection and phrase classification. In this phase of the assessment structure (concept selection and linkage) was the primary focus in terms of assessment and used for Assurance of Learning validation, while data collected about linking verbs and phrases was used purely as feedback to the researcher for later use.
10.4. **Assessment Phase 1 | Learning Objective**

*The Assurance of Learning process as defined by the AACSB requires a clearly articulated set of learning goals which are translated into learning objectives. The learning objectives were established for Assessment Phase 1 (see Table 6); Assessment Phase 2 (see Table 10); Assessment Phase 3 (see Table 21); and the Final Examination (see Table 25).*

*Each learning objective has a pre-defined measurement instrument and assessment criteria. In this dialogic concept mapping process the assessment instrument was either a snippet of the expert map or the whole concept map, assessed on structure related to main and associated concepts. This process was undertaken for Assessment Phase 1 (see Figure 42); Assessment Phase 2 (see Figure 52); Assessment Phase 3 (see Figure 63).*

Table 6 below identifies the assessment instrument and criteria for learning objective (LO) 3.2. The LOs were articulated in the Unit of Study Outline (see Annexure D).

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Instrument</th>
<th>Assessment Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2</td>
<td>Assessment of Structure including threshold concept and main concept selection and linkage.</td>
<td>Does the response demonstrate an integrated understanding of professional independence as an important ethical consideration and why it is a professional requirement?</td>
</tr>
</tbody>
</table>
The LO 3.2 for Assessment Phase 1 was set by the domain expert at a micro level using a snippet from the expert map (EM) in this case, focusing on the traditional linkages between ‘auditor’, ‘audit committee’, ‘management’, ‘auditor independence’, ‘professional judgement’ and ‘ethics’. Figure 42 below visualises the snippet and outlines the links overlaid on the EM shown in Figure 40.

**Figure 42:** Assessment Phase 1 | Learning Objective 3.2 Snippet

The results in Table 7 below revealed that 88.7% of the cohort met the expectations of the assessment. The LO required students to show an integrated understanding of professional independence in relation to ethics and professional judgement and the mark based on the structure of the concept maps would suggest that the requirements of the LO had been clearly met.

---

**Table 7:** Assessment Phase 1 | Learning Objective 3.2 Outcomes

<table>
<thead>
<tr>
<th>Part D</th>
<th>Assessment Phase 1</th>
</tr>
</thead>
</table>

**LEARNING OBJECTIVE: 3.2**
Response/solutions demonstrate an integrated understanding of professional independence as an important ethical consideration and why it is a professional requirement.

**Instrument: Concept Analysis Phase 1**
Assessment of Concept Selection and Linkage for 100 students

<table>
<thead>
<tr>
<th>Does not meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark: &lt;50.0%</td>
<td>Mark: &gt;65.0%</td>
<td>Mark: &gt;65.0%</td>
</tr>
<tr>
<td>11.2%</td>
<td>76.6%</td>
<td>12.1%</td>
</tr>
</tbody>
</table>
10.5. **Assessment Phase 1 | Review**

In summarising Assessment Phase 1 there were two main aspects to consider. The outcomes observed in relation to the student responses and the feedback from the domain expert.

On discussing the outcomes of Phase 1 with the students the following observations were made:

- many found the concept maps very beneficial especially in terms of understanding some of the terminology and linkages within the discipline;
- some found that the lecture summaries provided in both written and mapped form was too much information; and
- many were unable to link the lecture summaries with Powerpoint slides.

On discussing the outcomes of Phase 1 with the domain expert the following observations were made:

- students generally embraced the task of concept mapping and there was no obvious downside in using the technology. The concept maps of the lecture summaries were well received and used in workshops as a discussion platform. Some viewed it as a novelty;
- there was concern over the focus on the concept map structure at this stage of the Unit of Study obviating the need to focus on misconceptions in understanding around linking phrases; and
- language issues around English as Second Language students and Second Language writers were evident in material produced outside the dialogic concept mapping study.

Further discussions were held with the domain expert and the following recommendations were agreed regarding changes for subsequent phases to the assessment task:
• the time given to discuss the concept maps of lecture summaries would be slightly increased as it seemed to evoke class discussion; and

• the domain expert would endeavour to get the tutors more involved in the overall DCM process.
The aim of this phase of the Dialogic Concept Mapping Framework was to provide a baseline of the cohort’s knowledge space of the threshold concept ‘true and fair view’.

Students were provided with a range of learning artefacts comprising PowerPoint presentations; lecture summaries and a concept map of each lecture summary (see Figures 43, 44, 45). Curriculum alignment was validated by tabulating the concepts used in the lecture summaries (see Table 9) ensuring that all concepts to be used in the assessment for this phase (see Figure 47) had been introduced. Further the context within which each concept had been addressed in the lectures was reviewed in a curriculum linkage map (see Figure 46).

In the assessment task students had to create a concept map using seven concepts from the list provided in the task (see Figure 47) and make explicit reference to the threshold concept ‘true and fair view’. Student-developed concept maps were assessed against an expert map (see Figure 48) created by the domain expert based on concept map structure (a combination of concept selection and linkages). Figure 49 maps the concepts linked to the threshold concept, indicating the number of students selecting the main concepts and the number of links between the main concepts on the discourse pathway. In this phase students were also required to make explicit reference to the concept ‘evidence collection and evaluation’ which was presented as a threshold concept, and assessed in a similar manner (see Figure 50). Figure 51 shows links between the two threshold concepts observing alternate discourse pathways.

Assurance of Learning as defined by the AACSB was linked to a learning objective (see Table 10) and validated by assessing a snippet of the expert map (see Figure 52). The outcomes of the assessment are shown in Table 11.
11. Lectures 4 to 6

Students were given a PowerPoint presentation prior to all lectures and then a lecture summary of approximately three pages and a concept map of the lecture summary immediately after the lecture. Lecture summaries were discussed in class prior to the start of the following lecture and used by the domain expert to ensure curriculum alignment by identifying when concepts were introduced and if they were to be used in any subsequent assessment. They were also the basis for the curriculum linkage concept map looking at explicit links between concepts inherent with the lecture summaries. This process was undertaken for lectures 1 to 3 (see Chapter 9) and then again for lectures 4-6 (see Chapter 11).

11.1. Lectures 4 to 6 | Overview

The next part of the Unit of Study was a series of three lectures each of three hours duration. The material covered is outlined below in Table 8.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>17th Aug</td>
<td>Planning, Risk and Evidence</td>
</tr>
<tr>
<td>24th Aug</td>
<td>The Audit Report</td>
</tr>
<tr>
<td>31st Aug</td>
<td>True and Fair View</td>
</tr>
</tbody>
</table>

The concept maps of the lecture summaries included some linking phrases, generally limited to the higher levels of the concept maps. The maps were
explained to the students prior to subsequent lectures by way of reviewing previous week’s material. Threshold concepts were highlighted and the discourse pathway identified and used in the ensuing discussion with the students giving them an understanding how to read the concept maps and integrate them with their other learning artefacts.

**Figures 43: Planning Risk and Evidence**

The header concept (HC) is ‘auditor’s responsibilities’ and the concept map has a branch covering ‘true and fair view’ in relation to ‘financial reports’ and the ‘audit report’, and another branch covering ‘audit standards’ and the role they play in the overall process of ‘evidence collection and evaluation’ and ‘audit risk’ management. Finally the link is created between an auditor’s ‘professional judgement’ and professional scepticism’ and their role in developing the ‘audit report’.

**Figure 44: The Audit Report**

The HC is ‘auditor’s responsibilities’ and the concept map has branches covering the different forms of ‘audit opinion’ and its link to management of the ‘expectations gap’ and the client’s understanding of ‘true and fair view’.

**Figure 45: True and Fair View**

The HC is ‘auditor’ and the concept map has branches covering how the auditor manages the competing pressures of professional judgement’ and professional scepticism’ to ensure the ‘audit opinion’ provides ‘stakeholders’ with assurance that the ‘financial reports provide a ‘true and fair view’ of the current position of the company (client).
Figure 43: Lectures 4 to 6 | Lecture Summary | Planning, Risk and Evidence
Figure 44: Lectures 4 to 6 | Lecture Summary | The Audit Report
**True and Fair View**

- Auditor is expected to display a balance between professional scepticism and professional judgement.
- Auditing standards lead to a possible conflict in terms of balance between processes that support either serviceable or tick a box.
- Financial reports comply with accounting standards, which are sometimes considered deficient, exacerbating the expectation gap.
- True and fair view relates to the financial position and performance of the entity as stated in the financial statements and notes to the accounts for a financial year, as discussed under Section 297.
- Corporations Act in relation to the opinion expressed by the Auditor about an entity's financial position confirm report is as discussed in Section 307.
- Override criterion requires disclosure in notes in the financial statements of additional information.
- Stakeholders lead to an expectation gap in their assessment of wealth and progress.

**Figure 45:** Lectures 4 to 6 | Lecture Summary | True and Fair View
11.2. Lectures 4 to 6 | Curriculum Alignment

The role of curriculum alignment was to ensure that topics (concepts) were covered during the teaching process. The tabular representation shows sequence and coverage across a predefined timeframe verifying concepts used in assessments have been introduced in the period prior to the assessment. This process was undertaken for lectures 1 to 3 (see Chapter 9.2) and then again for lectures 4-6 (see Table 9, Chapter 11.2).

Table 9: Lectures 4 to 6 | Curriculum Review

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Threshold Concept</th>
<th>Lecture</th>
<th>Lecture</th>
<th>Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>18th Aug</td>
<td>Accounting Standards</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td>12-Sep</td>
<td>Assurance Engagement</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assurance Framework</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit Committee</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit Opinion</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit Planning and Strategy</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit Quality</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit Report</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit Risk</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auditing Standards</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auditor</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auditor Independence</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>Auditor Liability</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auditors Reporting Obligations</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auditors Responsibilities</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Business Climate</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communications to Users</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corporate Governance</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corporations Act</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ethics</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evidence Collection and Evaluation</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expectations Gap</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Financial Reports</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fraud</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Judgement</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality Control Device</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stakeholders</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evidence Collection and Evaluation</td>
<td>✔️</td>
<td>❌</td>
<td></td>
</tr>
</tbody>
</table>

The introduction of the threshold concepts of ‘auditor independence’ and ‘true and fair view’ was also confirmed as was the introduction of ‘evidence collection and evaluation’.
11.3. Lectures 4 to 6 | Curriculum Linkages

The role of curriculum linkage maps, developed here, was to identify whether two concepts had been explicitly linked (mentioned in the same paragraph) in the lecture summaries provided as written text. The visualisation of such links, overlaid on the expert map for the assignment (Figure 46) provides the domain expert with a singular view of how different concepts have been introduced and how they have been presented in context. The iteration of such maps through a dialogic concept mapping process could include material from other learning artefacts providing a meaningful representation of context. This process was undertaken for lectures 1 to 3 (see Chapter 9), for lectures 4-6 (see Chapter 11) and again for lectures 1-6 (see Chapter 14.4).

A curriculum linkage map for lectures 4 to 6, created to provide an understanding of which links had been introduced explicitly between concepts through the formal lecture process, is shown in Figure 46 below. It is a visual comparison of the expert map (EM) for the Assessment Phase 2 (see Figure 48) and a modified EM showing explicit links.

In the EM, the discourse pathway (DP) was shown by a heavy red line between the main concepts (MCs). The curriculum linkage map shows explicit links along the DP as heavy blue lines and links that are not explicit in the lecture summaries remain red. Other links between MCs and associated concepts are shown as normal blue lines. Links that were not explicit in the lecture summaries like ‘expectations gap’ to ‘accounting standards’; ‘auditor’ to ‘audit plan and strategy’ to ‘professional judgement’, are shown as dotted grey lines and finally explicit links between MCs, representing alternate pathways, found in the lecture summaries but not in the EM like ‘auditor’ to ‘professional judgement;
‘professional judgement’ to ‘true and fair view’; ‘true and fair view’ to ‘audit report’; and ‘accounting standards’ to ‘audit report’ are added as green lines. These links were addressed with the domain expert who acknowledged that the visualisation of this aspect of teaching was beneficial as it highlighted, in a contemporaneous manner, issues worthy of reflection. On review the domain expert ruled that overall the missing links were not an issue as it was expected that students would infer similar linkages through a broader engagement with other learning artefacts.

This is in line with the theory of dialogic concept mapping in its broadest interpretation as the student would normally have their own concept maps which would be updated as they encounter new links within other learning artefacts (see Figure 2).
Figure 46: Lectures 4 to 6 | Curriculum Linkages
11.4. Lectures 4 to 6 | Student Feedback

Feedback is an integral part of the dialogic concept mapping process and was undertaken initially by reviewing the lecture summaries at the start of the following lecture. As the time allocated was usually around five minutes the discourse pathway was used as a focal point for discussion. If students required additional feedback they had access to consultation time with the domain expert. This process was undertaken for lectures 1 to 3 (see Chapter 9.4) and for lectures 4-6 (see Chapter 11.4 below).

Each week consultation was provided to students on general technical issues related to concept mapping (CM). Two students sought additional information regarding the use of the CM tool for the assessment and they were provided with additional one-on-one assistance. This assistance was limited to the use of the tool and related to drawing curved lines, use of colour, management of linking phrases.

Consultation was available for students in respect of discussing the subject matter of the concept maps and eight students took advantage of this for the lecture on 17th August and seven students for the lecture on 23rd August and sixteen students for the lecture on 31st August. The main issues regarding concept mapping were related to verb selection and level of complexity required in linking phrases. During this round of consultations, many students’ conflated issues related to conceptual understanding with technical and presentation issues related to CM. This was particularly apparent after Lecture 6 for the threshold concept ‘true and fair view’ where students appeared to have issues understanding the concept. All students were referred to the domain expert for clarification.
12. Assessment Phase 2

The question framework was based on observations in prior work and in the development of the Workable Framework. Students had to use a defined number of concepts and could select them from a given list or use their own selection. Additional concepts could be used in the linking phrases allowing students to present a more rounded response. This process was used in Assessment Phase 1 (see Chapter 10), Assessment Phase 2 (see Chapter 12 below) and Phase 3 (see Chapter 14). A different process was used for the Final Examination (see Chapter 15) as no list of concepts was provided. Student-developed concept maps were assessed against an Expert Map developed by the domain expert and results analysed focusing on concept map structure and on changes in representation of predefined Threshold Concepts. Each assessment phase has a Learning Objective associated with the concept map and these were used to validate Assurance of Learning.

![Figure 47: Assessment Phase 2 | Task](image)

The assessment task (see Figure 47) identified two threshold concepts ‘true and fair view’ and ‘evidence collection and evaluation’ that students were expected
to use in their responses. They were advised that they could include associated concepts (ACs) of their choosing if they so desired, however, they were not to exceed seven concepts. The embedding of ACs and other concepts within the linking phrase was stressed as a way to provide a more comprehensive response.

### 12.2. Assessment Phase 2 | Expert Map

The expert maps were created by the domain expert and contained header concepts (relating to the question), main concepts (expected in student-developed maps) and associated concepts (allocated to linking phrases between main concepts). The associated concepts were allocated SOLO descriptors (prestructural, unistructural or multistructural) signifying the expected complexity of the linking phrase. A discourse pathway, linking some of the main concepts, was added as a mechanism to focus discussion regarding the expert map and to provide a baseline for structural assessment. Threshold concepts (main concepts under review) were identified on the discourse pathway. This process was undertaken for Assessment Phase 1 (see Figure 40), Assessment Phase 2 (see Figure 48); Assessment Phase 3 (see Figure 55); and the Final Examination (see Figure 65).

The expert map (EM) (see Figure 48) was created by the domain expert using the assessment criteria, and identifying where associated concepts could be used in linking phrases between main concepts. The linking phrases were tagged using Biggs SOLO Taxonomy descriptors in respect of the level of complexity of the phrase as expected in the student responses. Again it was impressed on the students that the EM was one possible response to the task.
The purpose of this part of the study was to observe change in a student’s understanding of threshold concepts so detailed analysis was limited to the links to and from the threshold concept of ‘true and fair view’. Phase 2 was the baseline for student understanding of this threshold concept. This process was also undertaken for Assessment Phase 1 (see Figure 41), for the threshold concepts ‘true and fair view’ in Assessment Phase 2 (see Figure 49); and for the threshold concept ‘evidence collection and evaluation’ (see Figure 50).
Figure 49 summarises the concept selection and linkages to the threshold concept of ‘true and fair view’. The number of times specific concepts and links in either direction were selected are shown in the diagram. The main concepts (MCs) on the discourse pathway (DP) were well represented with the cohort selecting the MCs ‘auditor’ 86 times; ‘evidence collection and evaluation’ 87 times; ‘professional judgement’ 72 times; ‘true and fair view’ 98 times; ‘auditing standards’ 57 times; ‘audit report’ 90 times; and ‘financial reports’ 78 times. The linkages on the DP were also acceptable with most links selected over 50 times and only the link between ‘evidence collection and evaluation’ and ‘professional judgement’ falling to a low of 45. Two associated concepts (ACs) ‘audit opinion’, ‘stakeholders’ had high (>20) level of links. Most reassuring was the noticeable reduction in the use of other concepts (OCs), reflecting a more focused answer. Only three OCs ‘serviceable’, ‘audit quality’, ‘third party’ were used as opposed to twenty in the Phase 1 Assessment.
Figure 50 summarises the concept selection and linkages to the TC of ‘evidence collection and evaluation’. The number of times concepts and links in either direction were selected are shown in the diagram. Three ACs ‘audit opinion’, ‘audit plan and strategy’ and ‘auditors reporting obligations’ had high (>20) level of links. Again there was a reduction in the use of OCs, limited to ‘quality control’, ‘sufficient’, ‘appropriate’, ‘accounting independence’, reflecting a more focused answer.

Figure 50: Assessment Phase 2 | Evidence Collection and Evaluation

The maps Figure 49 and 50 were discussed at length with the students during feedback on Phase 2. Around eight students expressed some difficulty in understanding the overall process and why their concept selection was not appropriate and they were dealt with by the domain expert.
The student-developed concept maps were assessed using a specially developed model that allowed the allocation of different weightings for concept selection, linkages, verb selection and phrase classification. In this phase of the assessment structure (concept selection and linkage) was the primary focus in terms of assessment whilst collecting data about linking verbs and phrases for later comparison.

12.4. **Assessment Phase 2 | Threshold Concept Linkages**

*As there was more than one Threshold Concept associated with the Assessment Phase 2, the linkages between them were mapped (see Figure 51) providing the domain expert with a broad view of context in relation to how students perceived pathways between the Threshold Concepts.*

Figure 51 shows the linkages between the two threshold concepts (TCs) ‘evidence collection and evaluation’ and ‘true and fair view’ used in this phase. The diagram was developed to give the lecturer a broader visual understanding of alternate pathways of discourse using the associated concepts (ACs), a view to understanding student responses in a broader context. The TC ‘evidence collection and evaluation’ was not assessed in relation to the validation of Assurance of Learning it was merely identified as a back up in case students failed to use the TCs nominated.

