USING MULTIMEDIA CONCEPT MAPS TO ENHANCE THE LEARNER EXPERIENCE IN BUSINESS LAW

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Abstract

Students' learning experience can be affected by difficulties in understanding the interrelationships between concepts and also between topics. Concept maps have been used in many disciplines (Kremer & Gains, 1996) to structure information and express relationships between them. Their holistic approach with multiple pathways through the learning resource can make relationships and linkages between topics and subtopics obvious, and contribute to a meaningful and positive learning experience. This paper outlines the development and formative evaluation of two hypermedia concept maps which led to the development of a series of eleven concept maps to enhance the learning experience of students in a first year undergraduate business law unit.

As part of the Stage 1 formative evaluation, two concept maps were developed together with supporting multimedia resources and trialled on the learners. Feedback was also obtained from technical staff. This phase was designed to assess and control the quality of the learning resource as well as the impact it had on the learning experience. The paper closes by discussing how information gained in Stage 1 was used in Stage 2 as a basis to modify the initially trialled maps and to develop the other supporting maps.

Using concept maps to enhance learning

In considering quality within education, the focus has shifted from teaching to learning, and especially to the quality of the learning experience. In contrast to the earlier behaviourist view of teaching as transferring knowledge, cognitive scientists view learners as processors of information who employ different strategies to remember and use information (Weinstein & Macdonald, 1986).

Monash University's Learning and Teaching Plan makes a strong commitment to enabling high quality teaching and learning (Monash, 2002). Positive learning experiences should be engaging and provide learners with opportunities that assist them to organise, acquire and remember in order to utilise and build on that knowledge. Research has indicated that concept mapping is an example of such a strategy (Novak, 1998; Novak & Gowin, 1984). Graphic organisers that arrange key ideas or concepts in a hierarchical set of nodes with lines or arrows that indicate linkages and relationships between them have been found to be effective learning tools as they parallel human cognitive structure. Concept maps of this nature have a history of use in many disciplines – statistics (Bulmer 2000), linguistics, artificial intelligence, management and education, for example (Kremer & Gains, 1996), to structure information and express

relationships between them. They were used in this business law unit by the educational designer as a strategy to elicit the important relationships in the subject from the teaching academic and then provided to the students to assist them with the structuring of their knowledge.

This report is about the introduction of concept maps or graphic organisers to a web based first year tertiary unit that is taught internationally in order to enhance students' learning experience. In courses delivered internationally where the language of instruction is not the learners' first language, graphic organisers provide a quick and convenient overview far more efficiently than discursive text that is in a learners' second language. Also, providing these graphic organisers in an online environment allows for wider access by all learners including off-campus learners, depending on of course, students having web access. These concept maps in hypermedia environments are also an effective navigational tool which provide a method of organising and browsing through information (Carnot, Dunn, & Canas, 2001). For all learners, off-campus and on campus, hypermedia concept maps make the course more navigable and simultaneously make the inter-relationships between concepts apparent in ways not otherwise readily perceived. In addition, Alpert and Grueneberg argue that human cognition is not limited to describing knowledge through a verbal text-based medium only and that sound and visual imagery also form a part of a person's knowledge (Alpert & Grueneberg, 2000) and cognitive processing. Therefore, the concept maps were so designed to both supplement and complement the textual information with auditory and visual support, again to enhance the quality of the learning experience and make the experience more memorable as well as more accessible to students with preferences for non-textual information.

The architecture of any hypermedia system supports concept mapping. As explained by Gaines and Shaw diagrams can be made into hypermedia objects linking them to text and diagrams and from within these diagrams to other diagrams, text and hypermedia objects (Gains & Shaw, 1995), a feature this project was desirous of exploiting. Providing the concept maps online also allows the possibility to respond faster to formative evaluation. Using hypermedia and WebCT to develop such concepts maps for delivery online also complies with Monash University's objective to facilitate and support flexible learning with educational technologies (Monash, 1999, 2002).

Though information represented through concept maps is easy for learners to understand, their development is iterative and time consuming. Developing concept maps in a multimedia environment is also resource intensive. Therefore the significance and the impact it had on the students' learning experience required to be assessed. It was also necessary that the quality of this iterative development was appropriately monitored through formative evaluation if quality learning outcomes were to be achieved. This evaluation included stakeholders and experts as well.

