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Using a Pictorial Quiz to Facilitate Learning During Nursing Science Lectures

Jon Cornwall
Department of Anatomy
University of Otago, New Zealand
jon.cornwall@otago.ac.nz

Abstract

Learning science has traditionally proved difficult for many students, including student nurses. This difficulty arises from many factors, including elements such as learning styles that are not congruent with the presented material, or an inability to engage with the subject. A tool to facilitate nursing student's learning science was developed and implemented. This novel technique involved a pictorial quiz that was presented to students during their science lectures. Students were then surveyed half way through the academic year to assess the effectiveness of the pictorial quiz as a learning tool.

Results indicated that students found the pictorial quiz to be a positive addition to their learning experience, with students indicating that learning was facilitated and the quiz experience was enjoyable. The current format for quiz delivery was also deemed acceptable. These results suggest the quiz tool currently exists in a format which is beneficial to nursing students learning and engaging with a science subject, and that the framework exists to further develop the potential of this novel tool across both other subjects and through different modes of delivery. Furthermore, the possible by-products of using the tool include improving lecturer creativity and developing critical thinking skills.

Keywords: Science, tertiary, education, nursing, quiz

Introduction

'*Everyone knows that the only hard paper in the nursing programme is Bioscience – it's the only paper you're likely to fail, so everyone is afraid of it.*' – Claire, Year 2 Nursing student, Otago Polytechnic.

Anecdotally, both nurses and nursing students report negative experiences about learning science in nursing school, with a recent survey at Otago Polytechnic indicating that many students have difficulty with the scientific element of the undergraduate curriculum (Cornwall, 2010). Seventy-six percent of second year nursing students surveyed indicated that the second year science subject, BN206 Bioscience, was the hardest subject in the year two nursing curriculum. The findings of this local survey reinforced many anecdotal comments related to the teaching of science in nursing courses at tertiary institutions, with international research suggesting students from many different countries have similar viewpoints (Davies, Murphy, & Jordan, 2000; McKee, 2002; Meehan-Andrews, 2009). Typically, the scientific courses within nursing qualifications seem to exist as a paradox where they are viewed as a 'necessary evil'; students must learn about the subject but struggle with the content. This raises the question: what can be done to make learning science easier for nursing students?

Background

Training for the degree of Bachelor of Nursing in New Zealand is undertaken in both Polytechnic and University environments. Each 3 year programme leads to registration as a registered nurse, with courses and curricula throughout New Zealand intermittently audited by the nursing council to determine whether the core competencies expected of graduate nurses are met. These core competencies must be fulfilled in order to allow courses to offer nursing degrees (and therefore registration with the national nursing body), yet interestingly no specific core competencies exist that stipulate the level of science or scientific content that must be demonstrated by students. However, scientific knowledge is implicit is the understanding of disease (physiological, psychological) models, and competencies relating to aspects of client safety are therefore interpreted as relevant to the understanding of basic anatomical and physiological principles, both of which underpin good nursing practice (Casey, 1996;

McKee, 2002). Therefore, the science elements of the nursing courses at Otago Polytechnic are viewed as a necessary and integral component of the course. The science based subjects anatomy and physiology are taught by Otago Polytechnic in year one and two of the nursing course, and are apparent in the curriculum under the moniker 'Bioscience'.

As previously stated, Bioscience is viewed as a 'difficult' subject by students enrolled in the nursing course, however this perceived difficulty in itself does not present an issue. Complications arise when the difficulty of the subject translates to downstream effects in other areas. Students may spend more time studying this subject, consequently struggling to keep up with their workload across the course as a result. Students may also become disillusioned because of the difficulty experienced with the science content, with this perhaps affecting them personally or socially. This has ramifications for not only their professional studies, but their living circumstances and relationships outside of the tertiary environment.

However, perhaps the most significant effect of the perceived difficulty of the Bioscience paper is the outcome based on student success and pass rates, with poor performance in this subject common both nationally and internationally when compared with other elements of the curriculum (personal communication with Head of School, Otago Polytechnic School of Nursing, 2010; McKee, 2002). Success affects not only the individuals involved, but also the course delivery as a whole. This means that students who fail must then be accommodated within the next years cohort, putting pressure on class numbers throughout the course and affecting the curriculum as a whole both horizontally (across year two) and vertically (into year three). Lecturers and other teaching streams are additionally affected by changing class numbers and confusion as to which students belong within individual classes.