In the domain expert’s view, the AC ‘audit opinion’ was correctly used as a major bridge between the two TCs. The data showed that it had with 28 links to ‘true and fair view’ and 36 links to ‘evidence collection and evaluation’ and deeper analysis (not shown on the diagram) revealed that 26 of those were both ways providing an acceptable alternate pathway to ‘professional judgement’. The other links were not deemed inappropriate by the domain expert but rather
a reflection of an enhanced understanding of the broader context of the question, remembering that the expert map and the discourse pathway was but one possible solution to the assessment.

Figure 51: Assessment Phase 2 | Threshold Concept Linkages
12.5. **Assessment Phase 2 | Learning Objective**

As noted above, the Assurance of Learning process as defined by the AACSB requires a clearly articulated set of learning goals which are translated into learning objectives. The learning objectives were established for Assessment Phase 1 (see Table 6); Assessment Phase 2 (see Table 10); Assessment Phase 3 (see Table 19); and the Final Examination (see Table 23).

Each learning objective has a pre-defined measurement instrument and assessment criteria. In this dialogic concept mapping process the assessment instrument was either a snippet of the expert map or the whole expert map, assessed on structure related to main and associated concepts. This process was undertaken for Assessment Phase 1 (see Figure 42; Assessment Phase 2 (see Figure 52); Assessment Phase 3 (see Figure 63).

Table 10 below identifies the assessment instrument and criteria for learning objective (LO) 3.3.

**Table 10: Assessment Phase 2 | Learning Objective 3.3 Criteria**

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Instrument</th>
<th>Assessment Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3</td>
<td>Assessment of Structure including threshold concept and main concept selection and linkage</td>
<td>Does the response demonstrate an awareness of the potential conflict between compliance with standards and professional judgement in forming an opinion that the reports present a ‘true and fair view’?</td>
</tr>
</tbody>
</table>
The LO 3.3 for Assurance of Learning for Phase 2 was set by the domain expert at a micro level using a snippet from the expert map (EM), examining the traditional linkages between ‘professional judgement’, ‘expectations gap’, ‘accounting standards’, ‘auditors reporting obligations’ and ‘true and fair view’. Figure 52 below visualises the snippet that outlines these links overlaid on the EM as shown in Figure 48.

**Figure 52**: Assessment Phase 2 | Learning Objective 3.3 Snippet

Student responses were assessed and analysed for internal structure (concept selection and linkages) and additional pathways. The results shown in Table 11 showed that 92.5% of the students met or exceeded the expectations of the assessment task.

**Table 11**: Assessment Phase 2 | Learning Objective 3.3 Outcomes

<table>
<thead>
<tr>
<th>LEARNING OBJECTIVE: 3.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response/solutions demonstrate an awareness of the potential conflict between compliance with standards and professional judgement in forming an opinion that the reports present a ‘true and fair’ view.</td>
</tr>
<tr>
<td><strong>Instrument: Concept Structure Phase 2</strong></td>
</tr>
<tr>
<td>Assessment of Concept Selection and Linkage for 100 students</td>
</tr>
<tr>
<td>Does not meet Expectations Mark: &lt;50.0% 7.5%</td>
</tr>
</tbody>
</table>

The LO required students to demonstrate an awareness of the potential conflict between compliance with standards and professional judgement in forming an audit opinion that the financial reports present a ‘true and fair view’. The mark was based on the structure of the concept maps and suggests that the requirements of the LO had been clearly met.
12.6. Assessment Phase 2 | Review

In summarising Phase 2 there were two main aspects to consider. The outcomes observed in relation to the students’ activities and responses and the feedback from the domain expert.

On discussing the outcomes of Phase 2 with the students the following observations were made:

- lecture summaries in the mapped format were well received and students could see linkages to their written summaries and PowerPoint presentations.

On discussing the outcomes of Phase 2 with the domain expert the following observations were made:

- there was still concern over focus on concept map structure at this stage of the Unit of Study, obviating the need to focus on misconceptions in understanding around linking phrases; and

- language issues around English as Second Language and Second Language writers were still evident.

Further discussions were held with the domain expert and the following recommendations were agreed regarding changes for subsequent phases:

- the example concept map to be created for a response to a question from the Mid Term Examination would be discussed in class and hence should have a discourse pathway in line with other material.
The Mid Term Examination was not used as an assessment instrument but as a teaching artefact integrated with the overall dialogic concept mapping process. A concept map (see Figure 53) was created, drawing from material in the lecture summaries and other learning artefacts and discussed as a sample response to one of the extended response questions.

Details of Assessment

The next assessment task completed by the cohort was the Mid Term Examination (MTE). While not specifically part of this study, the two threshold concepts (TCs) in the study were again examined in the MTE. The examination consisted of 20 multiple choice questions and four extended response questions limited to approximately 150-200 words.

The examination contributed 25% towards the students’ overall grade in the Unit of Study (UoS). One of the extended response questions on the threshold concept (TC) of auditor independence was:

Auditor Independence is the cornerstone of auditing. Auditor Independence has been described as comprising two facets: independence of mind and independence of appearance. Explain briefly the two notions of auditor independence and how they interrelate.

The concept map in Figure 53 provides a possible response. When discussing the concept map with the students as a mode of feedback it was stressed that the greyed out concepts and linkages were embedded in their lecture summaries and the additional concepts were from the text book which they had been directed to read as an external learning artefact.
The key to the answer was highlighted with bold red lines, focusing on the interrelationship between ‘professional scepticism’, ‘objectivity’ and ‘integrity’.

As the UoS ACCT6007 was a case-based course continually investigating instances of corporate failure, it included several examples like the collapse of Enron in 2001. There auditor’s independence was seen to be compromised and Arthur Anderson fell along with its client, leaving only the big four audit firms. This was integrated into the discussion.

From a dialogic concept mapping perspective this is exactly what one would expect if the study had been undertaken over a longer period and students had been required to create their own iterative concepts maps focused on TCs, continually incorporating material from other learning artefacts.
The aim of this phase was to assess changes as measured from Phases 1 and 2 in the cohort’s knowledge space regarding the threshold concepts of ‘auditor independence’ and ‘true and fair view’. Students were tasked to create a concept map using ‘corporate governance’ as the header concept and select another twelve main concepts from twenty seven available. The assessment task (see Figure 54) engaged the idea of ‘audit quality’ and no explicit direction was given to use any particular threshold concept. An expert map was created (see Figure 55) and curriculum linkages validated (see Figure 56). The raw data was mapped (see Figure 57) with the expert map as a background and then parsed to remove noisy concepts (see Figure 58) and noisy linkages (see Figure 59). This map was then overlaid with data showing the number of selected concepts and linkages forming the basis of further analysis.

Linking phrases were assessed for concept inclusion as defined in the expert map; relevance to the discipline (auditing); relevance to the question; and for linguistic acceptability. A coding system was subsequently developed (see Table 12) and examples of student output presented (see Table 13). Comparative analysis was undertaken to assess changes in the cohort’s knowledge space for the threshold concepts (see Figures 60, 61, 62). An issue with teaching was identified from the comparative mapping (see Figure 63) and steps were taken to rectify this immediately.

In conclusion, analysis of concept map structure (see Tables 18 and 20), revealed positive changes in the cohort’s representation of the threshold concepts. On review of linking phrases (see Tables 15, 16) issues were identified with relevance and linguistic acceptability and tagged for review after the final examination when a comparison could be made between written and mapped submissions. Finally the learning objectives (see Table 21) associated with this assessment phase and related to Assurance of Learning were deemed to have been met (see Tables 22, 23).
14. Assessment Phase 3

14.1. Assessment Phase 3 | Process

There were no further lectures held prior to this assessment phase. This phase was the culmination of the study in that it allowed work from previous phases to be used as baselines for assessing any positive change with regard to the cohort’s understanding of the two threshold concepts (TCs) ‘auditor independence’ and ‘true and fair view’. More detailed analysis was then conducted where the linking phrases were assessed to see if any more information could be elicited in respect of the cohort’s overall understanding of the TCs and the broader discipline domain.

The overall process undertaken was to:

- prepare the assessment task ensuring that the TCs of ‘auditor independence’ and ‘true and fair view’ are identified as possible main concepts (MCs);
- create an expert map (EM) comprising the MCs and identify the discourse pathway;
- assign all associated concepts (ACs) to relevant linkages within the EM;
- classify the linking phrases based on Biggs SOLO Taxonomy (SOLO) descriptors;

\[
\begin{align*}
(P) \text{ Prestructural} & : \text{ no associated concept} \\
(U) \text{ Unistructural} & : \text{ one associated concept} \\
(M) \text{ Multistructural} & : \text{ more than one associated concept}
\end{align*}
\]

- create a new curriculum linkage map for lectures 1 to 6;
- assess student-developed concept maps for structure, focussing on concepts and linkages;
• parse the data in an iterative manner to remove any concepts used by only a few students, stopping when there was visual clarity in the output with only a few ACs left without removing the header concept (HC), or MCs or TCs;
• parse the data in an iterative manner to remove any linkages created by only a few students, stopping when there was visual clarity in the output with only a few linkages left without removing any linkages between the HC, MCs or TCs;
• assess all the linking phrases in each student’s concept map using SOLO classification and after for subject relevance, question relevance and linguistic acceptability;
• review the outcomes for structure and linking phrase acceptance;
• assess learning outcomes in relation to learning objectives associated with this assessment task.

14.2. **Assessment Phase 3 | Task**

Provide a definition of ‘audit quality’. What factors or drivers might contribute to ‘audit quality’.

In your Concept Map you are restricted to use a total of ONLY 12 concepts not including Corporate Governance which is to be used at the top of your map as a starting point.

<table>
<thead>
<tr>
<th>Corporate Governance</th>
<th>Accounting Standards</th>
<th>Quality Control Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>True and Fair View</td>
<td>Corporations Act</td>
<td>Professional Judgment</td>
</tr>
<tr>
<td>Auditor</td>
<td>Financial Reports</td>
<td>Auditing Standards</td>
</tr>
<tr>
<td>Expectation Gap</td>
<td>Management</td>
<td>Audit Report</td>
</tr>
<tr>
<td>Audit Opinion</td>
<td>Stakeholders</td>
<td>Auditor</td>
</tr>
<tr>
<td>Audit Plan and Strategy</td>
<td>Auditor's Reporting Obligations</td>
<td>Evidence Collection and Evaluation</td>
</tr>
<tr>
<td>Audit Committee</td>
<td>Ethics</td>
<td>Business Climate</td>
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<tr>
<td>Assurance Engagement</td>
<td>Audit Risk</td>
<td>Auditor Liability</td>
</tr>
<tr>
<td>Fraud</td>
<td>Audit Quality</td>
<td>Communications to Users</td>
</tr>
</tbody>
</table>
This task required students to place ‘corporate governance’ as the header concept. This was chosen as it would allow students to build on the two discourse pathways from previous phases as shown on the expert maps (see Figures 40, 48) as separate branches to their concept maps allowing assessment of the conceptual bridges between them.

14.3. **Assessment Phase 3 | Expert Map**

The expert map (see Figure 55) was created by the domain expert using the header concept, and relevant main concepts (MCs) and threshold concepts. Associated concepts were allocated to relevant linking phrases between MCs. The linking phrases were tagged using Biggs SOLO Taxonomy descriptors in respect of the level of complexity of the phrase expected in the student responses. The discourse pathway was added to reflect one logical pathway for linking some of the MCs coherently within the domain of auditing and more specifically in response to the specific task.
14.4. **Assessment Phase 3 | Curriculum Linkages**

The curriculum linkage map (see Figure 56) for Phase 3 was redrawn by again reviewing the lecture summaries for lectures 1 to 6, as it was not a mere combination of Phase 1 (see Figure 38) and Phase 2 (see Figure 46) curriculum linkage maps. This was required as some of the main concepts (MCs) used in Phase 3 were addressed in either lectures 1 to 3 or 4 to 6 but were not part of the...
assessment associated with that Phase and would therefore be absent in those maps.

In the expert map (EM) part of Figure 56, the discourse pathway (DP) was shown by a heavy red line between the MCs. In the curriculum linkage map part of Figure 56, explicit links along the DP as heavy blue lines and other links between MCs and associated concepts as normal blue lines. Links that were not explicit in the lecture summaries (e.g. ‘management’ to ‘financial reports’; ‘corporations act’ to ‘auditors reporting obligations’, ‘corporations act’ to ‘auditing standards’, ‘assurance engagement’ to ‘corporations act’, ‘auditor independence’ to ‘ethics’, ‘auditor’ to ‘audit plan and strategy’, ‘quality control device’ to ‘expectations gap’), were shown in dotted grey lines. Explicit links between MCs found in the lecture summaries, representing alternate pathways, but not in the EM were added as green lines, namely: ‘corporate governance’ to ‘auditor independence’, ‘corporate governance’ to ‘auditor’, ‘corporate governance’ to ‘corporations act’, ‘auditor independence’ to ‘audit report’, ‘auditor independence’ to ‘professional judgement’, ‘auditor’ to ‘true and fair view’, ‘auditor’ to ‘professional judgement’, ‘auditing standards’ to ‘evidence collection and evaluation’, ‘auditing standards’ to ‘audit report’, ‘evidence collection and evaluation’ to ‘audit report’, ‘professional judgement’ to ‘audit report’, ‘professional judgement’ to ‘true and fair view’, ‘audit report’ to ‘quality control device’, ‘quality control device’ to ‘audit quality’, ‘true and fair view’ to ‘financial reports’.
Figure 56: Assessment Phase 3 | Curriculum Linkages
The curriculum linkage map was used by the domain expert to ensure that there had been teaching completeness when referenced against the Assessment Phase 3 task (see Figure 54) and the suggested or expert response shown in the EM (see Figure 55). Of particular interest was the bridge(s) between the two previous DPs associated with ‘auditor independence’ and ‘true and fair view’, in this case defined through the concept of ‘audit opinion’. The domain expert acknowledged that the visualisation of this aspect of teaching was beneficial as it highlighted, in a contemporaneous manner, issues worthy of reflection. On review the domain expert considered that overall the missing links were not an issue as it was expected that students would infer similar linkages through a broader reading of other learning artefacts.

14.5. Assessment Phase 3 | Data Analysis

The data analysis began with removing noise, defined in this case as concepts and links used by a small number of students. This was achieved by creating a concept map of the raw data showing all concepts selected by students and all links between concepts (see Figure 57). This was followed by removing concepts used by only a few students on an iterative basis (see Figure 58) and finally removing links between concepts used by only a few students on an iterative basis (see Figure 59).
14.5.1. **Assessment Phase 3 | Raw Data**

This is a representation of the raw data showing all concepts and links for the 100 student responses. The red framework represents the underlying expert map.

The diagram represents the whole corpus of data. At first glance it appears very messy but in reality many of the concepts and links shown relate to a small number of students. This is termed ‘noise’ and before analysis begins it is removed akin to processes undertaken in Semantic Analysis (Bradford | 2009) reducing the dimensions for analysis by removing noise.

**Figure 57: Assessment Phase 3 | Raw Data of Cohort Responses**
14.5.2. **Assessment Phase 3 | Limiting Concepts**

Figure 58 reflects the removal of ‘noise’ related to concepts. This was achieved in an iterative process starting with concepts selected by only one student and then progressing until we came to removing concepts only selected by up to 10% of students in their responses. The header concept and main concepts were deemed restricted and could not be removed irrespective of the number of students that had selected them.

There is no theoretical reason why 10% was chosen as the cut-off point. It was a subjective decision based on the visual representation of the output. The result was an end point where the expert map was visible and there were a manageable number (in this case six) associated concepts and other concepts left.

![Figure 58: Assessment Phase 3 | Limiting Concepts](image-url)
14.5.3. Assessment Phase 3 | Limiting Linkages

Linkages were then removed in a similar manner removing any links used by less than 10% of the cohort, leaving a useable response framework.

The diagram was then updated to show the number of responses for the header concept and main concepts on the expert map as a background, and also the number of responses for all remaining links.

This visualisation was identified by the domain expert as providing a good overview of the context within which the student cohort has addressed the task.

Figure 59: Assessment Phase 3 | Limiting Linkages
14.6. **Assessment Phase 3 | Linking Phrases Analysis**

**Linking Verbs and Phrases**

Linking phrases were then reviewed and classified by the domain expert as per Table 12 below using a four letter code e.g. U|A|I|X representing a linking phrase that was Unistructural | Relevant to Subject | Not Relevant to the Question | Not Linguistically Acceptable.

**Table 12: Assessment Phase 3 | Linking Phrase Coding**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLO Classifier</td>
<td></td>
</tr>
<tr>
<td><strong>P – Prestructural</strong></td>
<td>: main concepts linked</td>
</tr>
<tr>
<td><strong>U – Unistructural</strong></td>
<td>: main concepts linked with one associated concept</td>
</tr>
<tr>
<td><strong>M – Multistructural</strong></td>
<td>: main concepts linked with two or more associated concepts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Was the linking phrase correct in auditing terms</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the linking phrase add to responding to the question</td>
<td>A</td>
<td>I</td>
</tr>
<tr>
<td>Was the linking phrase linguistically acceptable</td>
<td>L</td>
<td>X</td>
</tr>
</tbody>
</table>

Examples of the phrases from student responses and the coding by the domain expert are shown in Table 13. Main concepts are shown in red and associated concepts used in examples from student-developed maps are shown in blue. The assessment as to whether linking phrases were relevant to both auditing and the question was recognised as very subjective and it was undertaken in two stages in order to allow a review of the process. Half the student maps were assessed and the results reviewed with the domain expert to identify and correct any issues with the process or marking structure but no major changes were made in the process.
### Example Linking Phrases

**Table 13: Assessment Phase 3 | Examples of Coded Linking Phrases**

<table>
<thead>
<tr>
<th>SOLO</th>
<th>Assessment</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simplistic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management <em>prepares Financial Report</em></td>
<td></td>
</tr>
<tr>
<td><strong>Prestructural</strong></td>
<td>P</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>I</td>
</tr>
<tr>
<td><strong>Unistructural</strong></td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>I</td>
</tr>
<tr>
<td><strong>Multistructural</strong></td>
<td>M</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>I</td>
</tr>
</tbody>
</table>

**Incorrect Theory** | Quality Control Device provides reasonable assurance to Stakeholder |
The output was then brought together in tabular format for further analysis as shown in Tables 15 (auditor independence) and Table 16 (true and fair view) below. The legend for Tables 15 and 16 is shown below in Table 14.