Concept maps for a first year undergraduate business law unit

The background and rationale

It is mandatory that undergraduate business students at Monash University take a business law unit. Taught across several Monash campuses, including the overseas campus in Malaysia, this 13-week unit uses a conventional lecture+tutorial mode, a textbook, supporting print materials and a basic site on the university's chosen learning management system, WebCT. It is also offered via flexible delivery to off-campus learners who make up a significant proportion of those enrolled (35% in semester 2 2002, of whom 58% were off-shore). The unit content covers legal requirements and consequences for choosing different business structures and also the topics of contract and negligence. It is a first-year unit studied predominantly by students in their first or second semester at University.

Many students find this unit complex and the required reading tedious primarily because learners enrolling in this unit are new to the rigours of tertiary study. They complete the unit *knowing* at least the key legal principles but the learning exercise achieves a far superior quality if learners *understand* the relationships between those principles. Understanding the links between legal concepts and topics is particularly important in business law as learners need to see and understand clearly all the relationships and links between alternative and competing arguments before they go on to analyse and evaluate arguments and counter arguments. These higher levels of understanding (Bloom, 1956; Biggs, 1999) or holistic learning outcomes (Svensson, 1997) are particularly important as the unit requires students to analyse scenarios from a business law perspective, addressing possible multiple concurrent or alternative

arguments. Without attaining understanding of the interrelationships between topics, sub-topic and even individual legal principles, such complex tasks are extremely difficult for students.

In short, what had to be designed was an integrated and meaningful mode of learning (Novak, 2001; Novak & Gowin, 1984; Okebukola & Jegede, 1988) which was an empowering (Novak, 1998) metalearning strategy that would assist learners to 'learn how to learn' (Wandersee, 1990 p. 927). Part of students' difficulty in learning was thought to be due to their being novices to the discipline area which led to a linear, blinkered, rote-mode learning approach (Ausubel, Novak, & Hanesian, 1978). The linear presentation of material did not assist the holistic learners and made it difficult for learners to see the important links between topics and concepts until the end of semester, if at all. This is an impediment to effective learning is likely to exist other units and discipline areas, for example statistics (Bulmer, 2000).

Acknowledging students' lack of experience in the study of business law, the introduction of concept maps was an attempt to move them towards a more meaningful mode of learning through a holistic approach to the body of knowledge. It was thought that this could enhance their learning by
- conveying effectively the overall structure of the unit and assist with the assimilation of facts;
- making business law more accessible and understandable by and making the relationships between key concepts transparent in a visual image;
- assisting with summarising and consolidating the information;
- providing an approach to note-taking which is different to the list or linear format of conventional note-taking;
- providing a way of relating, remembering and reviewing information;
- providing a method of building on existing information by developing new linkages;
- offering a non-linear method of accessing and navigating around the body of information, which in turn assists flexible and self-directed learning; and
- providing a graphical representation of information and linking other media to a very text-based and discourse oriented discipline.

The development process
The task was approached as a two-stage process. During Stage 1 a subset of the concept maps (the parent map and one other map) was developed and trialled. Stage 2 was to respond to the feedback from Stage 1 and develop or modify the balance resources accordingly.

It was decided that the concept maps will be on the WebCT site of the unit and also operate as a navigational tool within the site. The plan involved developing an overall parent concept map (Figure 1) that indicated the structure of the unit and presented its key topics as hyperlinked nodes which took the learner from the parent concept map to other maps depending on the selected concept. This would allow learners to make their individual pathways through the learning resource.