Although the concepts central to the theme of this paper are based on constructivist theory, the purpose of this paper is not to explore the relative merits of content delivery through deconstructing epistemological paradigms such as constructivism and its pedagogical sub-groups (e.g. cognitive apprenticeship, active learning). Rather, it is to determine how best to provide an effective learning experience through lectures delivered in a particular course. This paper explores the delivery of lecture material in

the year 2 Bioscience curriculum at a local school of nursing, and in particular describing and investigating a tool that was introduced during lectures in an attempt to facilitate learning Bioscience content. It will then discuss the quantitative assessment of student feedback that was gathered following this intervention, and suggest plans for the ongoing development of this learning tool. This investigation is important as it contributes to an understanding of whether a modification in the lecture delivery of the science content has the potential to facilitate an improvement in the student pass rates for the Bioscience course. As a consequence, it is hoped this short-term student feedback will allow progressive modifications in the delivery of the content in the medium and long-term, with the aim of refining the course delivery to ultimately minimise student failure rates and optimise the learning opportunity for students.

Student learning

Many variables can influence an individual's ability to learn new subject material with a multitude of cultural, social, and ethical factors all known to contribute to the learning experience (Cohen, 2006). All of these factors, when viewed in the social constructivist paradigm, influence an individual's learning in the classroom setting. However, of more importance to this study are not the *a priori* experiences of student's, more so the different ways of learning that students possess upon immersion in the classroom environment, as these are the focus of the teaching tool developed in this study.

Fleming (1996) describes a model whereby the different modes of material presentation are influential in how each individual learns. This model introduces the concept that visual, auditory, reading / writing, and kinaesthetic sources of information are all contributory to how individuals learn, with learning styles being highly variable (Fleming & Baume, 2006). It has also been demonstrated that individual student populations can have distinctly different learning preferences (Murphy, Gray, Straja, & Bogert, 2004). That is, some individuals have modal preferences that will influence individuals behaviours, with these perhaps not being fixed yet stable in the medium term (Fleming & Baume, 2006). Such modes may therefore be able to be identified and preferences for students matched with strategies for learning. This allows the use of learning strategies that most closely align with individuals preferences, an important consideration when looking to improve ones learning experience (Fleming & Baume, 2006).

As described above, different modes of learning may be dominant for different individuals. Expressing how successful each may be is helpful when determining how material could be presented to students, however even though a depth of understanding is generated differently for individuals via various modes there are other factors which contribute to the success of learning strategies.

Constructivism, which in general places learners in an active role, attempts to build on a subject's previous experiences to promote learning (Perkins, 1999). Different roles have been identified within this paradigm, with the active, social, and creative learner suggested as existing independently. Active learners acquire and learn actively, through such elements as discussion and debate. Social learners assimilate information differently, recognising that knowledge and understanding are highly social and 'truth' or fact is arrived at through social critical processes. The creative learner develops understanding through creating or recreating scenarios to create perspective and therefore understanding (Perkins, 1999; Biggs & Tang, 2007).

In addition to these elements, other factors contribute to students being able to 'engage' with subject matter effectively. Engagement, a term which is difficult to precisely define (Zyngier, 2008), is used in this instance to categorise factors encompassed in the delivery of the material to facilitate the learning experience. There are many variables which contribute to engagement in the classroom setting, including those external to the tertiary environment such as socioeconomic status and cultural background, and those that are internal (e.g. lecture delivery, the use of humour, creative teachers) (Horng, Hong, ChanLin, Chang & Chu., 2005; Zyngier, 2008). It has been shown that engagement in learning may lead to an improved retention, understanding, and active use of knowledge (Perkins, 1999). However, although engagement is not a universal predictor of academic success (Zyngier, 2008), one of the primary aims of this study was to facilitate the ease with which students could engage with a subject that is traditionally viewed as difficult to learn.

Engagement encompasses a wide variety of constructs, each attempting to explain how students behave, feel (emotions), and think (cognitive) with each of these elements contributing to different aspects of the psychology of engagement (Zyngier, 2008). The behavioural element encompasses how a student may do the work, follow the rules, or

participate, while the emotional aspect centre feelings, interest and value of the student towards the institution, other students, and teacher. The cognitive element includes the student's motivation, effort, and strategy use (Zyngier, 2008).