**Table 14**: Assessment Phase 3 | Linking Phrase Assessment

<table>
<thead>
<tr>
<th>Column</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A and A1</td>
<td>(A) Concepts linked to the TC ; (A1) and number times MCs selected</td>
</tr>
<tr>
<td>B</td>
<td>Number of Links</td>
</tr>
<tr>
<td>C</td>
<td>Expected SOLO classifier for MCs</td>
</tr>
<tr>
<td>D – E - F</td>
<td>Actual SOLO Classifier in % terms for responses</td>
</tr>
<tr>
<td>G</td>
<td>% Response that is theoretically incorrect</td>
</tr>
<tr>
<td>H</td>
<td>% Responses that is relevant to subject (auditing)</td>
</tr>
<tr>
<td>J1 and J2</td>
<td>(J1) % Responses relevant to question as raw data; (J2) then as corrected data allowing for fact that we are only interested in responses relevant to auditing.</td>
</tr>
<tr>
<td>K</td>
<td>% Responses with language issues</td>
</tr>
</tbody>
</table>

**Auditor Independence (Table 15)**

<table>
<thead>
<tr>
<th>Rows</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Group 1-2</td>
<td>MCs actually linked to TC and on DP from EM</td>
</tr>
<tr>
<td>Second Group 3-4</td>
<td>Links from TC to ACs on DP from EM</td>
</tr>
<tr>
<td>Third Group 5-9</td>
<td>Links from TC to other MCs from EM</td>
</tr>
<tr>
<td>Fourth Group 10-11</td>
<td>Links from TC to other ACs</td>
</tr>
</tbody>
</table>

**True and Fair View (Table 16)**

<table>
<thead>
<tr>
<th>Rows</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Group 1-3</td>
<td>MCs actually linked to TC and on DP from EM</td>
</tr>
<tr>
<td>Second Group 4</td>
<td>Links from TC to ACs on DP from EM</td>
</tr>
<tr>
<td>Third Group 5-7</td>
<td>Links from TC to other MCs from EM</td>
</tr>
<tr>
<td>Fourth Group 8-11</td>
<td>Links from TC to other ACs</td>
</tr>
</tbody>
</table>
14.7. **Assessment Phase 3 | Auditor Independence Analysis**

The results shown in Table 15 were discussed in depth with the domain expert and the following observations made:

**Main and Associated Concepts linked to the TC on the DP**

The main focus of the analysis (Rows 1 to 2) are the main concepts (MCs) ‘corporate governance’ and ‘auditor’ linked to the threshold concept (TC) ‘auditor independence’ and shown on the discourse pathway (DP). The MCs have Biggs SOLO Taxonomy (SOLO) descriptors associated with their links to the TC (see Column B). Also part of the main analysis are the two associated concepts (ACs) ‘audit committee’ and ‘ethics’ (Row 3 to 4) which are part of the linking phrases between the MCs and the TCs on the discourse pathway (DP).

**Main and Associated Concepts not linked to the TC on the DP**

A secondary part of the analysis (Rows 5 to 11) reveals five additional MCs (Rows 5 to 9) ‘evidence collection’, ‘professional judgement’, ‘true and fair view’, ‘audit report’, and ‘audit quality’ and two ACs (Rows 10 - 11) ‘audit risk’, ‘audit plan and strategy’ linked to the TC ‘auditor independence’ on the student responses. As these links were not reflected on the expert map (EM) (Figure 55) there was no expected SOLO classification.

Note: If there were less than 10 students selecting a concept or less than 10 links associated with a concept as seen with ‘ethics’ (Row 4) and ‘audit risk’, ‘audit plan and strategy’ (Rows 10 to 11); in line with the data parsing undertaken they were removed from analysis and are shown in the table in grey.
Table 15: Assessment Phase 3 | Auditor Independence Analysis

<table>
<thead>
<tr>
<th>Linked Concept</th>
<th>Users</th>
<th>Expected SOLO</th>
<th>Achieved SOLO</th>
<th>Theoretically Incorrect</th>
<th>Relevant Auditing</th>
<th>Linking Phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>links from Expert Map</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Corporate Governance</td>
<td>54</td>
<td>U</td>
<td>31%</td>
<td>50%</td>
<td>6%</td>
<td>13%</td>
</tr>
<tr>
<td>2 Auditor</td>
<td>90</td>
<td>U</td>
<td>30%</td>
<td>63%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>links to Expert Associated Concepts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Audit Committee</td>
<td>56</td>
<td></td>
<td>39%</td>
<td>57%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>4 Ethics</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>links to Main Concepts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Evidence Collection</td>
<td>21</td>
<td></td>
<td>48%</td>
<td>48%</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>6 Professional Judgement</td>
<td>15</td>
<td></td>
<td>33%</td>
<td>53%</td>
<td>0%</td>
<td>13%</td>
</tr>
<tr>
<td>7 True and Fair View</td>
<td>11</td>
<td></td>
<td>55%</td>
<td>18%</td>
<td>0%</td>
<td>27%</td>
</tr>
<tr>
<td>8 Audit Report</td>
<td>55</td>
<td></td>
<td>20%</td>
<td>73%</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>9 Audit Quality</td>
<td>11</td>
<td></td>
<td>55%</td>
<td>45%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>links to other Associated Concepts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Audit Risk</td>
<td>4</td>
<td>75%</td>
<td>0%</td>
<td>0%</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>11 Audit Plan and Strategy</td>
<td>1</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Analysis

- **Column A1, Rows 1 to 2 and 5 to 9:** show the number of students selecting the various header and MCs linked to the TC ‘auditor independence’ in the student responses. The TC was selected by 98 students and the high level of responses for the majority of other MCs (over 91 students) shows that most students selected the MCs as per the expert map (EM) and would have been judged to have placed their responses in the appropriate context;

- **Column B, Rows 1 to 4:** show linkages from TC ‘auditor independence’ to the MCs of ‘corporate governance’ (54), ‘auditor’ (90) and the ACs ‘audit committee’ (56) and ‘ethics’ (5). The low level of links direct to corporate governance (54) needs to be considered in context, whereby many students selected an alternate pathway through ‘audit committee’ (56) and hence deemed appropriate to the domain expert. The low level of links direct to ‘ethics’ (5) was noted but no further action was taken as ‘ethics’ was an associated concept in the context of this assessment task.

- **Column B, Rows 5 to 9:** show linkages from the TC ‘auditor independence’ to other MCs not directly linked on the DP on the EM. All of these links were acceptable in terms of positioning the TC in context in the subject of auditing. The high level (55) between the TC and ‘audit report’ provides a contemporaneous red flag for the domain expert to consider in relation to students’ nuanced understanding of ‘audit report’ in the context of the question;

- **Column B, Rows 10 to 11:** show that ACs linked to TC ‘auditor independence’ were selected by under 10% of the students - hence they excluded from further analysis at this stage;

- **Column C, Rows 1 to 2:** show the expected SOLO descriptors for the link from the TC ‘auditor independence’ to ‘corporate governance’ as unistructural with the associated concept defined as ‘audit committee’
from the EM (Figure 55) and the expected SOLO descriptor for the link from the TC ‘auditor independence’ to ‘auditor’ as unistructural with the associated concept defined as ‘ethics’ from the EM (Figure 55). These are the only concepts linked on the DP to the TC ‘auditor independence’. What is of note here is that the associated concept ‘ethics’ is missing, selected by only 5% of students in their responses. That does not mean they are incorrect in their response but the fact that no students selected the link, provides a contemporaneous flag for the domain expert to consider in relation to students’ nuanced understanding of ‘ethics’ in the context of the question;

- **Columns D to F, Rows 1 to 2:** show a profile of the SOLO descriptors associated with the student responses. Row 1 shows that 56% provided an AC between the TC ‘auditor independence’ and ‘corporate governance’ either unistructural or multistructural (Columns E to F) and Row 2 shows 67% provided an AC between the TC ‘auditor independence’ and ‘auditor’ either unistructural or multistructural (Columns E to F). No further analysis was pursued in respect of which ACs were included in the linking phrases, however this is worthy of further research;

- **Column D to F, Rows 3 to 11:** show the profile of SOLO descriptors provided in student responses. There was no basis to assess them as the EM did not have these links and hence did not have declared SOLO descriptors. However they provided a quick check as to the structure and complexity of student responses. They show that many of the links were unistructural, containing ACs but this aspect was outside the scope of this study;

- **Column G, Rows 1 to 11:** show a profile of theoretically incorrect linking phrases providing the instructor with the opportunity to address these in the lectures. Overall the domain expert felt the quantum did not seem unreasonable but again it provided a high level indication of where
a cohort of students might be experiencing difficulty (e.g. 13% of the 54 responses linking the TC to ‘corporate governance’ and 2% of the 90 students linking the TC to ‘auditor’ has had issues with theory). This broad analysis undertaken within the Unit of Study (UoS) could prompt timely intervention. There was no benchmark with which to assess the quantum and no further analysis was undertaken at this stage;

- **Columns H, J1, J2 and Rows 1 to 4:** show a profile as to the relevance of the linking phrase, firstly to the subject (72% to 96%) but there was no benchmark against which to assess this number. This section also shows in column J1 the relevance of the linking phrases to the question and here the results were disappointing with marks between 36% and 38%. These were reassessed shown in column J2 looking only at phrases that were first relevant to the subject and the results improved marginally to between 39% and 51%. Again there was no benchmark with which to assess the quantum and no further analysis was undertaken at this stage;

- **Columns H, J and Rows 4 to 8:** show a profile as to the relevance of the linking phrase to the subject with most phrases (over 80%) acceptable. The one link which is low (55%) of links from ‘auditor independence’ to ‘true and fair view’ was noted by the domain expert as ‘true and fair view’ was also a TC in the assessment and relevance issues at this level would need addressing. This section also shows in column J1 the relevance of the linking phrases to the question here the results were disappointing with responses of between 18% and 38%. These were reassessed column J2 looking only at phrases that were first relevant to the subject and the results improved to between 22% and 50%. There was no benchmark with which to assess the quantum and no further analysis was undertaken; and

- **Column K, Rows 1 to 11:** show a profile of linguistically unacceptable phrases from 0% to 27% with the link between TC and ‘corporate governance’ showing 13% of 54 phrases with issues and the link between
the TC and ‘auditor showing 17% of 90 phrases. This was discussed in depth with the domain expert as it did raise the issue as to whether it was possible to assess a linking phrase with language issues.

14.8. **Assessment Phase 3 | True and Fair View Analysis**

The results shown in Table 16 were discussed in depth with the domain expert and the following observations made.

**Main and Associated Concepts linked to the TC on the DP**

The main focus of the analysis (Rows 1 to 4) are the threshold concept (TC) ‘true and fair view’, the main concepts (MCs) ‘audit report’, ‘audit opinion’ and ‘financial reports’ which have Biggs SOLO Taxonomy (SOLO) descriptors associated with their links to the TC and the associated concept (AC) ‘accounting standards’ which is included in the linking phrases on the discourse pathway (DP).

**Main and Associated Concepts not linked to the TC on the DP**

A secondary part of the analysis (Rows 5 to 11) are three additional MCs (Rows 5 to 7) ‘auditor independence’, ‘professional judgement’ and ‘Corporations Act’ and four ACs (Rows 8 to 11) ‘stakeholders’, ‘management’, ‘expectations gap’ and ‘audit plan and strategy’ linked to the TC on the student responses. As these links were not part of the expert map (EM) (see Figure 55) there was no expected SOLO descriptor.

As with Table 15 above if there were less than 10 links associated with a concept (Rows 7, 10 and 11), in line with the data parsing undertaken they were removed from analysis and are shown in the table in a grey font.
### Table 16: Assessment Phase 3 | True and Fair View Analysis

<table>
<thead>
<tr>
<th>Linked Concept</th>
<th>A1</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J1</th>
<th>J2</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>True and Fair View</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Selected Users</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Linked from Expert Map</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Audit Report</td>
<td>97</td>
<td>92</td>
<td>P</td>
<td>35%</td>
<td>50%</td>
<td>2%</td>
<td>13%</td>
<td>77%</td>
<td>27%</td>
<td>35%</td>
<td>21%</td>
</tr>
<tr>
<td>2 Audit Opinion</td>
<td>8</td>
<td>8</td>
<td>P</td>
<td>50%</td>
<td>13%</td>
<td>13%</td>
<td>25%</td>
<td>63%</td>
<td>13%</td>
<td>20%</td>
<td>25%</td>
</tr>
<tr>
<td>3 Financial Reports</td>
<td>81</td>
<td>28</td>
<td>U</td>
<td>57%</td>
<td>35%</td>
<td>4%</td>
<td>0%</td>
<td>93%</td>
<td>29%</td>
<td>31%</td>
<td>14%</td>
</tr>
<tr>
<td><strong>Linked to Expert Associated Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Accounting Standards</td>
<td>62</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Linked to Main Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Professional Judgement</td>
<td>94</td>
<td>75</td>
<td>28%</td>
<td>65%</td>
<td>3%</td>
<td>4%</td>
<td>92%</td>
<td>23%</td>
<td>25%</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>6 Auditor Independence</td>
<td>98</td>
<td>11</td>
<td>55%</td>
<td>18%</td>
<td>0%</td>
<td>27%</td>
<td>55%</td>
<td>27%</td>
<td>50%</td>
<td>27%</td>
<td></td>
</tr>
<tr>
<td>7 Corporations Act</td>
<td>13</td>
<td>2</td>
<td>0%</td>
<td>0%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>100%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td><strong>Linked to other Associated Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Stakeholders</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Management</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Expectations Gap</td>
<td>8</td>
<td>38%</td>
<td>50%</td>
<td>0%</td>
<td>13%</td>
<td>63%</td>
<td>25%</td>
<td>40%</td>
<td>38%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Audit Strategy and Plan</td>
<td>1</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Analysis

- **Column A1, Rows 1 to 3 and 5 to 7**: show the number of students selecting the various header and MCs linked to the TC ‘true and fair view’ in the student responses. The TC was selected by 96% of students and on review there was quite a divergence in the level of responses to other main concepts. The majority linked to the TC were used in over 81% of the responses and ‘Corporations Act’ at 13%, although low, was discussed with the domain expert and deemed to be satisfactory as it was not on the DP nor on the main branches for the two TCs of ‘auditor independence’ nor ‘true and fair view’ However the MC of ‘audit opinion’ with only 8% response required immediate further remediation (see Section 14.12);

- **Column B, Rows 1 to 4**: show linkages from TC ‘true and fair view’ to MCs and ACs in the EM (see Figure 55). The main links shown are to ‘audit report’ (92), ‘financial reports’ (28) and ‘accounting standards’ (62). The links from ‘audit opinion’ to ‘true and fair view’ at (8) showed that all the students that selected ‘audit opinion’ linked it to the TC ‘true and fair view’;

- **Column B, Rows 5 to 7**: show linkages from the TC ‘true and fair view’ to other MCs not directly linked on the DP on the EM (see Figure 55). All of these links are acceptable in terms of positioning the TC in context of the subject of auditing. The low level (11) between the TC and ‘auditor independence’ needs to be seen in the context of the EM and the very low links from the TC to ‘Corporations Act’ (2) meant that it was not pursued;

- **Column B, Rows 8 to 11**: show ACs linked to TC ‘true and fair view’ reflecting no issues with the two ACs ‘stakeholders’ (18), ‘management’
For ‘expectations gap’ and ‘audit strategy and plan’ where the links were under (10) they were removed from the analysis at this stage;

- **Column C, Rows 1 to 3:** show the expected SOLO descriptor for the link from the TC ‘true and fair view’ to ‘audit report’ and ‘audit opinion’ as prestructural and the link to ‘financial reports’ as unistructural with the AC defined as ‘management’ from the EM (see Figure 55). These are the only concepts linked on the DP to the TC ‘true and fair view’;

- **Columns D to F, Rows 1 to 3:** show a profile of the SOLO descriptors associated with the student responses. Row 1 shows that the link between the TC ‘true and fair view’ to ‘audit report’ (87%) was prestructural or better (Column D to F) from the EM. Row 2 shows that the link between the TC ‘true and fair view’ to ‘audit report’ (75%) were prestructural or better (Column D to F) from the EM. Row 3 shows that the link between the TC ‘true and fair view’ to ‘financial reports’ (43%) were unistructural or better (Column E and F). No further analysis was pursued in respect of which ACs were included in the linking phrases, however this is worthy of further research;

- **Column D to F, Rows 4 to 6 and 8 to 9:** show the profile of SOLO descriptors provide in student responses. This provided a quick check as to the structure of the student responses but it was not analysed here in depth however this is worthy of further research;

- **Column G, Rows 1 to 11:** show a profile of theoretically incorrect linking phrases providing the instructor with the opportunity to address these in further lectures. It was noted that 25% of the 8 links between the TC and ‘audit opinion’ were theoretically incorrect. There was no benchmark to support additional assessment and no further analysis was undertaken;

- **Columns H, J1, J2 and Rows 1 to 3:** show a profile as to the relevance of the linking phrase to the subject. The link between the TC and ‘audit
report’ was 77% relevant and between the TC and ‘financial reports’ was 93% relevant. It was noted that only 63% of the phrases linking the TC to ‘audit opinion’ were relevant. Again there is no benchmark with which to assess this number. This section also shows in column J1 the relevance of the linking phrases to the question and here the results were disappointing with scores between 13% and 29%. These were reassessed in column J2 looking only at phrases that were first relevant to the subject - and the results improved marginally to between 20% and 35%. There was no benchmark to support additional assessment and no further analysis was undertaken;

- **Columns H, J1, J2 and Rows 4 to 6 and 8 to 9**: show a profile as to the relevance of the linking phrase to the subject ranging between 55% and 100% (Column H). This section also shows in column J1 the relevance of the linking phrases to the question, although the results were disappointing with scores between 6% and 27%. These were reassessed in column J2 looking only at phrases that were first relevant to the subject and the results improved to between 7% and 50%. There was no benchmark to support additional assessment and no further analysis was undertaken; and

- **Column K, Rows 1 to 6 and 8 to 9**: show a profile of linguistically incorrect phrases from 7% to 34% and specifically for the TC to ‘audit report’ was 21% of the 92 links. There was no benchmark with which to assess the quantum and no further analysis was undertaken. Although this relates to a small number of students it does provide a contemporaneous red flag for the domain expert to consider in relation to students’ overall ability to express themselves.
14.9. Assessment Phase 3 | Comparative Analysis

The analysis of cognitive progression was undertaken through comparative analysis. Changes in the understanding of the Threshold Concepts ‘auditor independence’ and ‘true and fair view’ were determined by comparing the structure of the student-developed concepts maps from Phases 1 and 2 to Phase 3. Figure 60 shows the comparison of phase 3 Expert Map (see Figure 55) to the parsed data (see Figure 59). Figure 61 shows comparison of the linkages between phase 1 and phase 3 for the Threshold Concept ‘auditor independence’ and, finally, Figure 62 shows the comparison of the linkages between phase 2 and phase 3 for the Threshold Concepts ‘true and fair view’.

14.9.1. Assessment Phase 3 | Comparative Analysis Structure

A comparison of the expert map (EM) for Phase 3 (see Figure 55) to the composite of student maps after parsing for ‘outlying’ concepts and links (see Figure 59) is shown in Figure 60. This was undertaken with a focus on structure and was integral to the feedback mechanism. Feedback was undertaken in a student workshop where the domain expert addressed issues related to concept selection. Analysis of main concepts (MCs) selection demonstrated that ‘corporate governance’, auditor independence’, ‘auditor’, ‘evidence collection and evaluation’, ‘professional judgement’, ‘true and fair view’ and ‘audit report’ on the discourse pathway (DP) were selected by over 91% of the student cohort. Also ‘quality control device’ was selected by 48% of the cohort, but even though ‘audit quality’ was the focus of the question, it was only selected by 39% of the cohort. What was noticeable was that ‘audit opinion’ was only selected by 8% of the cohort. The concept of the DP was
discussed in the workshops as was its relationship to the context within student responses.