Hyperlinks and mouse rollovers allowed for additional information and explanation that could be accessed at another level, for example, terminology (eg. 'torts' - civil wrongs for which a victim can sue the wrongdoer), while allowing also the simpler holistic overview at first glance.
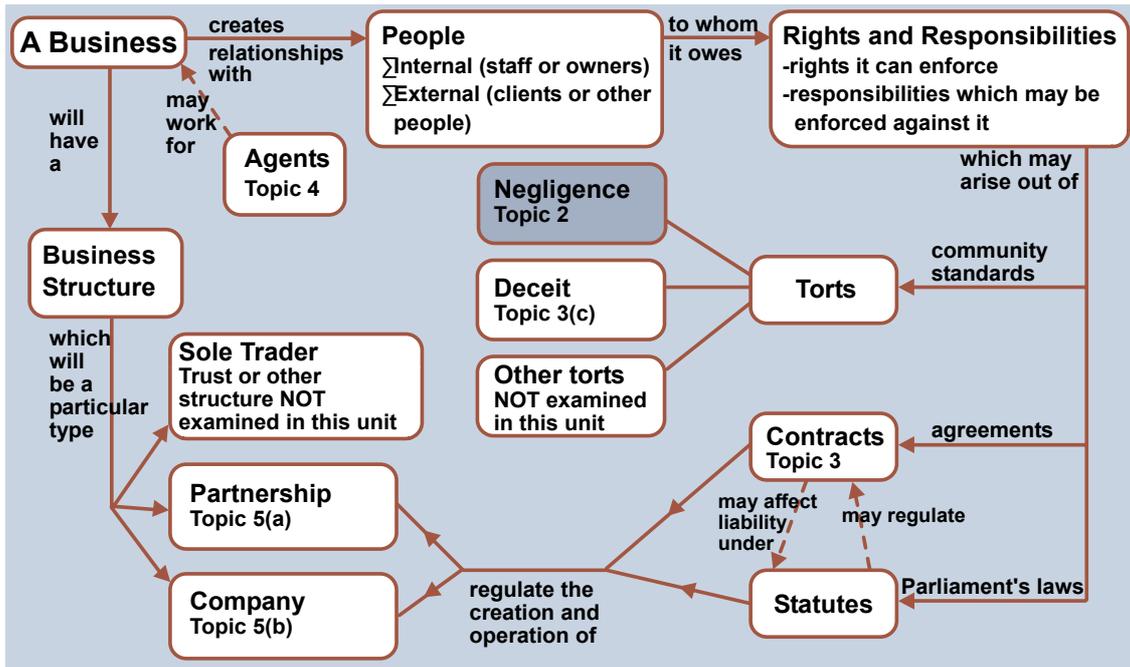
Figure 1. The main map of the unit (parent map)

This approach would be potentially useful for off-campus learners and those approaching materials non-sequentially to search for interrelationships between the many topics and a plethora of (legal) concepts and rules. Each of the remaining maps covers the information for one topic or sub-topic, approximately a week's worth of work for the learner. Multimedia elements of the maps include audio clips and mouse roll-overs activating pop-up boxes to add further clarification and/or direct learners to relevant sections of their textbook. This was intended to allow the learners to relate and integrate the textbook with concepts in the map in building their detailed knowledge and moving them on to a more meaningful-mode learning pattern (Novak & Gowin, 1984).

Stage 1 of the project

Development and trial of two multimedia maps
As concept maps were new to the learners and the teaching staff, Stage 1 of the development process was used to trial a sub-set of the maps and explore students' perceptions of the learning enhancement facilitated by the maps. This information was used in Stage 2 of the process in developing and improving the entire set of maps.