As outlined, constructivism and engagement have been identified as core theoretical concepts contributing to learning in the tertiary environment, and both contribute to the framework underlying this proposal. However, central to the focus of this paper is the concept that nursing students have difficulty learning *science*, with sources previously quoted that support this proposition (Thornton, 1997; McKee, 2002; Cornwall, 2010).

Science learning

There are a number of factors that could contribute to student's difficulties. Both McKee (2002) and Cornwall (2010) observed that nursing students have difficulty with science. More than half (54%) of the second year nursing students surveyed by Cornwall (2010) indicated that science subjects were those that they traditionally had the most difficulty with, but what is unclear is why students have problems with learning science *in particular* when science is compared to other papers in the curriculum. Certainly, factors such as class attendance are linked with student success (McKee, 2002), however there are other considerations specific to science that need to be considered.

Firstly, the very nature of science concepts can be completely foreign to some individuals (Johnstone, 1991; Perkins, 1999). As an example, for most people a cat is an animal that can be defined with *a priori* knowledge. When cats are being discussed, there is a formative notion of what has previously been experienced. In contrast, the Henderson-Hasselbach equation for acid-base balance is conceptually unfamiliar to most people (who have no experience of this equation), thus presenting individuals with a completely unfamiliar construct of which they are required to gain a functional understanding.

There are also different levels of thought required in scientific learning (Johnstone, 1991). There is the macro level, at which objects are visible and tangible, followed by the micro level in which items must be visualised. In addition to this, bodily elements interact in a way that requires symbols and equations in order to demonstrate the various interactions. In many instances this conglomeration of information all fits

together to create an understanding of a *single body system*, providing ample opportunity for students to become lost along the way.

Scientific descriptions and language are also often un-user friendly (Johnstone, 1991). Individuals may understand 'volatile' as referring to social interactions, but not so much to unstable gasses. Johnstone (1991) suggests that technical words must be used sparingly and alternatives employed where possible in order to prevent misunderstandings or confusion.

From a constructivist viewpoint, these variables may all contribute to the destabilisation in the processes underpinning of an individual's learning, with the learner being constrained by the limitations of their previous experience (Perkins, 1999) thereby affecting both student learning, engagement, and depth of understanding (Wilson & Fowler, 2005; Biggs & Tang, 2007; Zyngier, 2008). Interestingly, McKee (2002) found that one of the variables that influenced the success of nursing students was having undertaken previous science education. These findings reinforce the suggestions of Johnstone (1991) since previous exposure aids familiarity of content and understanding (Meehan-Andrews, 2009). In addition, it is unknown what influence other external variables may contribute to student's success with science papers. There may be a lack of appropriately trained science teachers, or the quality of science teaching in nursing schools may be of differing standards. Furthermore, there is no 'gold standard' method of delivering science curricula and examining science knowledge in nursing students. Both factors would likely contribute to students success rates in this subject.

Current Bioscience Curriculum

At present year two Bioscience at the Otago Polytechnic School of Nursing is delivered through 40 one hour lectures, spread equally over 10 teaching weeks through the year. In addition, questions relating to scenarios involving the previous week's content are posted on the class website at the end of each teaching week for students to work through in their own time. This structure has been in place since the beginning of 2008, when the curriculum was reviewed in light of a directive from school management. This directive included the removal of tutorials to make the course delivered entirely via face-to-face lectures. BN206 is assessed via five multi-choice tests (worth 5% each)

throughout the year, and one written examination on the year's material at the conclusion of the second semester. Since the curriculum and assessment methods have been changed to this format it has been noted that a larger number of students fail the end of year examination than the multi-choice tests.

Intervention tool

With respect to the learning of *scientific* material Meehan-Andrews (2009) suggests that a mixed mode delivery of science content is most beneficial to the learning experience, yet empirical data determining whether this leads to improved outcomes in either pass rates or workplace ability is unavailable. It is also possible that there is no single 'right' way to present science material to students (Meehan-Andrews, 2009).

Nonetheless, given the suggestion that every learning generation has its own distinct set of values, learning styles, ethics and beliefs (Meehan-Andrews, 2009) the provision of several different modes (visual, auditory, reading / writing, kinaesthetic) of learning accommodates the proxy of differences in learning styles (Fleming, 1996; Fleming & Baume 2006; Meehan-Andrews, 2009). It was also noted that using an 'active' method of learning, such as one that involved interactions of student and lecturer, provides a deeper learning, motive, and strategy than 'conventional' face to face lectures (Wilson & Fowler, 2005). With this in mind a pictorial quiz was developed as a learning tool. This was developed to facilitate engagement that not only provided visual information but delivered a variety of information in different contexts across multiple modes, with the aim of exposing students to many different forms of information within a short period of time. The tool was created with the intention of delivering material visually that was also *related to* the various modes, keeping in mind the overall objectives of both the course and the individual lesson plans. This provided congruence with the learning outcomes expected of the students, and in this way the tool was able to further explore and develop linkages with material delivered in the lecture in a more complementary fashion.