The other MCs ‘Corporations Act’, ‘financial reports’, ‘auditing standards’ were also well represented but there is no in-depth discussion as they were not on the DP and it was stressed that, as such, they could easily be replaced by alternative concepts (ACs) if the students’ response had a slightly different focus. It was stressed to the students that there was no single correct response but the expert map (EM) produced by the domain expert with threshold concepts (TCs), MCs and ACs did represent an appropriate response to the assessment task.

Discussion occurred regarding the selection of ACs ‘stakeholders’, ‘audit plan and strategy’, ‘management’ and ‘audit risk’ from the EM as MCs in student responses. There was no reason why they should not have been selected and their placement within the overall framework was considered acceptable. It was noted was that there were no OCs in the cohort’s response after parsing the data.

The overall assessment process was discussed in respect of structure of the cohort’s concept maps as compared to the various EMs. The idea of TCs was introduced and there was discussion regarding exactly what the comparative maps revealed to the domain expert with particular emphasis on context of the overall student response.

Finally there was discussion regarding the fact that only eight students selected the MC ‘audit opinion’ seen by the domain expert as an important part of the response; notably it is the bridge, between the two main DPs of ‘auditor independence’ and ‘true and fair view’ from previous phases of the assessment. It was resolved to hold an additional teaching activity that focused on the nuances of what was meant by ‘audit opinion’.
Figure 60: Assessment Phase 3 | Comparative Analysis Structure
14.9.2. Assessment Phase 3 | Comparative Analysis Auditor Independence

In this sub-section the changes in understanding of the threshold concept (TC) ‘auditor independence’ between Phase 1 and Phase 3 of the assessment were analysed. There are two measures available both related to concept map structure, the number of students selecting the concept and the number of students linking that concept to the TC.

The quality of concepts and associated links can be further graded depending on whether they are main concepts (MCs) and within that whether they form part of the discourse pathway (DP) as defined in the expert map (EM) and finally whether the concepts are associated concepts (ACs) or other concepts (OCs). The analysis (see Table 17) was limited to concepts visible on concept maps from both Phase 1 and Phase 3.

Table 17: Assessment Phase 3 | Auditor Independence Comparative Analysis

<table>
<thead>
<tr>
<th>Column</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>MCs and ACs in both Phase 1 and 3</td>
</tr>
<tr>
<td>B and F</td>
<td>Type of concept wither MC or AC</td>
</tr>
<tr>
<td>C and G</td>
<td>Whether MC was on the DP of the respective EM</td>
</tr>
<tr>
<td>D and H</td>
<td>% cohort selecting the concept</td>
</tr>
<tr>
<td>E and J</td>
<td>% cohort linking concept to TC</td>
</tr>
</tbody>
</table>

The pink highlighted row in Table 18 shows MCs that are in EMs for Phase 1 and 3

A tabular presentation (Table 18) was extracted from the Figure 61 below.
Table 18 shows that the selection of four MCs ‘auditor’, ‘audit report’, ‘professional judgement’, ‘corporate governance’, identified in the EM have been selected by over 64% of students in Phase 1 of the assessment and by over 94% of students in Phase 3 of the assessment with all increasing between the two phases. The MC ‘auditor’ which was on the DP of both phases has increased from 85% to 96% and the number of links increased from 62% to 90%. The selection of the AC ‘audit committee’ also increased from 34% to 56%. It was on the DP of both phases of the assessment and expected in the linking phrase between ‘corporate governance’ and ‘auditor independence’ (see Figures 40 and 55). This suggests Phase 3 shows a more sophisticated student cohort response demonstrating cognitive progression based on the structure of the concept mapping responses to the two phases.

When the comparison between the two phases is viewed in a visual format (Figure 61) with the EM as a template, subtle changes in expected responses are visible when looking at the DP and the placement of the ACs in the linking phrases. Whereas time was a constraint here, and only two maps were compared, analysing the DP around the TC. What becomes obvious through analysis is that in Phase 1 the MC ‘auditor’ is located before the TC on the DP and in Phase 3 it is located...
after the TC on the DP. These subtle changes in expected presentation suggest a variation in context between the two expected responses. From the analysis it was noted that the MC ‘auditor’ increased from 85% to 96% and the number of links increased from 62% to 90%. This suggests the ability of students successfully to develop their responses in changing contexts, again demonstrating cognitive progression. There are many other subtle changes visible but further in-depth analysis is beyond the scope here.
Figure 61: Assessment Phase 3 | Comparative Analysis Auditor Independence
14.9.3. **Assessment Phase 3 | Comparative Analysis True and Fair View**

In this sub-section the changes in understanding of the threshold concept (TC) ‘true and fair view’ between Phase 2 and Phase 3 of the assessment were analysed. There are two measures available both related to concept map structure, the number of students selecting the concept and the number of students linking that concept to the TC.

The quality of concepts and associated links can be further graded depending on whether they are main concepts (MCs) and within that whether they form part of the discourse pathway (DP) as defined in the expert map (EM) and finally whether the concepts are associated concepts (ACs) or other concepts (OCs). The analysis (see Table 19) was limited to concepts visible on concept maps from both Phase 2 and Phase 3.

**Table 19: Assessment Phase 3 | True and Fair View Comparative Analysis**

<table>
<thead>
<tr>
<th>Column</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>MCs and ACs in both Phase 2 and 3</td>
</tr>
<tr>
<td>B and F</td>
<td>Type of concept wither MC or AC</td>
</tr>
<tr>
<td>C and G</td>
<td>Whether MC was on the DP of the respective EM</td>
</tr>
<tr>
<td>D and H</td>
<td>% cohort selecting the concept</td>
</tr>
<tr>
<td>E and J</td>
<td>% cohort linking concept to TC</td>
</tr>
</tbody>
</table>

The pink highlighted rows in Table 20 shows MCs that are in EMs for Phase 2 and 3.
Table 20: Assessment Phase 3 | Comparative Analysis True and Fair View

<table>
<thead>
<tr>
<th>True and Fair View</th>
<th>Phase 2 Figure 49</th>
<th>Phase 3 Figure 64</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Professional Judgement</td>
<td>MC</td>
<td>DP</td>
</tr>
<tr>
<td>Audit Report</td>
<td>MC</td>
<td>DP</td>
</tr>
<tr>
<td>Financial Reports</td>
<td>MC</td>
<td>DP</td>
</tr>
<tr>
<td>Audit Opinion</td>
<td>AC</td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td>OC</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>OC</td>
<td></td>
</tr>
</tbody>
</table>

Table 20 shows that the selection of three MCs ‘professional judgement’, ‘audit report’, ‘financial reports’, identified in the expert map (EM) have been chosen by over 72% of students in phase 2 of the assessment and by over 81% of students in phase 3 of the assessment with all increasing between the two phases. The concept selection of MC ‘audit report’ which was on the DP of both phases and connected to the TC has increased from 90% to 97% and the number of links increased from 54 to 92. The concept selection of MC ‘professional judgement’ which was on the DP of both phases but not connected to the TC has increased from 72% to 94% and the number of links from 54% to 75%. The concept selection of MC ‘financial reports’ has increased from 78% to 81% and the apparent stagnation in links can be explained in that in Phase 3 it was not on the DP. The comparison of selection of other ACs and OCs ‘stakeholders’, ‘management’ is explicable as changes in context of the expected responses.

The issue around ‘audit opinion’ on the DP, given that it was only selected by 8% of the cohort in Phase 3 was identified as requiring immediate resolution (see Section 14.12).
When the comparison between the two phases was undertaken visually (Figure 62) with the EM as a template, subtle changes in expected responses are evident, especially when looking at the DP and the placement of the ACs in the linking phrases. With the time constraint and only two maps to compare, analysis was limited to the DP around the TC.

What is of interest is that the MC ‘professional judgement’ comes before the TC on the DP in both phases but in phase 3 it is separated by the MC ‘audit opinion’ something that was not well addressed. Most of the cohort preferred to link ‘professional judgement’ directly to the TC, with concept selection increasing from 72% to 94% and linkages from 54% to 75% again suggesting the ability of the students successfully to develop their responses in changing contexts. There are many other subtle changes visible but a more in-depth analysis is outside the scope of the study.
Figure 62: Assessment Phase 3 | Comparative Analysis True and Fair View
14.10. **Assessment Phase 3 | Learning Objectives**

Table 21 identifies the assessment instrument and criteria for learning objectives (LOs) 3.1 and 3.4 when assessed against the expert map (EM) for Phase 3 (see Figure 63) below.

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Instrument</th>
<th>Assessment Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Concept selection and structure of concept map</td>
<td>Relevant Response / Solution to problem / issue has been offered</td>
</tr>
<tr>
<td>3.4</td>
<td>Overall Presentation of concept map including, concept selection, structure and linking phrases</td>
<td>Demonstrates a sound knowledge of the role of audit in society and in the reporting process</td>
</tr>
</tbody>
</table>

![Figure 63: Assessment Phase 3 | Learning Objective Expert Map](image-url)
Table 22 reveals 95.3% of students met the expectations of the assessment.

**Table 22: Assessment Phase 3 | Learning Objective 3.1 Outcomes**

**LEARNING OBJECTIVE: 3.1**
Relevant Response / Solution to problem / issue has been offered

**Instrument: Concept Selection Phase 3**
Assessment of Concept Selection and Linkage for 100 students

<table>
<thead>
<tr>
<th>Does not meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark: &lt;50.0%</td>
<td>Mark: &lt;65.0%</td>
<td>Mark: &gt;65.0%</td>
</tr>
<tr>
<td>4.7%</td>
<td>65.4%</td>
<td>29.9%</td>
</tr>
</tbody>
</table>

The LO required students to provide a relevant response to the problem and the mark based on structure of concept maps would suggest that the requirements of the LO have been clearly met.

Table 23 reveals 93.5% of students met expectations of the assessment.

**Table 23: Assessment Phase 3 | Learning Objective 3.4 Outcomes**

**LEARNING OBJECTIVE: 3.4**
Demonstrates a sound knowledge of the role of audit in society and in the reporting process

**Instrument: Concept Map Phase 3**
Assessment of Concept Selection and Linkage for 100 students

<table>
<thead>
<tr>
<th>Does not meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark: &lt;50.0%</td>
<td>Mark: &lt;65.0%</td>
<td>Mark: &gt;65.0%</td>
</tr>
<tr>
<td>6.5%</td>
<td>90.7%</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

The LO required students to demonstrate a sound knowledge of the role of audit in society and the mark based on concept map structure would suggest that the requirements of the LO have been clearly met.
14.11. **Assessment Phase 3 | Review**

Overall the structure of the student-developed concepts showed that the cohort was able to refine its representation of its understanding of threshold concepts as measured through concept selection and linkage as more sophisticated tasks were set. The level of sophistication of the domain identified by the inclusion of associated concepts as defined by the Biggs SOLO Taxonomy (SOLO) descriptors in the expert map (EM), showed that students managed to replicate the domain expert’s representation of the EM with regard to the discourse pathway and further develop a range of linking phrases with a range of SOLO descriptors from prestructural (P), unistructural (U) and in some cases multistructural (M).

The level of theoretically incorrect phrases was considered acceptable at this stage as the data set was limited and there was no benchmark. The process did contemporaneously highlight some areas of concern that could be addressed immediately. The level of linguistically unacceptable phrases was noted and discussed with the domain expert. At this stage a rigorous analysis was beyond the scope of this study (see Chapter 16).

A major finding related to teaching proficiency was the low number of students (8%) selecting the concept ‘audit opinion’. This was discussed with the domain expert. Further analysis was undertaken (see Section 14.12) as it raises the question as to whether the students had been taught appropriately about ‘audit opinion’, or whether they had not understood its significance.

The assessment of whether the phrases were relevant to the discipline of auditing (63% - 100%) was acceptable, showing the ability of students to identify correctly two concepts and state the linkage between them. Analysis as to whether this represented rote learning was outside the scope of this study.

The assessment as to whether the linking phrase was relevant to the question (0% - 50%), proved problematic. The scores were low and if taken in isolation would
suggest that only a few students should have passed the assessment. When this was discussed with the domain expert it was suggested that certain concepts - for example ‘audit planning’ and ‘audit reporting’ could be linked in terms of the general audit context, but in terms of the question on ‘audit quality’ the student did not make that link in any identifiable way for e.g. ‘audit independence’ and ‘audit reporting’ are inextricably linked in terms of the confidence one can gain from ‘audit reports’ - but the linking phrase here needed to specifically include the word 'enhances' or 'leads to better quality' or similar to link back to the question. This raised the issue of the importance of the verb within the linking phrase and while some further analysis was undertaken, albeit beyond the scope of the main study, it is presented in Section 16.2.

14.12. **Assessment Phase 3 | Teaching Review of Audit Opinion**

As previously noted on examination of the student response for Phase 3 of the assessment (see Figure 64) only eight students had included the main concept (MC) ‘audit opinion’ in their maps even though the domain expert considered it was an integral part of the response and the link between the discourse pathway (DP) for the threshold concept (TC) ‘auditor independence’ and the DP for the TC ‘true and fair view’. This indicated that there might have been an issue with regard to the effectiveness of the teaching of the concept or that it had been taught and was not understood in context.
Subsequent analysis of the various teaching artefacts provided to the students before the lecture as PowerPoint slides, and after the lecture as lecture summaries and concept maps showed that the MC ‘audit opinion’ had been extensively covered in both lectures and lecture summaries. Further the MC was offered as an associated concept (AC) in Phase 2 assessment and linked by 28% students as an AC (see Figure 49) in their responses. Table 22 below provides a summary of the coverage of ‘audit opinion’ throughout the Unit of Study (UoS).
This review suggests a misconception in context about the relationship between ‘audit opinion’ and ‘audit quality’. However as the issue was identified contemporaneously within the UoS and prior to the final examination, it was rectified through a teaching activity presented on ‘audit opinion’.

It was also noted that ‘audit opinion’ had been identified as a MC on the DP for the Final Examination and hence there would be an opportunity to assess the cohort’s understanding again before the end of the UoS.
Dialogic Concept Mapping Framework | Final Examination
15. Assessment Final Examination

The Final Examination was different to all previous phases of the assessment in that, although the task was compulsory, students had the option to either create a concept map or provide an extended written response of 150 – 200 words. Further, for students creating a concept map there was no list of concepts provided, the only directive was that ‘corporate governance’ had to be the header concept. An expert map (see Figure 65) was created by the domain expert as one possible response and student responses assessed for structure. The assessment had learning objective 3.5 (see Table 25) associated with the response. The analysis shows that 94.4% of students met the criteria (see Table 26). The marks for the mapping responses were then compared to a randomly selected sample of students who provided written responses, to examine if there were identifiable differences. Due to limited time and the fixed data set from previous phases, the comparison was based solely on concept usage. Analysis showed that students who created concept maps were more focused in concept selection. Mappers also, on average, did better in that question and in the overall Unit of Study (see Table 31).

The final examination was part of the overall Assurance of Learning validation process even though the concept mapping (CM) exercise within the final examination was optional. Eighteen students responded with concept maps to the following question:

**Question:**

Auditor Independence is said to be the ‘cornerstone of auditing’. Therefore, to ensure ‘audit quality’ it is imperative for auditors to remain independent.

Outline how the existence, or lack, of auditor independence is argued to impact ‘audit quality’.
You may answer this question using a concept map with a maximum of 7 concepts excluding Corporate Governance which should be used as a starting point, or provide a written response to a maximum of one A4 page of the answer booklet.

What was novel in this assessment is that the students were not given a list of concepts from which to develop their answer. However the question does revisit one of the previously assessed threshold concepts ‘auditor independence’ and the expected response was embedded in the concept maps that the students had developed over Phases 1 to 3 of the CM assessment task.

15.2. Assessment Final Examination | Learning Objective

The final examination was used in the formal Assurance of Learning process as defined in Table 25 showing the assessment instrument and criteria for the learning objective 3.5.

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Instrument</th>
<th>Assessment Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>Concept Map Structure Final Examination</td>
<td>Does the response demonstrate a sound understanding of audit quality and show a contextual understanding of relevant ethical, social professional considerations.</td>
</tr>
</tbody>
</table>

*Table 25: Assessment Final Examination | Learning Objective 3.5 Criteria*

15.3. Assessment Final Examination | Expert Map

The mapped responses were assessed against an expert map (EM) shown in Figure 65 to provide validation of Assurance of Learning. They then were
compared to a random sample of eighteen written responses to this question, in order to see how the mapping cohort had performed when compared to written responses.

![Diagram](image)

**Figure 65**: Assessment Final Examination | Expert Map

The EM in Figure 65, created by the domain expert showed the header concept of ‘corporate governance’, the threshold concept of ‘auditor independence’ which was identified in the task and six main concepts (MCs) comprising ‘audit committee’, ‘auditor’, ‘professional judgement’, ‘audit opinion’, ‘quality control device’ and ‘audit quality’. The linking phrases were all expected to have the Biggs SOLO Taxonomy descriptor of prestructural (P) in an examination setting.
The results in Table 26 showed that 94.4% of the cohort who submitted mapped responses met or exceeded the expectations of the assessment. The learning objective (LO) required students to demonstrate a sound understanding of ‘audit quality’ and show a contextual understanding of relevant ethical, social professional considerations.

**Table 26: Assessment Final Examination | Learning Objective 3.5 Outcomes**

<table>
<thead>
<tr>
<th>LEARNING OBJECTIVE: 3.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response/solutions demonstrate a sound understanding of audit quality and shows a contextual understanding of relevant ethical, social professional considerations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrument: Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment of Concept Selection and Linkage for 18 students</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary Examination (Cohort 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not meet Expectations Mark: &lt;50.0% 5.6%</td>
</tr>
<tr>
<td>Meets Expectations Mark: &lt;85.0% 84.1%</td>
</tr>
<tr>
<td>Exceeds Expectations Mark: &gt;85.0% 10.3%</td>
</tr>
</tbody>
</table>

The mark based on the structure of the concept maps would suggest that the requirements of the LO had been clearly met.

### 15.4. **Assessment Final Examination | Comparative Analysis**

This final examination also provided an opportunity to undertake a different form of comparative analysis. Rather than comparing the cohort’s concept maps to the expert map (EM) we compared mapped and written response from the same assessment task. A comparison of the main concepts (MCs) as detailed in the EM (see Figure 65) is shown in Table 27 revealing some interesting differences in terms of the overall concept selection, inherent within the different forms of response.

With eighteen mapped responses and a limit of seven MCs per response the total number of MCs that could have been selected by mappers is 126 (18x7). The mapped responses selected 80% (100 concepts) for the MCs on the EM, whereas the written responses selected only 58% (73 concepts). Of note was the fact that none of the written responses used the header concept ‘corporate governance’ even though it was designated as mandatory in the concept mapping task. This
lack of use of a pointer in relation to context also resulted in none of the written responses using the MC ‘audit committee’. Further the question related specifically to the MC ‘audit quality’, selected by all the mapped responses but by only thirteen of the written responses. This suggests that the structure embedded in the concept mapping process did provide direction in terms of context something neither identified nor embraced in the written responses.