The maps were developed by the teaching academic and the educational designer on a conventional whiteboard. The educational designer's direct input and role at this point was to serve as the 'outsider' unfamiliar with the unit content, to ask basic questions designed to elicit fundament concepts, and verify the understanding imparted by the concept maps under construction. The draft maps were then circulated among others teaching the unit for feedback and further refinement. The resulting diagrams, accompanying text for roll-overs and multimedia components were then developed as multimedia files by the University's Centre for Learning and Teaching Support. Consequently the parent map of the unit (Figure 1) and the concept map of topic 2 (Figure 2) were developed. The topic 2 map carries an audio file and links to further information.
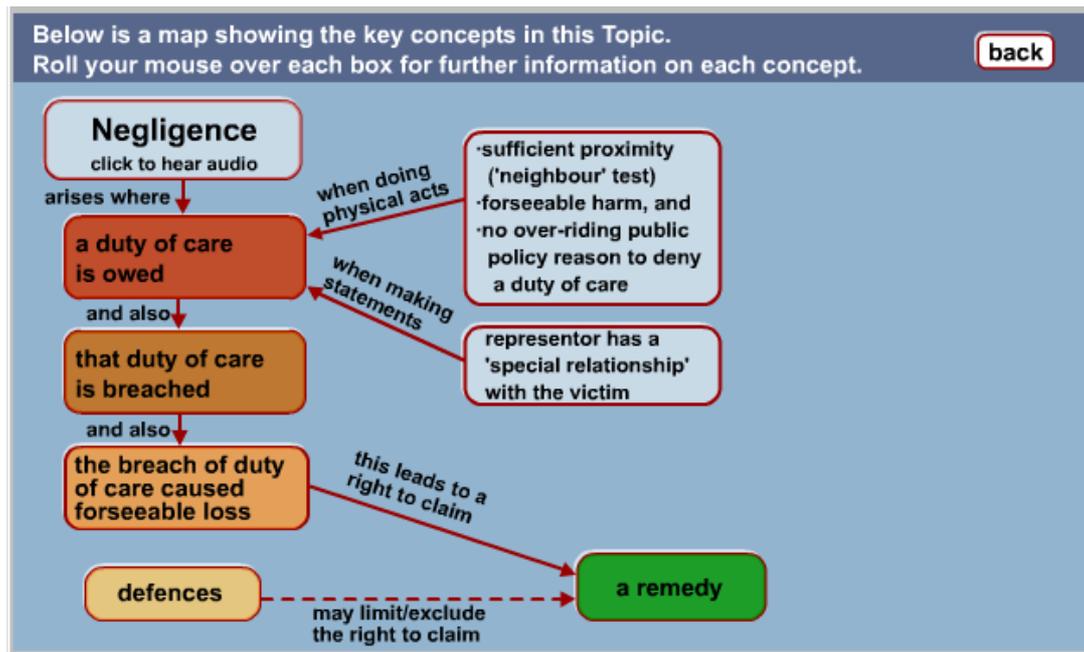
Figure 2. Map of topic 2

Evaluation and results

Evaluating work in progress is crucial to the quality of the materials developed as well as to monitor end-user or learner satisfaction. In order to obtain formative evaluation, these two maps were trialled prior to developing the maps of other topics. A prototype WebCT site for topic 2 was developed and currently enrolled students were invited to visit the site by the teaching academic, and respond to the online survey. The survey questions probed the contribution the resource made to the students' learning experience and how individuals employed the resource to further their learning.

Feedback from technical staff prompted changes to the colours and contrasts used in the maps, which were not merely aesthetic but related to user-friendliness of the maps. Also, feedback from the same group led to repositioning of the rollover text to facilitate easier viewing or greater user-friendliness.

Student feedback was received initially through an anonymous online survey. Since the learning experiences, particularly of off-campus students were seen as essential in the evaluation, telephone interviews were conducted on 10% (*n* = 15) of those independent learners. Interviewees were mostly from urban and rural Australia and two were based overseas.

In general, students' comments were positive. They suggested an improved quality of learning and a positive impact on their learning experience which validated the introduction of the concept maps. They believed "the flow charts worked well to link all the theory together". Similar observations offered were:

> The overview diagram of the topic Negligence made it clear in my mind all the issues in that topic that I had to know about.

> It told me where everything was; I referred back to it quite a bit. You could understand things much better because it sort of gave a relationship. It helped to enhance my understanding.

Their comments also indicated that the maps provided guidance through the study process.

> I go through the diagram to see all details. Then I come back to the diagram from time to time.

> The diagrams, they save a lot of work. Brings it all together and it's something you have in front of you as you work.

The maps also provided students with an alternative approach to note-taking:

> They were useful. I printed the main diagram and took notes on the info in the boxes.

The visual and auditory support which complemented the concept maps was positively received.

> The audio comment was really good . . . particularly for a DE [distance education] student.

> It's [concept maps] a good way to assist students with videos, diagrams etc rather than just reading a textbook and doing tute questions.

The maps proved to be also useful in revision.

> It helped me understand. I was interested looking at it. I'm starting to go back to it now, see how some of the things fit together a bit more.

> Was able to follow it better once you get into it, then it becomes clearer. Particularly when you do your reading and return to it, it becomes clearer. It helped me to understand where everything stood.

Despite the very positive feedback, the one disappointment voiced by many was that the diagrams were not easily printable, a technical improvement that required to be addressed.