Tool development

The quiz tool was developed and implemented to improve nursing student's science learning experience, with the additional goal of an improved success rate in the course. This particular format was chosen for many reasons. The foremost consideration in the development of the quiz was that it that enabled an active and fluid method of delivery that could accommodate a variety of strategies to develop the learning of students. It also allowed the delivery to move between student-centred, teacher-centred, and content-centred delivery where necessary, depending on the interactions of the class and the perceived difficulty of the students with the material from individual lectures. There was also the necessity to be aware of the amount of time the tool would necessitate in both development and delivery. The quiz tool had to take only a small amount of time to implement quiz in each lecture, thereby encroaching minimally on students' lecture time so as not to affect their performance in other parts of their course or detract from their efforts in Bioscience.

Certainly, assumptions were made about the format and type of intervention that would best suit students. Given that the course material is primarily delivered through face to face lectures, the tool was developed to deliver material in a non-written format so that it could be easily delivered in conjunction with the lecture. Therefore, the pictorial quiz was determined to be the most effective mode of delivery. It had to recognise the difficulty inherent in science subject, as well as different learning modes and preferences, all the while framing the delivery within the objectives of the course and presenting information in a visual format that was stimulating to the students.

The subject matter was a vital consideration in the success of the quiz as a learning tool. As previously discussed, learning science is noted as particularly difficult for some students, including student nurses. By implementing a pictorial quiz it was hoped that (primarily) visual cues could impart an integration of concepts and circumstances in a manner that was previously unavailable to students with lecture delivery. In this way the subject can both be reduced and deconstructed; content can be delivered via a 'mixed mode' with the goal that information can be more easily digested, appearing 'in reach' and familiar. Through this mechanism of intervention links and relationships between various elements of the subject matter are provided in a manner which the

student is capable of recognising, with the goal that this relates to an increased understanding of material. It has been suggested that using a mixed delivery incorporating such a framework leads to improved learning outcomes (Perkins 1999), with a creative element deliberately fostered in this approach as creativity is reported to promote engagement with students in the classroom setting (Horng et al., 2005).

In order to achieve these goals, pictures were used that provided historical, social, and environmental context in order to provide linkages between the facts and concepts presented in the lecture. These pictures also provided the opportunity for students to develop anchoring institutions (Perkins, 1999), relating information to ideas and knowledge previously learned. Students were given time to discuss their thoughts, then encouraged to discuss their ideas with the lecturer, where an effort was made to promote inclusion and interaction between individuals. In this way, a conscious effort was made by the lecturer to engender interaction with a view to fostering the emotional, behavioural, and cognitive elements that contribute to student engagement.

In the nursing course most students are young and mostly female, and although the format was chosen without bias towards sex (males also partake in the course), it was developed in a way that noted the age of the audience. For instance, pictures of celebrities with disease or illness were selected if they may be familiar to a younger audience, disease processes likely to affect the demographic (e.g. Chlamydia) were chosen ahead of more obscure disease processes. In this way it was hoped to create an element of familiarity and 'buy in' from the audience. Each picture (or diagram) could then be seen to be contributing to exposing the student to the topic in a manner that was different to that which they experienced with lecture delivery. This could include pictures, numbers, items, or scenarios that were linked to the subject or content matter.

The use of humour and games in the classroom setting have been suggested to improve the engagement of students (Horng et al., 2005; Selby, Walker, & Diwaker, 2007; Baid & Lambert, 2010), therefore it was recognised that humour could play an important part in the delivery of the quiz. Although humour and games do not suit every learning style, where cooperation and competition sometimes influence an individual's enthusiasm to participate (Baid & Lambert, 2010), it was hoped that the format of the quiz would be non-confrontational and inclusive enough to encourage participation, with

humour utilised to promote this occurring. Where possible the lecturer introduced humour either verbally or in the form of an amusing picture or anecdote related to the picture.