Table 27: Assessment Final Examination | Comparison Main Concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>A</th>
<th>Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Governance</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Audit Committee</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Auditor</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td><strong>Auditor Independence</strong></td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Professional Judgement</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Audit Opinion</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Quality Control Device</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Audit Quality</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td><strong>Main Concepts</strong></td>
<td>78</td>
<td>100</td>
</tr>
</tbody>
</table>

Additional concepts, deemed by the domain expert to be possible associated concepts (ACs) are shown in the Table 28 below. Another interesting issue shown by the data is that the mapped responses used an additional 19 ACs, in line with the restriction that they were only to use seven concepts in their response and the fact that 100 had already been accounted for. However the written responses used an additional 67 ACs and within that group there was a focus on ‘financial reports’, ‘independence of mind’ and ‘independence of appearance’ providing the domain expert with an insight into the cognitive progression of the cohort and flagging some further refinements in terms of teaching for subsequent cohorts.
Table 28: Assessment Final Examination | Comparison Associated Concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>A Words</th>
<th>F No Students Using Concepts</th>
<th>G No Students Using Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Written</td>
<td>Mapped</td>
</tr>
<tr>
<td>Evidence Collection and Evaluation</td>
<td>6</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Financial Report</td>
<td>14</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Professional Scepticism</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>True and Fair View</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Audit Report</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Independence of Mind</td>
<td>15</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Independence of Appearance</td>
<td>15</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Associated Concepts</strong></td>
<td><strong>67</strong></td>
<td></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

Additional concepts were deemed by the domain expert to be possible other concepts (OCs); they are shown in Table 29. An issue here is that there was a high number of OCs selected, eleven in all, with twenty-one used in written responses and seven in mapped responses.

Table 29: Assessment Final Examination | Comparison Other Concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>A Words</th>
<th>F No Students Using Concepts</th>
<th>G No Students Using Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Written</td>
<td>Mapped</td>
</tr>
<tr>
<td>Accounting Standards</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Engagement</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Audit Plan and Strategy</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Risk</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Standards</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CLERP9</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Corporation Law</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ethics</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Other Concepts</strong></td>
<td><strong>21</strong></td>
<td></td>
<td><strong>7</strong></td>
</tr>
<tr>
<td><strong>Total Concepts</strong></td>
<td><strong>161</strong></td>
<td></td>
<td><strong>126</strong></td>
</tr>
</tbody>
</table>

Overall the mapped responses used 126 concepts as expected. The written responses used 161 concepts and appeared to frame their answers in a different
way, at a lower level of sophistication around ‘independence of mind’ and ‘independence of appearance’. On further detailed analysis of the written responses it was apparent that many students used each concept several times as outlined in Table 30 below which shows:

- Column A : Concept selected shown in groups MC, ACs and OCs;
- Column B : Average use of each concept in written responses;
- Column C : Maximum use of each concept in written responses; and
- Column E : Use of each concept in mapped responses by definition =1.

The table reveals some basic issues with context and language within the cohort. The count of words used in written responses ranged from 155 – 224 and within that the average use of each concept ranged from one to over three for the MCs ‘auditor’ and ‘auditor independence’. However some respondents used concepts like ‘auditor’ nine times and ‘independence of mind’ seven times, in their responses. This may point to problems with written communication skills, an issue often not formally addressed and often deemed outside the purview of Universities (Birrell | 2006).
Table 30: Assessment Final Examination | Comparative Analysis Mapped and Written Responses

<table>
<thead>
<tr>
<th></th>
<th>B Written</th>
<th>C</th>
<th>D Mapped</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg Words</td>
<td>Max Words</td>
<td>Avg Words</td>
<td>Max Words</td>
</tr>
<tr>
<td>Concept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate Governance</td>
<td>155</td>
<td>224</td>
<td>165</td>
<td>225</td>
</tr>
<tr>
<td>Audit Committee</td>
<td>0.00</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Auditor</td>
<td>3.28</td>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Auditor Independence</strong></td>
<td>3.33</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Professional Judgement</td>
<td>1.50</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Opinion</td>
<td>2.00</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Quality Control Device</td>
<td>1.50</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Quality</td>
<td>2.31</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Main Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence Collection and Evaluation</td>
<td>1.17</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Financial Report</td>
<td>1.93</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Professional Scepticism</td>
<td>1.38</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>True and Fair View</td>
<td>1.17</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Report</td>
<td>1.67</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Independence of Mind</td>
<td>2.07</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Independence of Appearance</td>
<td>1.73</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Associated Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounting Standards</td>
<td>1.00</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>1.13</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Engagement</td>
<td>1.00</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Audit Plan and Strategy</td>
<td>1.00</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Risk</td>
<td>1.00</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Audit Standards</td>
<td>1.33</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CLERP9</td>
<td>2.00</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Corporation Law</td>
<td>1.00</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ethics</td>
<td>1.50</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>1.00</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td>0.00</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Other Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further analysis was not undertaken; however the data was consistent with Uzawa and Cummings (1989) who indicated that the lack of vocabulary is probably the best indicator of overall text quality and that Second Language writers have specific difficulties in the early years of their education. In the context of this study that might account for some of the linguistic issues encountered when the linking phrases were assessed, but on review of the written responses the majority seemed to have a systemic issue with a general level of English writing skills throughout the cohort. Birrell (2006) found that
allowances are often made in higher educational institutions for the poor quality of English spoken and written by students, even at the Masters level.

In terms of comparing the final assessment of mapped and written responses Table 31 shows statistical data obtained from the Learning Management System (Blackboard). This data showed that the students who provided mapping responses scored better (average 57.6%) in terms of the actual question and had a better average mark than both the comparative group (53.6%) and the overall cohort (55.9%).

Table 31: Assessment Final Examination | Comparative Analysis Mapped and Written Marks

<table>
<thead>
<tr>
<th></th>
<th>Does not meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
<th>Average Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam Q4 Written Response</td>
<td>61.1%</td>
<td>38.9%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Exam Q4 Mapping Response</td>
<td>33.3%</td>
<td>50.0%</td>
<td>16.7%</td>
<td></td>
</tr>
<tr>
<td>UOS Written Response</td>
<td>33.3%</td>
<td>50.0%</td>
<td>16.7%</td>
<td>53.60%</td>
</tr>
<tr>
<td>UOS Mapping Response</td>
<td></td>
<td></td>
<td></td>
<td>57.60%</td>
</tr>
<tr>
<td>UOS Average</td>
<td></td>
<td></td>
<td></td>
<td>55.90%</td>
</tr>
</tbody>
</table>

15.5. Assessment Final Examination | Review

From the mapped responders’ perspectives, being limited to seven main concepts, (MCs) and only able to use a concept once in their concept mapping (CM) the overall response was more focused. The selection of MCs was focused with ‘corporate governance’ 100%; ‘audit committee’ 89%; ‘auditor’ 85%; ‘auditor independence’ 100%; ‘professional judgement’ 61%, ‘audit opinion’ 72%, ‘quality control device’ 50% and ‘audit quality’ 100%. The CM mode of response clearly forced mappers to spend more effort on focusing on an answer than constructing a coherent piece of prose. The other associated concepts (ACs) selected were ‘evidence collection and evaluation’ 50%, ‘financial reports’ 17%, ‘true and fair view’ 28%, ‘audit report’ 11% and finally a range of other concepts (OCs). This resulted in good structure for the mapping cohort more obviously demonstrating cognitive progression and retention. The lack of use of
any ACs within linking phrases might suggest that the answers were unsophisticated, however, it might also relate to not defining this option explicitly in the task.

From the written responders’ perspective, although given direction in the question as to how to create a concept map starting with ‘corporate governance’, as a header concept (HC) none of the written responses included this HC. The complete lack of use of ‘audit committee’ is more difficult to explain except that is does logically fit between ‘corporate governance’ and ‘auditor independence’ as was highlighted in previous assessment tasks and in other learning activities. The MCs used by this sample were ‘audit’ 100%, ‘auditor independence’ 100%, ‘professional judgement’ 44%, ‘audit opinion’ 67%, ‘quality control device’ 22% and ‘audit quality’ 72%. There was a broad spread of ACs ‘evidence collection and evaluation’ 33%, ‘financial reports’ 78%, ‘professional scepticism’ 44%, ‘true and fair view’ 33%, ‘audit report’ 17%, ‘independence of mind’ 83% and ‘independence of appearance’ 83%. Finally, there was a broad range of OCs, 11 in all, used in 21 instances. Many responses contained considerable repetitive use of concepts which seemed to suggest some redundancy adding little to the overall response and potentially a rhetorical strategy by students.
16. Other Considerations and Future Research

In view of disappointing results in relation to relevance of linking phrases to the assessment task and linguistic acceptability additional work was undertaken to provide a basis for further research.

16.1. English as Second Language

No account had previously been taken regarding the cultural background of the students and of their English language proficiency to understand if that might have a bearing on the quality of the linking phrases used in assessment tasks.

On analysis, the cohort for Unit of Study ACCT6007 (see table 32) revealed 98% international students with 82% from China. The effects of English as Second Language (ESL) and Second Language (L2) writers might therefore have a bearing on the linguistic competency of the cohort.

Table 32: Further Research | Unit of Study Cohort

| There are students from 18 countries in your unit of study (defined as country of birth). The most common countries of origin are given below: |
|---|---|
| China (Excludes SARS and Taiwan) | 93 | 82% |
| Australia | 2 | 2% |
| Korea, Republic of (South) | 2 | 2% |
| Russian Federation | 2 | 2% |
| Thailand | 2 | 2% |
| Cambodia | 1 | 1% |
| Colombia | 1 | 1% |
| France | 1 | 1% |
| Germany | 1 | 1% |
| Hong Kong (SAR of China) | 1 | 1% |
| India | 1 | 1% |
| Indonesia | 1 | 1% |
| Lebanon | 1 | 1% |
| Nepal | 1 | 1% |

Vespoor et al. (2012) suggest that a useful way to assess general proficiency in a second language is to assess writing samples. Writing offers the ability to reflect, supporting more complex linguistic composition. In order to undertake such an assessment the characteristics of each L2 proficiency level would need to be clearly defined.
Our simple analysis of written responses (see Tables 27 to 30) from the final examination did indicate possible issues with written communication. While it is beyond the scope of this study to make a judgement due to the limited data set, in a broader longitudinal setting where not only linking phrases but changes in linking phrases could be assessed over time it is possible that teaching processes could be developed and implemented to ameliorate this as an issue. The issue of ESL also relates to understanding the language of the discipline as noted in section 5.4.3 above.

16.2. **ESL and Linking Phrases**

Fromkin *et al.* (2003:191) contend that the verb is the most important element in the sentence, playing a central role in the meaning and structure of sentences. The verb determines the number of objects and limits the semantic properties of both its subject and objects. To that extent concept mapping (CM), with linking verbs, would seem to be an ideal tool to assess a student’s rudimentary understanding and ability to express a point of view while reinforcing the other associated aspects of grammar.

From previous unpublished work (van der Laan *et al.* | 2005) the verb in the linking phrase had been identified as an important factor in assessment and hence details of verbs used in Phase 1 and Phase 2 of the assessment task were collated. The linking verbs related to the threshold concept (TC) ‘auditor independence’ were mapped (see Figure 66) and to the TC ‘true and fair view’ were mapped (see Figure 67) as an internal data source for future analysis in respect of developing the framework for using Biggs SOLO Taxonomy descriptors based on verb analysis, as an assessment rubric.

At this stage no analysis was undertaken but the diagrams were discussed with the students simply as a means of assisting English as Second Language (ESL) and Second Language (L2) writers with enhanced verb selection.
Figure 66: Further Research | Verb Analysis Auditor Independence

Figure 67: Further Research | Verb Analysis True and Fair View
In the analysis of expected knowledge defined in the conceptual framework (CF), Brabrand and Dahl (2009) had considered the verb used in the learning objectives (LOs) associated with a Unit of Study (UoS) and allocated a knowledge “level descriptor” based on SOLO. Additionally they segmented the verbs as qualitative relating to unistructural (U) and multistructural (M) and qualitative relating to relational (R) and extended abstract (EA) and endeavoured to show that SOLO could be used in this manner to analyse expected cognitive progression based on changes in LOs in a program with a range of UoS.

Using a concept similar to Brabrand and Dahl (2009) it should be possible to classify a verb as being able to support unistructural (U) or multistructural (M) linking phrases. This would probably be discipline dependent and very subjective initially but the system could be set up to learn from previous linking phrases throughout a longitudinal study over several Programs. An initial review of the verbs in Figures 66 and 67, and a review of a subset of linking phrases representing ‘auditor independence’ (see Table 33) suggested that verb selection in isolation was not the total arbiter as to whether the context of linking phrases could be assessed using SOLO descriptors for relevance to the assessment task (e.g. enhances).

Rather, what was significant was the phrasal verb consisting of a verb in combination with a preposition or adverb or both, the meaning of which is different from the meaning of its separate parts: 'look after', 'work out' and 'make up for' would always be necessary for grammatically correct integration of associated concepts (ACs) into linking phrases. Students used verbs like ‘accomplish’, ‘extinguish’ which are acceptable at the SOLO prestructural (P) level but they needed to use phrasal verbs like ‘accomplish by’, ‘extinguish through’ in order to integrate ACs and develop higher level representation. Perhaps the analysis of the phrasal verb would support the selection of acceptable associated concepts (e.g. monitored through the ‘audit committee’; provides through ‘ethical standards’).
Chen (2007) found that there are reasons why Chinese learners of English avoid using phrasal verbs which often leads to ineffective communication. The word ‘panwang’ can illustrate this issue. ‘Pan’ and ‘wang’, two Chinese verbs, share the meaning ‘look’ in ancient Chinese but in modern Chinese the combination means ‘expect’ or ‘look forward to’. ‘Fu’ means ‘again’ but ‘xi’ means study in ancient Chinese while in modern Chinese the word ‘Fuxi’ means ‘review’ or ‘go over’” (Chen | 2007:350). Based on these preliminary findings it was evident that any framework that assessed the linking phrase would be improved if it also supported the teaching and reinforcement of phrasal verbs. In the dialogic concept mapping (DCM) process the lecture summaries could be modified and compressed to use linking phrases with embedded ACs thus exposing the student to phrasal verb combinations. Then, if supported over a longitudinal study and integrated with an iterative assessment framework, the ESL and L2 issues might be negated and if not it would certainly be visible to change detection allowing Assurance of Learning validation.

Finally, consideration would have to be given to the use of an extended DCM process over more than a single UoS where concepts are continually revisited.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Governance</td>
<td>enhances</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Corporate Governance</td>
<td>including the audit committee needs to maintain auditor's objectivity and</td>
<td>U</td>
<td>P</td>
</tr>
<tr>
<td>Corporate Governance</td>
<td>provides through ethical standards both integrity and objectivity</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Corporate Governance</td>
<td>is an external mechanism in terms of safeguarding the auditor and is an essential requirement for</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Corporate Governance</td>
<td>is an external mechanism monitored through the Audit Committee including the Auditor and is a fundamental requirement for the provision of</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
and a student’s understanding continually enhanced resulting in the linking phrases becoming too complex and possibly unworkable. Killen (2005:171) addressed this form of complexity and suggested that allowance would have to be given to situations where the learner has mastered the content and thinking strategies at a high level and this integrated ‘unit’ of understanding could become a lower level response for a more sophisticated U-M-R cycle of learning within the same mode (Figure 13).
17. Conclusions, Contributions and Limitations

17.1. Summary and Conclusions

The primary proposition examined in this study was introduced in Chapter 2.

Primary Proposition:

*The validation of Assurance of Learning as defined by the AACSB and in its broader notion defined in this study, would benefit from some form of iterative visualisation. An example is the use of a dialogic concept mapping process focused on threshold concepts providing, through observation, a contemporaneous insight into curriculum management, teaching proficiency and cognitive progression and retention.*

**AACSB definition of Assurance of Learning**

Validation of Assurance of Learning, as defined by the AACSB, was achieved by assessing responses to various assessment tasks, including the final examination, against a range of pre-defined learning objectives. The metrics used were either snippets of student-developed concepts maps compared to an expert map created by the domain expert for structure (concept selection and linkages), or the whole concept map assessed for general presentation and structure. On conclusion of each phase of the assessment task the outcomes were discussed with the student cohort, and steps taken to remedy any identified issues. The progressive analysis of the results across subsequent phases (see Table 34) allowed a more definitive statement to be made regarding the learning outcomes of the Unit of Study ACCT6007: Contemporary Issues in Auditing.
Learning objectives (see Table 34) were set by the domain expert for each phase of the assessment task including the final examination. In Phase 1, learning objective 3.2 was linked to a snippet from the expert map (see Figure 42) focused on the traditional linkages between ‘auditor’, ‘audit committee’, ‘management’, ‘auditor independence’, ‘professional judgement’ and ‘ethics’ allowing the cohort to demonstrate an integrated understanding of professional independence as an important ethical consideration and why it is a professional requirement. Table 34 reports that 11.2% of the students ‘Did Not Meet Expectations’.

In Phase 2, learning objective 3.3 was linked to a snippet of the expert map (see Figure 52) focused on the traditional linkages between ‘professional judgement’, ‘expectations gap’, ‘accounting standards’, ‘auditors reporting obligations’ and ‘true and fair view’. Table 34 reports that 7.5% of the students ‘Did Not Meet Expectations’.

In Phase 3, learning objective 3.4 was linked to overall presentation of the whole cohort response compared to the expert map (see Figure 55). Table 32 reports that 6.5% of the students ‘Did Not Meet Expectations’. Learning objective 3.1 was linked to the whole concept map structure of main and associated concepts compared to the expert map (see Figure 55). Table 34 reports that 4.7% of the students ‘Did Not Meet Expectations’.

In the final examination, learning objective 3.5 was linked to the whole concept map compared to the expert map (see Figure 65) looking at general presentation and structure of main concepts for those students that selected to provide a mapped response. Table 34 reports that 5.6% of the students ‘Did Not Meet Expectations’.

The reduction from 11.2% in Phase 1 to 4.7% in Phase 3 showed a progressive improvement in the cohort’s ability to communicate their understanding of auditing issues related to defined threshold concepts, reflecting cognitive progression. The apparent anomaly in the learning objective 3.5 where there was an increase to 5.6% who ‘Did Not Meet
Expectations’ is explicable as the final examination assessment was based on different criteria wherein: the format was different as students were not given a list of concepts to choose from; and the cohort was based on the 18 students providing mapped responses. Alternatively, as the 5.6% is not far from previous results in Phase 3 of the assessment task, it could indicate that the dialogic concept mapping process is suitable for various sized cohorts.