While these responses came from a small sample of students, they show that for these students the two concept maps provided a worthwhile and useful resource that significantly enhanced their learning experience. For most students interviewed, the concept maps were a functional enhancement to the learning materials.

Stage 2 of the project

Developing and implementing the remaining concept maps
Stage 2 undertook the development of an additional nine maps. The lessons learned from Stage 1 were taken into consideration in developing the balance concept maps to cover the entire set of topics in the unit. Prior to doing this however, Stage 2 involved returning to the two concept maps previously developed for Stage 1 and addressing requirements raised in the evaluation.

In Stage 2 the multimedia development team were able to ensure that the maps were printable. Of course, the printed map would still be only a static version of the original, lacking the audio clips, mouse roll-over text and embedded links to information and related concept maps. Yet, it would serve the learners' need as a framework for note-taking and organising information. During this development stage, further work was also required to improve colour schemes of the existing maps and thereby improve contrast and provide clearer visibility of the information within the maps. The multimedia team were also to improve the size as well as the location in which the pop-up boxes would appear when rolling the mouse over in order to provide a 'neater' diagram. This would enhance the accessibility and user-friendliness of the maps to students. Hence, rather than the rollover boxes appearing in the top right corner of the screen, they were to appear as close as possible to the corresponding box. This repositioning also reduces eyestrain – an important consideration for the students' physical comfort which in a way contributes to the overall learning experience.

Consequently, the maps initially developed in Stage 1 were improved by making minor changes to size and placement of the boxes, together with changes to the colours so that there was more contrast between text and surrounding space. This meant that most boxes appeared initially 'uncoloured' and then became coloured only when the mouse was rolled over that box, with the corresponding roll-over text passing up in a box of the identical. Figure 3 shows the topic 2 map as re-developed in Stage 2, looking neater, and with less colour in the static version.
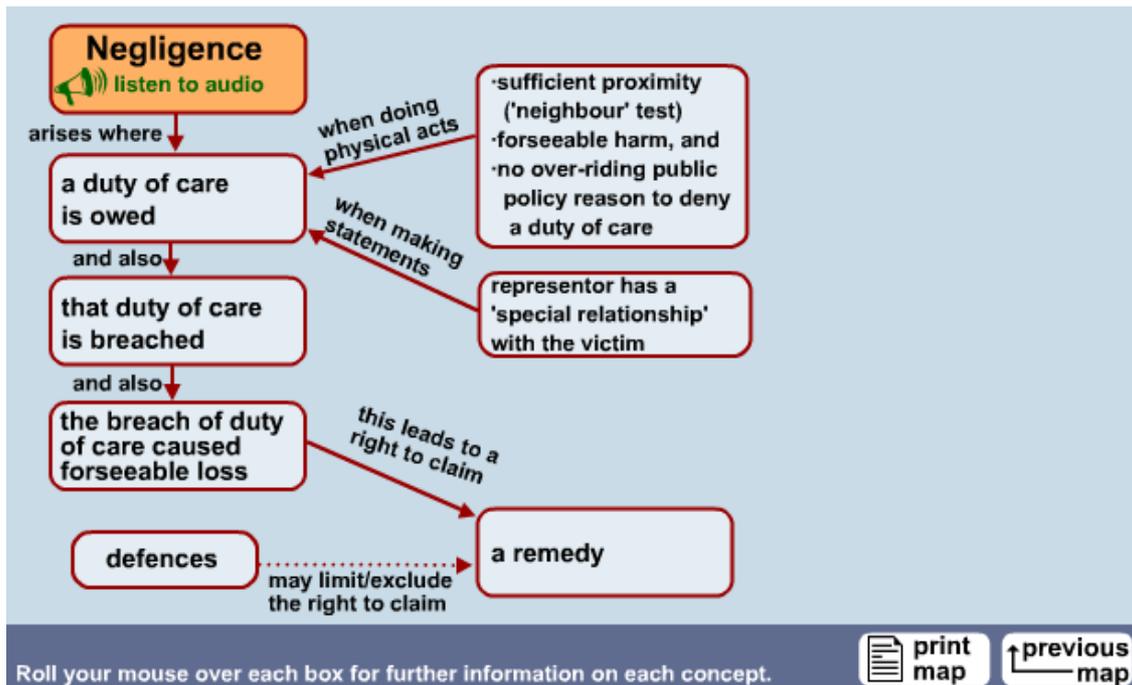
Figure 3. Improved Map of topic 2

For five of the maps developed in Stage 2, two teaching academics were initially involved in addition to the educational designer instead of one (followed again by circulation to other academics for input). This process seemed to result in greater input of alternative ideas at the development stage, when compared to the more minor edits generally suggested by additional teaching academics after the initial draft maps were produced.