The timing of the quiz during the lecture was also considered. It is well documented that it is difficult to concentrate for sustained periods of time (Biggs & Tang, 2007), therefore it was decided to place the quiz mid-lecture. This provided a period for the students to have a break in concentration after twenty to twenty-five minutes, perform an activity where they were able to switch focus and interact with other students, then return to concentrating on the second half of the presented lecture.

Preparation for each individual quiz involved time, background knowledge of the lecture topic, and planning of the quiz implementation. Time was necessary for the lecturer to research the topic and design the quiz around relevant questions and objectives, with the proviso being that the lecturer understood the necessary background information and topic with enough depth to enable objectives to be integrated efficaciously with the quiz delivery.

Method

The pictorial quiz, based on material relevant to the lecture topic, was introduced half way through each 2nd year science lecture. Each quiz involved four to six picture-based questions, which were shown on a single PowerPoint slide (Figure 1). Students were then instructed that they had two minutes to discuss amongst themselves the relevance of each picture to the topic of the lecture they were currently receiving. The complete quiz process usually took around five to seven minutes including time for discussion between students and lecturer.

Eighty-one students (of one hundred) were surveyed as a teaching exercise mid-course to provide opinion about the effectiveness of the quiz as a learning tool. Category 'B' ethical approval (departmental) was gained for this exercise. No personal data was gathered during the process; surveys were handed out and retrieved by a person

independent of the Bioscience curriculum to avoid bias. Returned surveys were kept in a locked cabinet, with access available only to the primary investigator.

Figure 1. Example of A Pictorial Quiz

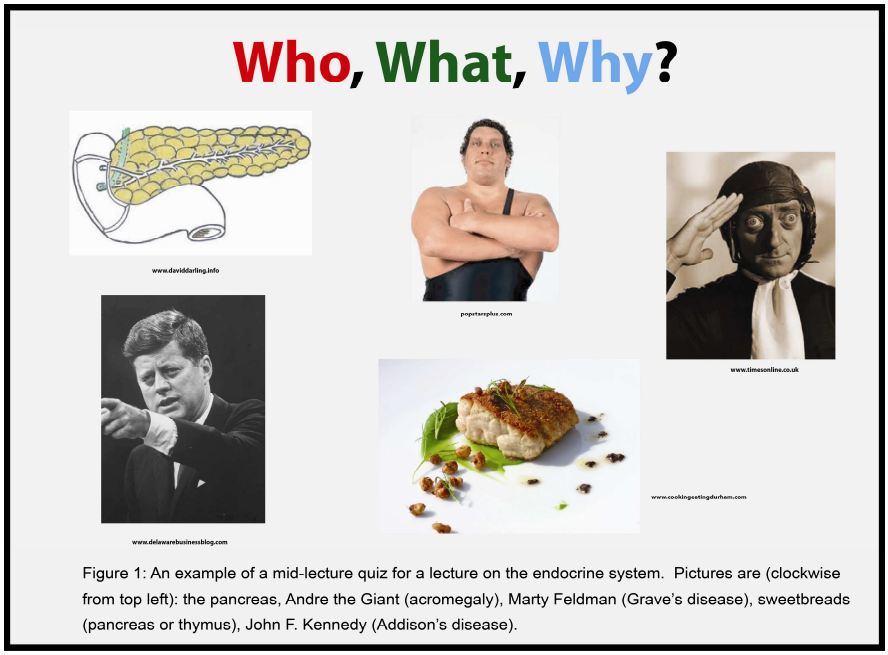

Figure 1: An example of a mid-lecture quiz for a lecture on the endocrine system. Pictures are (clockwise from top left): the pancreas, Andre the Giant (acromegaly), Marty Feldman (Grave's disease), sweetbreads (pancreas or thymus), John F. Kennedy (Addison's disease).

Students were asked ten questions (Table 1) relating to the use of the quiz, answering in the following categories: agree, tend to agree, disagree, tend to disagree. Responses to each individual question of 'agree' and 'tend to agree' were grouped, as were 'disagree' and 'tend to disagree', to provide an outcome which was either affirmative or negative in reference to each question. These data were then calculated as percentages of respondents agreeing or disagreeing with each statement.