Table 34: Assessment Summary | Learning Objectives Outcomes

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Learning Objectives</th>
<th>Does not meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>LO 3.2</td>
<td>11.2%</td>
<td>76.6%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Phase 2</td>
<td>LO 3.3</td>
<td>7.5%</td>
<td>75.7%</td>
<td>16.8%</td>
</tr>
<tr>
<td>Phase 3</td>
<td>LO 3.4</td>
<td>6.5%</td>
<td>90.7%</td>
<td>2.8%</td>
</tr>
<tr>
<td></td>
<td>LO 3.1</td>
<td>4.7%</td>
<td>65.4%</td>
<td>29.9%</td>
</tr>
<tr>
<td>Exam</td>
<td>LO 3.5</td>
<td>5.6%</td>
<td>84.1%</td>
<td>10.3%</td>
</tr>
</tbody>
</table>

**Broader Concept of Assurance of Learning**

To observe and validate the broader context of Assurance of Learning through the use of dialogic concept mapping of threshold concepts a design-based research methodology was adopted (see Chapter 3). A conceptual framework established by drawing on a broad corpus of literature was honed to provide a baseline validation process (see Chapters 4 and 5). The conceptual framework was iteratively altered to provide a workable framework (see Chapter 6) using a series of pilot observations on concept mapping as an assessment tool (see Annexure B) and concept mapping as a feedback mechanism (see Annexure C). The workable framework was further tailored to cater for local restrictions and practical limitations, resulting in the development of a practical framework (see Chapter 7). This practical framework was observed (see Chapters 8-16) using a dialogic concept mapping process, first to validate Assurance of Learning as required by the Business School as part of its participation in the AACSB and second to conclude whether dialogic concept mapping process
could be demonstrated to validate a broader implementation of assurance of learning embracing curriculum management, teaching proficiency and cognitive progression and retention.

Consequential sub-propositions were also identified:

a. *The validation of Assurance of Learning through the demonstration of curriculum management, using dialogic concept mapping, can be achieved by mapping major areas of the curriculum to ensure that teaching is both sequenced and undertaken.*

Although the actual curriculum (a static historical document) was not mapped as a separate concept mapping exercise within the dialogic concept mapping process, concepts from the curriculum were identified and their teaching (inclusion in lecture summaries, assessment questions and expert maps), validated and shown in tabular form (see Tables 5 and 9). Further a representation of the taught curriculum (a dynamic live document) was mapped directly from the lecture summaries provided to the students (see Figures 35, 36, 37, 43, 44, 45). These lecture summaries were further analysed and presented as a series of curriculum linkage maps (see Figures 38, 46 and 56) identifying whether two concepts had been explicitly linked in the lecture summaries, providing a more comprehensive view of the learning context in relation to when and how concepts were presented in the discipline domain. This form of curriculum management provided a means of validating the sequencing of the planned curriculum, the taught curriculum and most important the context around the teaching, offering the domain expert an ability to justify the use of concepts and discourse pathways used in assessment tasks. To that end, this study demonstrates that dialogic concept mapping is a process to validate curriculum management as part of a broader definition of Assurance of Learning. In supporting the contemporaneous analysis of the taught curriculum with a focus on content delivery, sequencing and context, the dialogic concept
mapping process demonstrated that curriculum management could assist in the validation of Assurance of Learning.

b. The validation of Assurance of Learning through the demonstration of teaching proficiency, using dialogic concept mapping, can be achieved through the identification of gaps in student’s understanding of threshold concepts and allowing the contemporaneous rectification of any misconceptions.

Teaching proficiency is a broad concept and its validation in this study was confined to analysing concept maps submitted by students as part of each phase of the assessment task to contemporaneously review the cohort’s progressive understanding of concepts in a particular context. This allowed anomalies in student representation of their knowledge using concept mapping to be easily identified, as seen in Figure 64, where the concept of ‘audit opinion’ was very poorly addressed by the majority of the student cohort in Phase 3 of the assessment task. The contemporaneous manner of this observation allowed immediate identification of this issue. Once identified the issue was rectified through additional teaching activities which in themselves were validated as the concept ‘audit opinion’ was again assessed in the final examination. In that assessment task it was selected by a larger percentage of the cohort submitting both written and mapped responses, perhaps reflecting a better understanding of the concept of ‘audit opinion’ in context. In supporting the contemporaneous identification and immediate rectification of teaching issues, the dialogic concept mapping process demonstrated that teaching proficiency could assist in the validation of Assurance of Learning.
c. The validation of Assurance of Learning through the demonstration of cognitive progression and retention, using dialogic concept mapping of threshold concepts, can be achieved by the integration of assessment and feedback at the macro and micro level using standard methodology of structure and linkage as well as enhanced methods using Biggs SOLO taxonomy.

In Phases 1 and 2 of the assessment task, a student’s understanding was assessed using concept mapping comparing their maps to expert maps created by the domain expert and assessed for structure with regard to concept selection of main and associated concepts and concept linkages. In Phase 3, a broader assessment process was undertaken, initially examining the linking phrases using Biggs SOLO Taxonomy descriptors. The linking phrase were also assessed for relevance to the discipline domain, relevance to the assessment task and finally for linguistic acceptability (see Tables 15, 16). Timely feedback was provided using comparative mapping using the expert map as a background to the cohorts (peer group) maps (see Figures 60, 61, 62) providing a basis for demonstrating acceptable response options, while identifying and addressing misconceptions in real time. The dialogic concept mapping process demonstrated the cohort’s cognitive progression and retention based on the assessment of discrete changes in two defined threshold concepts ‘auditor independence’ and ‘true and fair view’ (see Tables 18, 20) during the Unit of Study. In supporting a mechanism to contemporaneously assess changes in student understanding of threshold concepts, the dialogic concept mapping process demonstrated that cognitive progression and retention could assist in the validation of Assurance of Learning.
17.2. Contributions

Prior research has shown that Assurance of Learning as defined by the AACSB is well established in many higher educational institutions. Currently validation of Assurance of Learning is primarily focused on curriculum management at the Program level. This study challenges that somewhat rigid process of ostensibly aligning validation solely with curriculum management and posits the question, through observation, as to the whether higher educational institutions should expand the Assurance of Learning process, specifically to include support for teaching proficiency and cognitive progression and retention. The research advances theory on the use of dialogic concept mapping as a process within which different assessment instruments, both qualitative and quantitative, can be used in an integrated fashion to contemporaneously demonstrate that end. Moreover, the research brings together disparate theories in a loosely coupled arrangement to determine a practical framework for efficient, timely and effective feedback.

Thus, this research provides the following contributions:

- to Assurance of Learning theory by proposing a practical framework to undertake current validation while supporting a broader definition of Assurance of Learning;

- to the theory of concept mapping by the design, development and implementation of a dialogic concept mapping process to contemporaneously validate curriculum management, teaching proficiency and cognitive progression and retention;

- to the theory of threshold concepts by the visual observation of a cohort’s cognitive progression and retention of these concepts as demonstrated through a dialogic concept mapping process;
• to the practice of assessment in a higher education context by developing and testing a framework which integrates Biggs SOLO Taxonomy as a metric for validating Assurance of Learning through the use of student-developed concept maps. Further, allowing inferences about learning validation to be made by assessing the representation of a student knowledge space at a particular point in time and how it changes through individual or group assessments. Additionally through the integration of expert concept maps to enhance learning and rectify misconceptions;

• to the practice of feedback in a higher education context through developing and testing a framework which contemporaneously assesses and offers direction to students undertaking assessment tasks, while also providing feedback to instructors as to the level of comprehension exhibited by students in respect of specific teaching artefacts;

• to the literature on English as Second Language and Second Language writers through the reporting of how a dialogic concept mapping process identifies English as Second Language and Second Language writers issues and suggested remedies; and

• to the literature on design-based research through the reporting of a deployment of a dialogic mapping process from the definition of a conceptual framework, to the development of a workable framework and finally to the observation of a practical framework.

In sum the inferences drawn from this research developed on a unique data set to answer a specific question will assist those seeking to satisfy the Assurance of Learning educational standards of the AACSB.
17.3. **Limitations**

The study was an integrated, cyclical mix of qualitative and quantitative observations based on a design-based research methodology where the researcher was embedded in the minutiae of the study. Its greatest strength was that the final practical framework (see Chapter 7) was developed from observations undertaken in developing the conceptual framework (see Chapters 4 and 5) and modified to inform a workable framework (see Chapter 6) and then validated by existing theory (see Chapters 8 to 16). Its greatest weakness was that the final practical framework had to be observed over a single Unit of Study of thirteen weeks, due to restrictions in access to both teaching staff and student cohorts.

As a single case study, any statements on generalisation need to be tempered but in this case the actual observation of the dialogic concept mapping was a compressed version of a conceptualised larger study. Expected knowledge could not be addressed but prior knowledge was addressed by observing changes in threshold concepts over the duration of the Unit of Study continuously revisiting the students’ knowledge space to assess and validate cognitive progression and retention. No access has been granted to date to undertake any further research. However further work has been undertaken, outside the scope of the study, to apply some of the findings to assessment tasks in a self-regulated learning and assessment environment.

The implementation of new technologies in a higher educational context can be fraught with danger, but in this case the design-based research methodology assisted a smooth implementation as there were no issues in respect of the use of technology. The process was certainly supported through the work done prior to the commencement of the study and validated in informing the working framework where several observations related to student and instructional staff acceptance of technology and process were developed.
Having a single domain expert would pose problems over a longitudinal study, but here the focus was on a single capstone Unit of Study and the ability of the domain expert to capture every nuance of dialogic concept mapping in the preparation of lecture summaries and expert maps was not of great concern as the focus of the study was to observe whether the dialogic concept mapping process could be demonstrated to validate a broader understanding of Assurance of Learning.

Lack of time and limited access meant that no formal student evaluation of the concept mapping process was possible. Anecdotal evidence gathered from the initial development phases and throughout the actual assessment task phases suggested that students found concept mapping of benefit, when supporting associated learning artefacts and also a good mechanism with which to approach assessment tasks.

At this stage no analysis was undertaken of the verbs used in the linking phrases (see Figures 66 and 67) but they were discussed with the students as a means of assisting English as Second Language (ESL) and Second Language (L2) writers with enhanced verb selection. Finally the issue related to English as Second Language and Second Language writers certainly limited any capability to properly assess the use of linking phrases to validate Assurance of Learning. At the same time it identified future research opportunities that could tailor this aspect of the dialogic concept mapping process allowing a more tightly integrated teaching and assessment pedagogy that could address the broader issue of English as Second Language and second Language writers.

In raising the issue of English as Second Language it begs the question, how do students who cannot communicate properly both verbally and in written form in the language of the Program, gain professional qualifications. Assurance of Learning as defined by the AACSB does not test this aspect of a Program but seems merely to offer a student ‘an assurance of the opportunity to learn’.
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Presentations undertaken prior to start of Study


ANNEXURES
Annexure A: Concept Mapping Instructions

The following document was distributed and discussed with students prior to them starting the assessment task. It covers some basic issues related to the concept mapping task.

Table 35: Concept Mapping Instructions

<table>
<thead>
<tr>
<th>Issue</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Concepts</td>
<td>If asked to answer a question with specific reference to a “concept” you need to make sure that you talk about that “concept” as one of your concepts not in a linking phrase.</td>
</tr>
<tr>
<td>Linking of Concepts</td>
<td>If asked to answer a question with specific reference to a “concept” it is likely that concept will have multiple links to other concepts.</td>
</tr>
</tbody>
</table>

There can only be ONE linking phrase between any two concepts

This is NOT acceptable

A linking phrases cannot be a series of bullet points

This is NOT acceptable
Issue
You are not making effective use of the linking phrases if it contains the concepts that you are linking

This is NOT advisable
It is not realistic to think that your answer can be satisfactorily developed in a linear format

This is NOT advisable
There should be NO line around any Linking Phrase

This is NOT acceptable
Issue

If Concept D is referred to in several linking phrases and is a concept in its own right then perhaps the map should be redrawn

This is NOT advisable

There should be NO additional text in the concept box

This is NOT acceptable

If an issue is referred to in several linking phrases then perhaps it should become a concept

This is NOT advisable
Annexure B: Pilot Study Concept Mapping

<table>
<thead>
<tr>
<th>Phase</th>
<th>Instrument</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unrestricted Mapping</td>
<td>Students to develop a concept map from scratch using seven concepts with no restrictions on concepts used. The map was to contain linking verbs. There was a context for the questions in terms of the software development life cycle. Proposition: Students should be able to identify relevant concepts to develop a suitable CM structure without assistance in concept selection. Outcomes: Students unable to provide suitable maps without major intervention by teaching staff. Many students struggled to even identify seven concepts associated with question. The linkages were not well thought out the verb selection was mediocre. Literature Review attached.</td>
</tr>
<tr>
<td>2</td>
<td>Prior Knowledge</td>
<td>Students to develop a concept map on a subject deemed a mandatory precursor to the UOS. Question provided in CLOZE format with twelve concepts in CM but six concept spaces were blank. Students expected to fill in the gaps. Linking verbs were already present. There was a context for the questions in terms of the software development life cycle.</td>
</tr>
<tr>
<td><strong>Proposition</strong></td>
<td>Students should be able to complete concept map without any assistance.</td>
<td></td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>Students unable to provide suitable maps without major intervention by teaching staff. Even with the intervention and review of expert map there was a lack on concrete understanding of the topic that was deemed mandatory as a precursor to the current UOS. Literature Review attached.</td>
<td></td>
</tr>
</tbody>
</table>

### 3 Rapid Assessment
Students to complete a series of simple concept maps in response to short answer questions where concepts provided, students required to insert suitable linking verb. There was a context for the questions in terms of the software development life cycle.

| **Proposition** | Students should be able to provide a range of responses as one would expect with a written response to a question. |
| **Outcomes** | Students unable to provide suitable maps without some intervention by teaching staff. Limited and often repetitive response on linking verb. |

### 4 Multi-Phased Assignments
Students to develop individual summary concept map with only seven concepts over three lectures with linking verbs. About five concepts provided for each lecture after group discussion. No assistance with linking verbs. There was a context for the questions in terms of the software development life cycle.

<p>| <strong>Proposition</strong> | Students should be able to provide a range of responses as one would expect with a written response to a question. |</p>
<table>
<thead>
<tr>
<th>Outcomes</th>
<th>The concept maps were varied with reasonable attempt at final concept selection with linking verbs, although verb selection very repetitive.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer Group Collaboration</td>
<td>Students to develop group concept map over three lectures with linking verbs. About four concepts provided for each lecture after group discussion. No assistance with linking verbs. Groupings were provided by domain expert.</td>
</tr>
<tr>
<td>Proposition</td>
<td>Students should be able to provide a range of responses as one would expect with a written response to a question.</td>
</tr>
<tr>
<td>Outcomes</td>
<td>The concept maps were varied with reasonable attempt at concept selection and verbs selection. There was obvious dissent amongst group members as to the structure and linkages for the final CM. There were obvious signs of dominant personalities gaining their way even though it was often not the most appropriate answer.</td>
</tr>
<tr>
<td>Student Group Presentations</td>
<td>Students to use concept mapping as a presentation tool for group presentation. Group size around 4 and with expectation of 2 maps each.</td>
</tr>
<tr>
<td>Proposition</td>
<td>Students should be able to provide a range of responses as one would expect with group presentation.</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Reasonably good response from some individuals but little integration between group members. One group developed presentation as a dialogue with each member visually building on previous team members’ map, a form of DCM.</td>
</tr>
<tr>
<td></td>
<td>Use in Examinations</td>
</tr>
<tr>
<td>----</td>
<td>---------------------</td>
</tr>
<tr>
<td>7</td>
<td>Concept map as part of mid-term examination. Presented as a CLOZE based assessment with 12 concepts three of which were placed in the map, and a selection of 10 verbs which could be repeated if required.</td>
</tr>
<tr>
<td>8</td>
<td>An expert map was used with 15 concepts in three hierarchies. Students were asked to collapse each hierarchy so we ended up with 5 concepts. The linking phrases then had to include reference to the concepts removed.</td>
</tr>
<tr>
<td>9</td>
<td>Students provided with an expert map for group discussion of one of their previous lectures that they had in PowerPoint format.</td>
</tr>
</tbody>
</table>
### Proposition
Students should be able to understand a CM as part of their toolkit when provided and explained by the teaching staff and participate in the discussion.

### Outcomes
Good vibrant discussion, with many issues raised. Especially liked the fact that the expert map had links to previous lectures and was not seen as a topic in isolation.

<table>
<thead>
<tr>
<th>Explaining Concept Maps</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students were required to read three A4 texts and the domain specialist then presented an expert map and discussed these with the students.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>In general limited active participation. A few students took the lead but many sat idle and waited to be asked a question. However the whole process very well received and students felt it was an important adjunct to their learning. They felt it should have been undertaken earlier in the course.</td>
</tr>
</tbody>
</table>


Concept Mapping Observations: Unrestricted Concepts

Associated Theory

Firstly, in general essay writing some students suffer from writing block, that is an inability to begin or continue writing for reasons other than a lack of basic skill or commitment (Rose | 1980). This can exacerbate issues related to writing apprehension stimulating a pattern of anxiety based on past experiences. This results in lower expectations and negative responses from teachers and presentation of work displaying a lack of writing competence (Daly | 1985). It would seem logical that concept mapping, a genre and form of assessment might stimulate inbuilt phobias about testing and assessment situations. Hence care is needed to ensure that students are not cognitively overloaded in any concept mapping assignment (Sweller et al. | 1998). However proponents of concept mapping suggest that it makes use of "dual coding" (Paivio | 1986; 1991), where the visual system processes and stores images (imagens) and the verbal system processes linguistic information (logogens). According to Clark and Paivio (1991) dual coded information is easier to recall and the more students make use of the dual coding the better they are at using the information. Adcock (2000) also suggests that concept mapping can ease the "cognitive load" on some students, by allowing them to focus on essential relationships, rather than on decoding a written text. Overall, the literature affirms that concept mapping has a positive impact on learning outcomes.

Second, the cohorts observed throughout the concept mapping study had a demographic skewed to students with English as Second Language (ESL). This was not seen as an immediate issue as Chularut and DeBacker (2004) clearly demonstrated that concept mapping can
benefit ESL students across a range of levels of English proficiency. However, familiarising students with a comprehensive concept mapping strategy to support the linking of information from the text at hand to prior knowledge; the organisation and summarisation of their thoughts during reading; and the organisation and recall of specific text details and difficult vocabulary is essential.

An important criteria for evaluating content validity is the use of experts in a domain to judge the representativeness of concepts and the accuracy of maps within that subject domain (McClure et al. | 1999). In this observational phase, there was one domain expert with more than seven years experience in teaching in this domain but limited experience in concept mapping.

The relationships between map scoring method and measures of reliability and validity were reviewed by McClure et al. (1999) where they evaluated several scoring methods, including holistic assessments.

In discussion with the domain expert an understanding of the general review process was developed which included analysis of:

- concepts and relationships expected in the map;
- concepts and relationships missing from the map;
- structure of relationships around the areas that pertaining to the question; and
- incorrect structure of relationships in the map.

There was no penalty in relation to direction of arrows or for incorrect or superfluous data, although two maps did resemble a “knowledge dump” with respect to the quantum of detail provided.