A further nine concept maps were developed in Stage 2, making a total of eleven maps. Like the map for topic 2, all maps developed in Stage 2 carried embedded audio clips and links to further information. Where a lengthy topic was involved (eg contract law), an 'overview' map was developed with further hyperlinked subsidiary maps. The entire set of concept maps was then made available to students via the unit WebCT site in the first semester, 2003.

Challenges faced in enhancing the learner experience

As in any innovation, there were some problems, and hence the need for formative evaluation. The two staged development process proved to be a useful approach as Stage 2 allowed the opportunity to refine and improve on Stage 1.

Developing, trialling and evaluating a smaller number of concept maps in Stage 1 enabled the team to pause, reflect and reconsider feedback in the light of quality and learner needs as against progressing through all the maps and supporting multimedia components and focusing on quantity. As with any innovation, the quality is likely to be improved through closely monitored iterative development based on end-user feedback. The smaller scale trial in Stage 1 was a way to gain meaningful feedback at a useful stage, while providing the trial maps to students via WebCT allowed last–minute edits and access to all students in a way that avoided the unreliability of limited 'test' groups or the possible inequity of depriving 'control groups' of access to the new resources. It was also hoped that the initial smaller scale trial would allow problems to be identified and solved before Stage 2 was attempted.

During Stage 2 when developing and implementing the full set of concept maps for the unit, additional challenges were encountered. These were reviewed from the perspective of the learner experience and addressed accordingly. Again, further evaluation is scheduled in the form of an online survey and

interviews with students. Discussion of these challenges below is intended to assist staff facing similar projects in the future as they seek to make innovative developments using technology to enhance student learning.

One challenge faced during the Stage 2 development and implementation phase was the newer version of the software package (Flash6) used by Multimedia to create the maps. Student computing labs and IT equipment in the teaching rooms did not carry this software and therefore the concept maps were initially unusable in these learning and teaching spaces. These are situations best avoided by timely and continuous dialogue between developers of multimedia learning tools and the other areas of the university that support and update lecture room and computer laboratory facilities. If situations such as this are not foreseen, then the students' learning experience is not enhanced, only frustrated.

It is also crucial that these learning tools are adequately trialled, not just within the learning management system, but also within the particular tool of that system in which it will sit. In WebCT, the Content Tool is a navigation tool in its own right and applying an additional and overriding navigation tool via the concept maps proved a problem. Idiosyncrasies of the Content Tool also posed challenges for Multimedia developers who found that instructions within the script may operate perfectly in other areas of WebCT, yet cause the maps to malfunction in the Content Tool. All these challenges needed to be adequately addressed and user-friendliness ensured or the students' learning experience would only be a negative one.

Further, student feedback revealed that concept maps may not be perceived by all students as valuable for enhancing their learning. In the feedback obtained in Stage 1, one student commented -

> I'm not a diagram person so I didn't use them.

This comment provides a useful reminder of learner differences in preferences and styles (Felder, 1996; Kolb, 1984). It is necessary to keep in mind that multimedia concept maps are not the answer to all students' learning difficulties, rather there is a constant need to develop and build in alternative strategies to ensure a positive learning experience of all students.

Conclusion

It could be safely concluded that the introduction and use of multimedia concept maps proved to be successful in this study. However had the approach been for students to develop their individual concept maps in order that they see alternative and multiple ways information and concepts relate, the learning experience would probably have been of greater value and significance. Comparing each others' maps would have conveyed to them the absence of one correct view. However, experience has shown that for various reasons, many (if not most) of the students would not have completed the task. While acknowledging that students' creating their own concept maps is a valuable metalearning function that would enhance the learner experience significantly, it was considered too demanding and time consuming a task for first year undergraduate students. Further, in creating the concept maps for this unit, the academics discovered the task challenging, even with their many years experience and in-depth knowledge of the unit.

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