Table 1. Results of Bioscience Quiz Survey

Question Number	Agree		Tend to agree		Subtotal		Tend to disagree		Disagree		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
1	69	87.3%	8	10.1%	77	97.5%	1	1.3%	1	1.3%	79	100.0%
2	25	31.3%	36	45.0%	61	76.3%	15	18.8%	4	5.0%	80	100.0%
3	53	66.3%	25	31.3%	78	97.5%	1	1.3%	1	1.3%	80	100.0%
4	47	60.3%	26	33.3%	73	93.6%	4	5.1%	1	1.3%	78	100.0%
5	45	56.3%	29	36.3%	74	92.5%	4	5.0%	2	2.5%	80	100.0%
6	2	2.5%	2	2.5%	4	4.9%	61	75.3%	16	19.8%	81	100.0%
7	53	67.9%	22	28.2%	75	96.2%	1	1.3%	2	2.6%	78	100.0%
8	60	75.0%	16	20.0%	76	95.0%	3	3.8%	1	1.3%	80	100.0%
9	64	81.0%	14	17.7%	78	98.7%	0	.0%	1	1.3%	79	100.0%
10	7	9.5%	17	23.0%	24	32.4%	42	56.8%	8	10.8%	74	100.0%

Survey Questions

1. The quiz gives me a break from concentrating during the lecture
2. The quiz provides information which helps me remember details about the lecture material
3. The quiz is interesting to me
4. The quiz is fun for me
5. The quiz makes the lecture material seem more relevant and 'real world'
6. The time the quiz takes up is too long
7. The information in the quiz is relevant to the lecture
8. I appreciate having a break in the middle of the lecture when the quiz is on
9. Having the quiz is a good idea
10. There should be more than 5 or 6 questions in each quiz

Results and Discussion

The large majority of the students responded positively to the implementation of the quiz (Table 1). Strong responses of over 75% agreement were indicated for eight of the ten questions, relating to elements including the quiz being fun, relevant to lecture material, interesting, providing a break in concentration, and a good idea.

The two responses that scored less that 75% agreement related to the size and length of the quiz, with 5% indicating that the duration of time the quiz consumed was too long, and 32% recording that there should be more than 5 or 6 questions in each quiz.

The aim of this project was to introduce a tool that would improve the learning experience of students enrolled and participating in the BN206 Bioscience course at the Otago Polytechnic School of Nursing. This paper has described the rationale for the development and implementation of such a tool to enhance learning science through lecture delivery. It is hoped that the implementation of this tool will lead to an improvement in student engagement and therefore an improvement in the overall pass rate for the paper.

The majority of students responded positively to the implementation of the quiz tool. Responses of the students to the introduction of the quiz indicated they found it interesting (97%), fun (94%), and a good idea (99%). This indicates that students were perhaps primarily engaged by and 'bought in to' the concept, and were therefore willing to accept it as part of the lecture delivery. Humour and interest are well documented as contributing to a productive learning environment (Baid & Lambert, 2010).

As previously discussed, the timing of quiz delivery was considered and the tool utilised mid-lecture in order to give the students a break in concentrating. Results indicate the implementation of the quiz achieved these goals, with 98% of students indicating that the quiz gave them a break from concentrating, and 95% indicating they appreciated the break mid-lecture. It was hoped that the sequel would include an improvement in student concentration for the second half of the lecture, however that was not assessed, and perhaps should be considered as a question in future surveys. However, achieving a positive response with regard to students' self-assessment of concentration levels is important. Students then have a predictable lecture framework to prepare for, where they know concentration is required in two short bursts rather than for a whole hour. It is suggested that this lecture format an easier proposition for students to deal with when facing a whole day of lectures.

Students also indicated that the quiz provided information which helped them remember details about the lecture material (76%), making the lecture material seem more 'real world' (93%). They also saw the material as relevant to each lecture (96%). These points are vitally important, as the quiz was developed to present the lecture material in a more digestible, enjoyable, and engaging format in order to promote learning by developing understanding and links (contextual hooks) utilising as many modes as possible given the constraints of the presenting format.

Lastly, the time spent delivering the quiz appears to be satisfactory, as only 32% thought there should be more than five or six questions in each quiz, and 5% indicated the quiz process took too long. This suggests that the current format, in terms of time taken for the quiz, is appropriate for the quiz tool as it is currently delivered. Whether this would need to be modified with more complex arrangements or deliveries of the tool is not known.