Although a manual process, it mirrored work reported by Gouli et al. (2005) where they had a computerised model that qualitatively characterised aspects of a map as complete, incomplete, inaccurate, inaccurate-superfluous, missing and non-recognisable. The overall
framework developed by Gouli was of further interest as it provided the opportunity to consider an assessment framework that rewarded correct answers whilst punishing incorrect answers or a framework based on subtractive rather than additive assessment (Samuelowicz & Bain 2002). The correctness of an answer to a given question using unrestricted concept mapping is by definition subjective in nature and hence assessment depends heavily upon the finesse of the marking scheme. Typically additive marking schemes used for concept mapping assesses the inclusion of specific concepts, links or verbs. There is no obvious literature on subtractive marking schemes in concept mapping although they are quite common in multiple choice questions in disciplines like medicine and oral language exams. However, when applied to other disciplines such as computer science, Becker and Casey (2010) observed negligible difference in marks between additive and subtractive marking schemes but did find that in additive schemes, the more subjective questions resulted in higher marks. Becker and Casey (2010) also noted that stronger students were less concerned with the use of different marking schemes.

Further, in terms of holistic assessment, Besterfield-Sacre et al. (2004) in their study developing scoring rubrics for concept mapping tasks, developed a holistic scoring process using three categories that emerged from the experts’ comments on a range of student maps; comprehensiveness, organisation, and correctness. Comprehensiveness is defined as “the student’s ability, as portrayed through the map, to define the subject area, his or her level of knowledge of the area, and the breadth and depth of that knowledge”; organisation as “embodying the student’s ability to systematically arrange the concepts, the hierarchy of concept placement, and the connections/integration of the branches”; and correctness as “capturing the accuracy of the material presented in the map by considering the level of sophistication (or naïveté), the use of inappropriate terms, and any misconceptions that the map might contain” Besterfield-Sacre et al. (2004:110)
To this end we had no issues with a holistic assessment model on the understanding that we would be visiting several additional options as we observed different phases of mapping prior to finalising our choice for our assessment framework.
**Concept Mapping Observations: Prior Knowledge**

**Associated Theory**

The response to the first cloze mapping task, where the concepts were missing, was good with most students getting the upper hierarchies correct with some disagreement in the lower hierarchies. The cloze mapping task that asked them to insert missing verbs was not well done and many students even failed to insert verbs in the concept map.

Harris and Silva (1993) reported that most English as Second Language (ESL) students have issues with verb inflectional morphology (agreement with nouns in person, number, etc.); verbal forms (participles, infinitives, gerunds) and verb complementation (the types of clauses or constructions that must follow a particular verb). Also ESL students have a difficult time with syntax (the arrangement of words in a sentence) and conveying a message through their writing. These issues could affect how ESL students would handle linking verbs and their extension to linking phrases in concept mapping. However the distinction between language proficiency and writing ability is not clear cut (Kroll 1990) and further analysis, outside the anticipated scope of this study, might be required to make such a distinction in order to understand and address a given ESL writer's problems.

In order to minimise the effect of ESL, Malia (2006) found that it was important for ESL students to have some instruction about different academic writing genres regarding its general organisation and structure. Many students have limited experience with academic genres such as lab reports, research papers and even if competent specific disciplines often have different expectations for writing.

To assess prior knowledge the idea that students should be given a written passage with the cloze concept mapping test rather than just introducing them to a new genre was considered. If there is a decision to do this in the study it was...
noted that when a cloze test is used to assess comprehension in written passages, the passages would need to be specially prepared to ensure they contain all the information required by the student to respond correctly. It would not be feasible to allow alternate word (concept) choices Osterlind (1998).

Kalyuga (2007) found that inexperienced learners favoured more information and structure, whereas experienced learners were comfortable with less formal direction. In the case of simple procedural tasks of merely labelling lines and boxes there is a potential “to evoke more elaborative processes because learners had to complete no search processes for semantic connections between concepts” (Sweller et al. | 1998) which might in turn reduce cognitive load and uncertainty. Some benefit might also be gained using worked examples (Sweller and Cooper | 1985). An implication of these findings is that there is a need to differentiate concept mapping assessment based on the specific affordances and tasks that have to be completed (Gurlitt et al. | 2006).

Since Novak (1998) was drawn to the idea of using concept mapping to assess a students’ prior knowledge, concept maps have been used extensively for this purpose (e.g Makham et al. | 1994; Novak & Musonda | 1991; Kinchin et al. | 2000; Cañas | 2003; Hay & Kinchin | 2008; Amadieu et al. | 2009). Some authors have reservations as to the suitability of concept mapping, not only for prior knowledge testing but for assessment in general. Schau et al. (2001) and Ruiz-Primo (2000) question the reliability and validity of the scoring systems associated with many of the assessment models.

According to the contemporary view of learning, prior knowledge is a major variable that impacts directly on learning process (Gouli et al. | 2003). The belief that the construction of new knowledge was based on prior knowledge required a change from the view that learning is absorption of transmitted knowledge, to the view that learning is conceptual change (Resnick | 1983; Strike & Posner | 1985; West & Pines | 1985).

An important issue to consider is that students with inaccurate preconceptions may not be helped by prior knowledge activation strategies unless some form of
direct instruction on that knowledge is embedded into an approach such as previewing, where students are presented with background material such as definitions and explanations of difficult concepts before they read specific texts (Graves et al. |1983).

Further learning and assessment artefacts should seek to “refine prior knowledge, and not attempt to replace learners' understanding with their own. Second, designers must anticipate a long-term learning process, of which the short-term experience will form an incremental part. Third, designers must remember that learning depends on social interaction; conversations shape the form and content of the concepts that learners construct. Only part of specialized knowledge can exist explicitly as information; the rest must come from engagement in the practice of discourse of the community” (Rochelle | 1995: online).

In the epigraph to his 1968 book, Ausubel states “If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.”
## Annexure C: Pilot Study Feedback Mechanisms

### Table 37: Concept Mapping Pilot Study Assessment Observations

<table>
<thead>
<tr>
<th>Phase</th>
<th>Observation</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 1     | Selection of Threshold Concepts | **Proposition**: The continual assessment of a student’s understanding of TCs could be used as a means of assessing competence progression by using a multi-phased assessment within a single UOS.  
**Outcomes & Recommendations**: Worked with domain expert to identify TCs within the subject domain and develop a multi-phased assessment that continually revisited the TCs to allow cognitive progression to be assessed. A single TC was chosen ‘project management’. It was agreed that students would not be lectured on the theory of TCs. |
| 2     | Development of Expert Maps | **Proposition**: Expert maps could be drawn for all weeks of the assessments and comparative maps provided every three weeks showing the expert maps and the peer group maps provided of student-developed responses.  
**Outcomes & Recommendations**: Expert maps were drawn for all weeks of the assessments and comparative maps provided |
Recommendations every three weeks showing the expert maps and the peer group maps provided for students maps. At that point there was considerable dialogue between domain expert and students, who were given the option to use the current expert map as a basis for future work.

3 Lecture Summaries

Proposition : Concept maps of Powerpoint slide shows provide by the domain expert, developed with well-defined DP could serve as a basis for discussion around TCs in revising material from previous lecturers.

Outcomes & Recommendations : Concept maps of lecture presentations provided after each formal lecture and discussed in the following lecture. The concept map would identify the TC and a DP. As it was expected that only five minutes would be assigned to this review the DP would be used in the discussion as a means of focus and stimulating discourse and would also support the ongoing understanding of the TC in the broader context of the subject. Students would not be advised exactly what the DP and TC were as it might invite rote learning. Very well received and visible animated discussion. It was noted that in ACCT6007, the UOS for the next phase of developing a PF, lecture summaries (three – four page written summaries of what was actually covered in the lecture) were provided by the lecturers as well as the seemingly obligatory Powerpoint presentation. It would seem logical to include these in any lecture summary concept maps.
Annexure D: Unit of Study Outline

BUSINESS SCHOOL

ACCT6007
Contemporary Issues in Auditing
Semester 2  2011

Unit of Study Outline

Coordinator:
Associate Professor Sandra van der Laan
Phone: 9351 6431 Email: sandra.vanderlaan@sydney.edu.au
Office: Faculty of Economics and Business Building, Level 3, Room 341
Consultation Times: As specified on Blackboard

Lecturing Staff:
Professor Graeme Dean
Phone: 9351 3107 Email: graeme.dean@sydney.edu.au
Office: Faculty of Economics and Business Building, Level 3, Room 305
Consultation Times: As specified on Blackboard

Professor Frank Clarke
Phone: 9351 3107 Email: frank.clarke@sydney.edu.au
Office: Faculty of Economics and Business Building, Level 3, Room 306
Consultation Times: As specified on Blackboard

Ms Angela Hecimovic
Phone: 9351 8614 Email: angela.hecimovic@sydney.edu.au;
Office: Faculty of Economics and Business Building, Level 3, Room 345
Consultation Times: As specified on Blackboard

Lecture Classes:
<table>
<thead>
<tr>
<th>Lecture Stream</th>
<th>Location</th>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream 1</td>
<td>Merewether Lecture Theatre 2</td>
<td>Wednesday</td>
<td>3:00pm to 6:00pm</td>
</tr>
</tbody>
</table>

**Seminar Classes:**

**Student Allocation:** Students will be advised via Blackboard as to which stream they are to attend for the Saturdays Seminar. Student attendance at all three (3) Saturdays is required.

<table>
<thead>
<tr>
<th>Seminar Stream</th>
<th>Location</th>
<th>On Each Saturday</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream 1</td>
<td>Institute Lecture Theatre 1</td>
<td>8(^{th}), 15(^{th}) and 22(^{nd}) October</td>
<td>9:00am to 5:00pm</td>
</tr>
<tr>
<td>Stream 2</td>
<td>Merewether Lecture Theatre 1</td>
<td>8(^{th}), 15(^{th}) and 22(^{nd}) October</td>
<td>9:00am to 5:00pm</td>
</tr>
</tbody>
</table>

**Voluntary Interactive Workshop Classes:**

<table>
<thead>
<tr>
<th>Location</th>
<th>Day / Time</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farrell Lecture Theatre</td>
<td>Fridays 2:00pm to 4:00pm</td>
<td>Dates and topics will be advised on Blackboard</td>
</tr>
</tbody>
</table>

### 1 Unit of study information

#### 1.1. Faculty Handbook description

This unit seeks to improve students’ understanding of the function, nature and procedures of commercial auditing in the context of corporate financial reporting. It has particular regard to auditing’s business, legal and economic foundations. Recurrent reference shall be made to several practice and policy matters of contemporary importance to auditing and auditors, especially as they relate to the function of auditing in ensuring the quality of corporate financial statements and the role of auditors in corporate governance. Matters related to international and local financial dilemmas, like McKesson and Robbins, BCCI, Barings, Enron, WorldCom, Parmalat, Fannie Mae, China Aviation Oil, Daewoo, Livedoor, AIG, Bond Corporation, Adsteam, HIH, One.Tel, Ansett Australia, Westpoint, Allco, Madoff and Centro will be discussed.
1.2. **Pre-requisite units**  
ACCT6001

1.3. **Assumed knowledge and/or skills**  
Students are expected to have a general understanding of the business financial reporting and legal environment in which listed corporations operate. Students are also expected to have a general understanding of the role of accounting and public disclosure as an information decision making stream for stakeholders.

1.4. **Workload requirement**  
Academic Board guidelines state that one credit point equates to approximately one and a half to two hours of student effort per week for a typical 13 week semester. This means that if you are an **average student** seeking to get **an average result** for this Unit then you should plan to **spend, on average, at least nine hours each week** on learning activities including 2 contact hours spent in lectures and engagement in the Saturday seminar streams. These recommended hours assume that you are actively engaged in learning during this time. Refer to the learning activities in 2.2, such as doing pre-reading for the lectures, preparing for the Saturday seminars and completing assigned assessment tasks, discussing your work with friends or group members to learn together, revising, researching in the library or online, reading, and when necessary attending staff consultation.

2 Learning aims and outcomes

2.1 **Learning aims of the unit**  
This unit aims to inculcate students’ understanding of the function, nature and procedures of commercial auditing in the context of corporate financial reporting. It seeks to contrast alternative views on several contemporary auditing issues, drawing on the differing ideas contained in two texts, as well as case material in the digitised library. This study of auditing will have particular regard to its business, legal and economic foundations. Recurrent reference shall be made to several practical and policy matters of contemporary importance to auditing and auditors, especially as they relate to the function of auditing in ensuring the quality of corporate financial statements and the role of auditors in corporate governance. Matters examined include: ‘what is meant by ‘solvency’, ‘going concern’, audit qualification in contrast to an ‘emphasis of matter’. This is of especial importance in the wake of the
legislative reforms embodied in Australia’s CLERP 9 legislation related to financial reporting and auditor independence (which took effect in June 2004), the 2002 USA’s Sarbanes-Oxley Act (SOX), and in responses to the aftermath of the 2007-09 global financial crisis (GFC). These legislative reforms were in response, amongst other things, to a spate of unexpected corporate collapses in Australia and the US and the perceived ‘accounting and auditing irregularities’ that emerged as a result of inquiries into those failures. Recently there have been some moves to reassess the need of many governance obligations, a good example being the changes to SOX’s internal controls requirements in 2007. Also, accepted wisdoms about ‘risk’ are being questioned in the light of the performances of directors and auditors of financial institutions during 2007-09.

Whereas the scope of this unit is broad - covering conceptual, ethical, policy and practical matters – the unit is integrated thematically. Accordingly, the study of auditing foundations, procedures and ‘standards’ will focus on four separate, but related, themes: namely, auditing as a process of:

- quality assurance through quality control;
- evidence collection and evaluation;
- independent authentication and judgment formation; and
- communication and reporting.

To enhance the understanding of the business, legal and economic facets of auditing, we shall examine several actual cases that illustrate auditing and corporate failure or financial distress– and their commercial and legal consequences.

This unit draws upon prior units of study in which accounting, legal skills and knowledge have been inculcated. Issues in auditing are pursued as being dependent upon the effectiveness of accounting in disclosing the wealth and progress of companies. Accordingly, the commercial settings in which notable financial causes célèbres have occurred are used to illustrate the contemporary issues of concern in the practice and regulation of contemporary auditing.
In addition to developing a substantive knowledge of corporate governance, the unit of study fosters students’ capacities to:

- Collect, organise, appreciate and critically evaluate research and practice based knowledge about auditing.
- Critically reflect on the strengths and weaknesses of different theoretical approaches that are used to study issues related to auditing.
- Learn independently and assume responsibility for the learning process.
- Tolerate ambiguity and appreciate the insights of a variety of perspectives.
- Think critically about existing practices and their implications for individuals, organisations and society.
- Manage deadlines.
- Develop the motivation for life-long learning.

### 2.2 Learning outcomes

ACCT6007 Contemporary Issues in Auditing complements and extends the material covered in ACCT6001.

Specifically, this unit aims to assist students to develop proficiencies in relation to the following learning outcomes. Students are expected to:

- Demonstrate a capacity to work independently including the ability to plan and achieve goals.
- Critically evaluate underlying theories, concepts, assumptions, limitations and arguments in disciplinary and cross-disciplinary fields of study.
- Develop coherent arguments when recommending solutions and critically evaluating theories in major fields of study.
- Manage, analyse, evaluate and use information efficiently and effectively.
- To develop skills in acquiring, organising, presenting and interpreting research and practice based findings.
- Negotiate and create shared understandings by respectfully interacting with people from diverse backgrounds.

Program-level outcomes are progressively introduced or developed within the units of study that comprise the program. Aligning unit of study learning outcomes with their related program outcomes (and associated learning goals) helps to:

- Provide a unified quality learning experience for students,
- Give the context of how the unit of study ‘fits in’ to the degree program,
- Communicate clear expectations of whether a specific skill or topic is introduced, developed or assured in a unit of study.

ACCT6007 assures two program learning outcomes (and associated learning goals) for the Master of Professional Accounting (MPAcc) and Master of Commerce (Accounting Specialisation), namely outcomes 3 and 5 as follows:
<table>
<thead>
<tr>
<th>MPAcc and MCom (Accounting specialisation) Program Learning Goals (PLG)</th>
<th>MPAcc and MCom (Accounting Specialisation) Program Learning Outcomes (PLO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A graduate from this program should be:</td>
<td>A graduate from this program should be able to:</td>
</tr>
<tr>
<td>PLG.1 Able to make effective use of investigative skills to identify, define and analyse complex business and professional problems and to propose innovative relevant solutions.</td>
<td>PLO.1 Research and investigate complex business and professional problems using research-based ideas and/or insights from Accounting.</td>
</tr>
<tr>
<td>PLG.2 Able to critically analyse and question knowledge claims and to offer independent and creative solutions to related conceptual debates.</td>
<td>PLO.2 Evaluate competing arguments and perspectives within Accounting, and formulate and present independent and professional responses to the related conceptual and/or technical debate.</td>
</tr>
<tr>
<td>PLG.3 Able to address business and professional challenges effectively and in a manner that demonstrates an advanced understanding of disciplinary knowledge and ethical, social and global awareness.</td>
<td>PLO.3 Offer solutions to business and professional challenges by integrating a sound knowledge from Accounting with a clear understanding of relevant ethical, social, professional and/or global considerations.</td>
</tr>
<tr>
<td>PLG.4 Able to communicate information, ideas, findings and arguments effectively to an advanced professional standard.</td>
<td>PLO.4 Demonstrate the ability to work effectively to formulate and communicate ideas, findings or arguments clearly and persuasively in a professional format and/or presentation.</td>
</tr>
<tr>
<td>PLG.5 Able to access, integrate and utilise diverse information sources and knowledge to make sound judgements and propose insightful and creative solutions to complex business and</td>
<td>PLO.5 Make rigorous and insightful use of relevant information from diverse sources to formulate and present professional solutions and/or judgments to complex</td>
</tr>
</tbody>
</table>
The two program goals (bolded) will be assured through the assessment in Semester 2, 2011.

The following alignment table shows how the unit of study learning outcomes link with the Program Learning Outcomes, the teaching and learning activities, and assessment items:

<table>
<thead>
<tr>
<th>Professional Problems</th>
<th>Accounting/Reporting Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLG.6  Able to apply professional accounting principles, techniques and standards to different accounting and reporting scenarios and contexts.</td>
<td>PLO.6  Demonstrate understanding and application of relevant accounting principles, techniques and standards to support accounting and reporting in different contexts, including different forms of business organisation and group structures/arrangements.</td>
</tr>
</tbody>
</table>
## 2.2 Unit of Study Learning Outcomes and Links to Program Learning Outcomes

<table>
<thead>
<tr>
<th>ACCT6007 Intended Learning Outcomes</th>
<th>Relevant Program Learning Outcomes (PLOs)</th>
<th>ACCT6007 Student Learning Activities and Teaching methods</th>
<th>ACCT6007 Assessment items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>This unit aims to assist students to develop proficiencies in relation to the following learning outcomes. Students are expected to:</strong></td>
<td><em>The Unit of Study learning outcomes relate to the following MPAcc &amp; MCom Accounting Program Learning Outcomes</em></td>
<td><em>The main learning activities which students will practice and develop their knowledge, skills and attributes</em></td>
<td></td>
</tr>
</tbody>
</table>
| **Demonstrate a capacity to work independently including the ability to plan and achieve goals.** | PLO1  
PLO 3 | - Prepare for, attend and actively participate in seminars  
- Work through in seminar activities  
- Reinforce learning through personal study  
- Actively participate on discussion board within blackboard and in staff consultations as required | Individual assignment  
Group assignment  
Mid Semester examination  
Final examination |
| **Critically evaluate underlying theories, concepts, assumptions, limitations and arguments in disciplinary and cross-disciplinary fields of study** | PLO2  
PLO3  
PLO5 | - Prepare for, attend and actively participate in lectures and seminars  
- Work through in seminars activities  
- Reinforce learning through completion of personal study questions  
- Actively participate on discussion board within blackboard and in staff consultations as required | Individual assignment  
Group assignment  
Mid Semester examination  
Final examination |
| **Develop coherent arguments when recommending solutions and** | PLO1 | - Complete individual and group assignments | |

Annexure D
<table>
<thead>
<tr>
<th>Activity Description</th>
<th>PLOs</th>
<th>Activities</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| Critically evaluating theories in major fields of study.                             | PLO3 | - Actively participate in seminars  
- Work through in seminars activities  
- Reinforce learning through personal study  
- Actively participate on discussion board within blackboard and in staff consultations as required | Individual assignment  
Group assignment  
Mid Semester examination  
Final examination |
| Manage, analyse, evaluate and use information efficiently and effectively.             | PLO4 | - Prepare for, attend and actively participate in seminars  
- Work through in seminars activities  
- Conduct research using a variety of information sources | Individual assignment  
Group assignment |
| To develop skills in acquiring, organising, presenting and interpreting research and practice based findings. | PLO5 | - Prepare for, attend and actively participate in seminars  
- Work through in seminars activities  
- Reinforce learning through personal study  
- Actively participate on discussion board within blackboard and in staff consultations as required | Individual assignment  
Group assignment  
Mid Semester examination  
Final examination |
| Negotiate and create shared understandings by respectfully interacting with people from diverse backgrounds. | PLO6 | - Read assigned materials  
- Work collaboratively with group members  
- Attend group meetings and participate in discussions and decision-making  
- Conduct research using a variety of information sources.  
- Prepare group assignment.  
- Provide evidence of leadership and teamwork in your group. | Group assignment |
# Assessment

<table>
<thead>
<tr>
<th>Assessment task</th>
<th>Weighting</th>
<th>Word equivalent</th>
<th>Due date</th>
<th>Closing Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Honesty Module#</td>
<td>0%</td>
<td>n/a</td>
<td>Week 4</td>
<td>19 November 2011</td>
</tr>
<tr>
<td>Mid-semester test</td>
<td>15%</td>
<td>1,000</td>
<td>4pm Wednesday 7th September</td>
<td>Date of exam</td>
</tr>
<tr>
<td>Individual assignment*</td>
<td>10%</td>
<td>1,000</td>
<td>Final component - 3pm, Wednesday <em>(via Blackboard)</em>, 21 September 2011*</td>
<td>1 October 2011</td>
</tr>
<tr>
<td>Group case study assignment*</td>
<td>20%</td>
<td>1,000</td>
<td>Saturday sessions as assigned: 8th, 15th and 22nd October <em>All group reports MUST be submitted (via Blackboard), by 3:00pm Friday 7 October 2011</em>,</td>
<td>17 October for written report</td>
</tr>
<tr>
<td>Presentation (10.0%) (Assessed as individual)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Report (10.0%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final examination</td>
<td>55%</td>
<td>3,000</td>
<td>As advised through MyUni</td>
<td>Date of exam</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
<td><strong>6,000</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Students must complete the academic honesty module in Blackboard with a mark above 80% by the final day of exams, or an Absent Fail (AF) grade will be given for the entire unit. Students can complete the module multiple times until this grade is achieved.
Students who completed the module with a score of 80% or above last semester do not need to do it again.

* Late assignments for the individual assignment and the Written Group Report may be submitted after the due date –via the TURNITIN upload link located in the Blackboard site. Note that all late assignments will be penalised 10% per calendar day or part thereof.

Please Note: All assessment tasks as outlined above MUST be attempted and submitted before the respective Closing Date referred to above. Any student failing to attempt and submit any item of assessment a grade of ‘Absent Fail’ is required to be recorded for that student for the entire Unit of Study.

3.1. Detailed assessment information

Individual Assignment – 10% Course Marks – Final Component
Due 3:00pm Wednesday 21st September 2011.

The Assignment - is to be completed individually (for 10 marks counting towards the overall grade). It has been designed to encourage students to think critically and analyse the major themes of the unit as an iterative process through the production of a series of concept maps. Training and software will be provided. Details of the assignment and the relevant interim due dates and weightings will be provided to students on Blackboard by the end of week 3.

Submission of Assignment - The assignment must be submitted electronically via Blackboard. Assignments submitted electronically via Turnitin do not require cover sheets.

Students MUST ensure that your student ID number (SID) is in the top right hand corner of each page of your individual assignment prior to upload to the Blackboard site. Full information about how to prepare assignments for electronic submission can be found in the Turnitin Student Guide: http://blackboard.econ.usyd.edu.au/webapps/portal/frameset.jsp?tab_tab_group_id=_20_1

Annexure D
**Group Case Study**

**The Assignment** - Assessment and grading will be on the basis of each participant’s performance in the case study segment of the course. Participation will entail several facets of activity – (i) reading in advance and general participation in each of the Saturday session case study discussions (no specific marks will be awarded for this component); (ii) actual direct involvement in a group case-study project entailing: a) oral presentation and related seminar discussion as a group (for a max. 10.0 marks allocated individually); and b) preparation and submission of a written case report (for a max. 10.0 marks allocated as a group). For every case two groups will be assigned to undertake the formal presentation/discussion. Each group will be designated different aspects of the specific case to discuss.

Seminar presentations – case studies - totalling 20% of the final grade will comprise:

Participation (individual) - 0 marks (but compulsory – see above)
Case presentation (group and individual) - 20 marks (written and oral work as outlined below).

Since the material for each Saturday module will be provided in advance (mainly via the digitised E-Library on the CD-ROM Readings pack and augmented by material posted on Blackboard) it will be assumed that all students will have prepared for each case study.

As noted, each case study group will be required to prepare a case analysis for class presentation during the Saturday sessions. Students are encouraged to use powerpoint as well as other visual aids as part of the presentation to the seminar stream.

**Submission of Assignment components**

**Component No. 1 - A written group case report (1,000 word limit) 10% marks**

This group report is assessed as a group effort and the mark awarded for the group report shall be awarded to each member of the group equally.
ALL GROUP REPORTS must be submitted electronically via Blackboard. The electronic submission is due by 5:00pm Friday 5 October 2011.

Students MUST ensure their Group Code number plus the SID of all members forming part of the group is in the top right hand corner of each page of the group assignment. Full information about how to prepare assignments for electronic submission can be found in the Turnitin Student Guide:

http://blackboard.econ.usyd.edu.au/webapps/portal/frameset.jsp?tab_tab_group_id=20_1

Please note that this group case report (1,000 words) is an academic piece of writing, and thus must be correctly referenced (both “in text” referencing and contain a correctly formatted reference list). Failure to do so will result in the loss of marks.

It should be noted that some previous students have not handled this part of the course assessment well. In particular, they have failed, in ‘getting their hands dirty’ by exploring particulars of these complex auditing cases, to discern the general auditing lessons from the cases. This has then been exacerbated when they have been called upon to recall those general issues in answering the final exam questions. This semester, part of the voluntary workshop program will focus on how those case particulars can be used to illustrate general auditing issues underpinning the possible exam-type questions covered in the workshops.

Component No. 2 – The Presentation of the case study made by groups on the allocated Saturday Stream – 10% marks, assessed individually

Each group are to prepare an analysis of their part of the case study assigned to the group. While the presentation should present a group view of the material presented, each member of the group will be assessed individually on their presentation of the material
forming part of the group analysis. Students are NOT required to hand in any material relating to their presentation.

**Allocations of Groups**

Students will be allocated their group case studies during week 3 of the Semester through Blackboard. Students will be expected to make contact with their other group members by Wednesday 24th August 2011.

Failure to make contact may result in the student completing the group work as an individual and may seriously affect the students’ assessment mark for this component of assessment.

**Mid-semester examination**

A mid-semester examination will be held at 4pm on Wednesday, 7 September 2011, as detailed below. The test will entail multiple choice questions and short answer (extended response) questions. The test will comprise a comprehensive examination of the general principles and themes pursued in the lectures and as detailed in the Topic schedule sessions 1-6 inclusive. The mid-semester examination is 60 minutes duration inclusive of reading time.

**Final Examination**

The final examination will be based on all the work covered in all lectures and Saturday sessions. It is emphasised that attendance at classes is a necessary but not a sufficient condition for adequate examination preparation. All students should study any readings (including the material provided in the digitised E-Library that is specified in lectures), prescribed textbooks, and participate in discussions.

**3.2. Referencing style and style guide**
All written submitted assessment items should adhere to the relevant assessment criteria; including preference for typed pages formatted with 1.5 line spacing, Times New Roman 12 point font (or similar) with 2 cm margins.

You need to provide a reference whenever you quote, paraphrase or summarise someone else’s opinions, theories or data. You must also reference any graphical information you use such as tables, photos or diagrams. The Harvard (or author-date) referencing style is one of the most commonly used and preferred in the accounting discipline. Details are available at: http://www.econ.usyd.edu.au/Learning/student_learning_support/academic_writing.

3.3 Feedback on assessment

Assessment tasks are either: (a) formative – these tasks are meant to provide an opportunity for feedback to assist in further learning in the unit; or (b) summative – these tasks are meant to provide information to assessors and/or examiners about student performance in the unit. Most assessment tasks are a combination of both. For formative assessment tasks students are requested to make an appointment to see a member of staff for detailed feedback (generic and assignment specific feedback will be provided). For summative assessment tasks students will have the opportunity to review their assessment tasks for errors and/or omissions. Students wishing to discuss their overall performance in this unit are able to meet with the unit co-ordinator at a time to be advised after the final grades become available. However, any such meeting is conducted under the assumption that students have fully apprised themselves of the rules surrounding the awarding of grades and the understanding that student marks and hence final grades are merely a composite of marks awarded for each assessment task. The unit co-ordinator does not have any discretion or authority to alter marks or grades. University policy on assessment is available at: www.sydney.edu.au/policy

<table>
<thead>
<tr>
<th>Assessment task</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-semester test</td>
<td>Marks posted to Blackboard by 26 September 2011.</td>
</tr>
<tr>
<td>(formative and summative)</td>
<td>Students will also have the opportunity to review their scripts on a date to be advised through Blackboard.</td>
</tr>
<tr>
<td></td>
<td>Students have the opportunity to discuss matters relating to their progress and unit content with staff during consultation times.</td>
</tr>
<tr>
<td>Individual assignment</td>
<td>Marks posted to Blackboard and general feedback with Annexure D 339</td>
</tr>
<tr>
<td><strong>(formative and summative)</strong></td>
<td>assignments available to students with individual feedback via annotation to the submission by 14 October 2011. Feedback through expert maps will also be provided after submission of progressive maps. Students have the opportunity to discuss matters relating to their progress and unit content with staff during consultation times.</td>
</tr>
<tr>
<td>Class group case presentations and reports (formative and summative)</td>
<td>Each component of the group case study presentation will have feedback. Feedback will be detailed on the case study requirements. Students have the opportunity to discuss matters relating to their progress and unit content with staff during consultation times.</td>
</tr>
<tr>
<td><strong>Final examination (summative)</strong></td>
<td>As advised through MyUni. Students will also have the opportunity to review their scripts on a date to be advised through Blackboard. Students have the opportunity to meet with the unit co-ordinator at a time to be advised on Blackboard.</td>
</tr>
</tbody>
</table>

### 3.4. Academic honesty, plagiarism, legitimate cooperation and groupwork


Academic honesty is important to protect students' right to receive due credit for work submitted for assessment. It is clearly unfair for students to submit work for assessment that dishonestly represents the work of others as their own and gain marks and degrees, which are not based on their own efforts and abilities. Deliberate breaches of academic honesty constitute academic misconduct. These breaches include: plagiarism, fabrication of data, recycling previously submitted material, engaging someone else to complete an assessment on one’s behalf and misconduct during supervised assessments.
The penalties for academic misconduct may include: a mark of zero on the assessment; a fail grade in the unit of study, additional assessment (including an unseen exam), and reference of the matter to the University Registrar.

All assessments will be checked for plagiarism. Where plagiarism is suspected, the assessment will be fully checked and monitored using manual process, google checks and also electronic plagiarism detectors. In order to do this, the Faculty may reproduce the assessment, provide a copy to another member of faculty, and/or communicate a copy of this assignment to a plagiarism checking service (which may then retain a copy of the assignment on its database for the purpose of future plagiarism checking).

Academic dishonesty involves more than just copying material. Cooperation and helping other students may at times trigger academic dishonesty proceedings if it appears you have worked too closely with another student. In this unit,

Individual assignment - This is an individual assignment.
Group case study report and presentation - This is a group assignment with an individual component.
Mid-semester test - This is an individual assessment.
Final examination - This is an individual assessment.

Individual assignments must be written and prepared alone. You may consult with other students about ideas and possible research sources but the analysis and writing of the assignment must be done by yourself. Group assignments should be prepared within the group. Students should contribute fully to the group and take part in all group activities, contributing ideas, analysis and writing to the final product. While students within the group should assist each other freely, students should not carry this level of cooperation outside the group. One group may cooperate and help another group about ideas and possible research sources but the analysis and writing of the assignment must be done by the group alone.

4 Texts and other resources

There are three textbooks for this subject which students are assumed to have access to:

- Gay & Simnett (2010)

Students will also be provided with a unit-specific CD-Rom readings pack in the first lecture.

Students are also recommended to read:

- Clarke, Dean and Oliver (2003) *Corporate Collapse*, Cambridge University Press: selected chapters will be distributed to students in digitised form throughout the semester

# 5 University and Business School policies and support

## 5.1. Business School policies


It is crucial that you take the time to consult this manual early in your studies in order to familiarise yourself with policies and procedures relating to critical issues such as the Business School’s policy on special consideration (including requirements and timelines. e.g. lodging applications five working days after a missed assessment), appeals (lodge within 15 working days of the decision) and other policies such as enrolment, credit etc. Assistance is available from the Business School’s Student Information Office, see: (sydney.edu.au/business/student_information_office).

## 5.2. University policies

- **University policies**: sydney.edu.au/policy
- **Assistance** is available from the University’s Student Centre: sydney.edu.au/current_students/student_administration
- **The code of conduct** is an important policy which outlines the University’s expectations about treating all staff employees and students with respect, dignity, impartiality, courtesy and sensitivity and refrain from acts of discrimination, harassment or bullying: sydney.edu.au/ab/policies/Student_code_conduct.pdf

## 5.3. Student resources and services

Links to other student services and resources are included on Blackboard and on the learning and teaching section of the Business School website: sydney.edu.au/business/learning.

# 6 Continual improvement of the Unit
6.1 Past Feedback
Students who have completed this unit previously have provided feedback through the Unit of Study Evaluation (USE) instrument, unit specific survey instruments and staff/student meetings convened for the purpose of providing feedback.

6.2 Improvements made
Feedback provided by students has been incorporated into the unit of study. Students have made the following suggestions which have been incorporated into the unit:

- Reducing the number of assessment items
- That more time be allocated to the Mid Semester Exam but weighting be retained, the Mid Semester examination will now have a duration of 1 hour with no dedicated reading time

6.3. How feedback will be collected
Student feedback is valued in this unit. A student representative will be identified at the beginning of the semester to liaise with the unit coordinator on behalf of the student body as a whole. Student representation provides an opportunity for students and the unit coordinator to exchange ideas on all aspects of a unit including unit structure, assessment and so on. The student representative will be invited to attend and participate in the staff/student meeting with other student representatives and unit coordinators in an exchange of views on all units of study in the Discipline. Individual students wishing to see academic staff may, of course, do so during consultation times or by appointment. All students will also be given the opportunity to anonymously evaluate the unit of study in the official USYD evaluation surveys administered at the end of each semester. Feedback will be used to make further changes to improve the unit of study.
### Topic and assessment schedule

**Key:**
- EL = *Digitised E-library* materials related to particular cases which can be accessed through CORS or from CD-Rom Readings Pack.

<table>
<thead>
<tr>
<th>Session</th>
<th>Date 2011</th>
<th>Topic</th>
<th>References</th>
</tr>
</thead>
</table>
| 1.      | SV Wednesday 27\(^{th}\) July | • Introduction to the Unit of Study  
                    • Auditing: its function, business, legal and economic contexts  
                    • Modern approaches to auditing  
                    • Professional structure and its implications  
                    • Digitised CD-Rom Introduction  
                    • Concept Mapping Introduction | GS Chapters 1, 2 and 3.  
                                                        ID prologue, Chs 1, 5.  
                                                        EL CD reading pack |
| 2.      | SV Friday 29\(^{th}\) July  
               Farrell Lecture Theatre  
               Bring your laptop if you have one! | • Digitised CD-rom demonstration  
                                                        • One x 1 hour session  
                                                        • Farrell Lecture Theatre  
                                                        • Bring your laptop if you have one! | Voluntary  
                                                        Commencing at 2pm  
                                                        (Voluntary) |
| 3.      | GD/FC Wednesday 10\(^{th}\) August | • Auditing and corporate governance  
                                                        • Corporate audit committees  
                                                        • Independence - of the auditor, audit judgment and ethics | GS Chapter 3.  
                                                        ID Chs 1, 2, 3 and 5  
                                                        EL CD reading pack |
| 4.      | GD/FC Wednesday 17\(^{th}\) August | • Audit planning  
                                                        • Risk analysis including analytical review procedures, internal control review and testing | GS Chapters 5, 6, 7, 8 and 9.  
                                                        (Annexure D) |
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>ID Chapters</th>
<th>EL Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>24th August</td>
<td>Evidence collection and evaluation, The audit report, Fraud, Types of fraud; auditing and the 'business judgement rule', Auditing and fraud detection - history and present</td>
<td>Chs 2, 3 &amp; 5</td>
<td>CD reading pack</td>
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<tr>
<td>31st August</td>
<td>Statutory quality standard of 'truth and fairness', Interface of accounting and auditing, Going concern considerations, Forensic auditing, Madoff video</td>
<td>Chs 5, 12, 13, 14</td>
<td>CD reading pack</td>
</tr>
<tr>
<td>7th September</td>
<td>Mid-semester Test, 4pm Start</td>
<td>Chs 1, 5</td>
<td></td>
</tr>
<tr>
<td>7th October</td>
<td>Case Study written report</td>
<td>Chs 5, 16</td>
<td></td>
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<tr>
<td>8th October</td>
<td>Case work: Equity Funding, McKesson and Robbins, Bond Corporation, Adsteam, Enron Video</td>
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<tr>
<td>Date</td>
<td>Day</td>
<td>Date Details</td>
<td>Case work</td>
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| Sat 2.     | Saturday  | 15<sup>th</sup> October 9.00am start As assigned on Blackboard               | • Madoff  
• China Oil  
• BCCI  
• Barings Bank, NAB, AIG  
• HIH video |
| Sat 3.     | Saturday  | 22<sup>nd</sup> October 9.00am start As assigned on Blackboard               | • HIH  
• Enron  
• Parmalat  
• WorldCom |
| 7. SV      | Wednesday | 26<sup>th</sup> October As timetabled                                        | • Semester Review  
• Final Exam Preview |