Overall, the students responded positively to the implementation of the quiz tool. Interactive lectures have previously been demonstrated to improve elements of the learning experience such as short term retention of knowledge (Selby et al., 2007), and this interactive tool was carefully developed in order to promote the learning experience of students in this particular environment. In general a constructivist framework for the tool accompanied the tools' development, with the mixture of doing and observing (both themselves and others) fitting well within the constructivist paradigm. The environment in which the tool was implemented was carefully monitored to include stimulating interaction between students, interaction between students and their teacher, with continual reflection by the developer to ensure different learning modes and styles were catered for. Students indicated the tool is fun, relevant, interesting, and helps them remember lecture material, amongst other things. These variables have been noted by different authors as contributing to an effective learning experience (Horng et al., 2005; Selby et al., 2007; Zyngier, 2008; Akl et al., 2010).

Measuring student's impressions of the quiz quantitatively via survey provided a quick method of interpreting how the tool was viewed by those receiving it. The survey is repeatable and takes very little time, allowing repeated measurements of different cohorts of students. Furthermore, responses to individual questions in the survey allow 'fine tuning' to be implemented in the delivery of the quiz year to year. It is therefore, to some extent, a barometer of how the quiz tool may be modified or developed from year to year in order to become more efficacious.

The implementation of this tool has followed a process of inquiry which involved the identification of a need, gathering of information, development of a strategy, implementation of a strategy, analysis of results, communication of results, and evaluation of success. Using this method of inquiry into the students' perceptions of the quiz tool provides an innovative way of improving course delivery which has previously been demonstrated to engage and teach students more effectively (Justice et al., 2007). Both the quiz format and survey document are also simple to use, indicating that other teachers may be able to use the device and record student feedback with relative ease. Using and modifying the quiz tool in multiple teaching environments also contributes to the professional development of the individual lecturer, perhaps allowing them to explore their own creativity in arranging scenarios in an independent fashion, with the

reflective process perhaps promoting the development of critical thinking skills. It may also be developed in conjunction with other staff members, with collegial by-play important in improving performance not only on a personal level, but also through encouraging collegial and professional interactions in the tertiary environment (Zyngier, 2008). Such collegial interaction and idea sharing is important in the development of curricula and individual courses or programmes (Cohen, 2006).

Ultimately, however, it is hoped that the use of this tool could lead to improved outcomes in success rates for the course. Given that around ten percent of the final examination is modified every year, examination material remains reasonably consistent from year to year and marks can be compared between years to assess student success rates. Of course, this is not an entirely reliable method of measuring course success or the use of the quiz tool. Many variables will likely influence the outcome of the students in the following years, including the difference in cohorts from natural selection, an improvement in communication and teaching expertise of the lecturer, and overall student workload from other subjects. Nevertheless, using and developing the class survey and noting overall grades and exam marks should provide useful feedback regarding development of the tool. Quantitative data from both the survey and examination marks also provides the lecturer with the opportunity to reflect on their own practise, gaining insight into teaching delivery, curriculum development, and learning styles. Future investigations could then aim to more definitely assess whether such forms of interaction actually leads to better learning outcomes. However, more stringent forms of quantitative analysis such as subjecting one half of the class to an intervention whilst withholding it from the other may prove difficult, as ethical approval would likely not be granted to a study that had the potential to handicap groups of students.

Future development

The application of the quiz during the past academic year has allowed the delivery of the tool to be observed and a critiqued. Initial reflection suggests that the development platform is robust and necessitates no change to its basic structure, with no significant problems having been encountered by the lecturer relating to the delivery of the quiz. Apart from enough time being available for the tool to be used during the lecture, the only other requisite is preparation time for the acquisition of background knowledge or

the development of more intricate scenarios, with innovations such as 'Whodunnit?' scenarios played out through a series of pictures. For instance, in a nursing environment this could lead students through a variety of symptoms, investigations, and presentations through to diagnosis or treatment. Such a scenario may then include auditory elements such as sounds (heart, lung, or medical equipment) played over loudspeaker to the class.

Quiz material and delivery could also be crafted to develop an understanding of what is expected in different course assessment procedures. At present the most problematic aspect for students in the assessment procedure is the final examination, therefore deconstructing the difficulties faced by students in this process may help facilitate better course outcomes. Working backwards from examination questions and answers, lecturers could provide mock exam questions and answer frameworks pictorially, before introducing a written version of the question. In this way the lecturer would provide examples of scenarios that presented material relevant to examination questions, reframing material so that it can be more easily digested by students with different learning preferences. This allows students who are less competent at disseminating written exam questions to practise formulating and understanding a framework for undertaking written examinations, and would facilitate the alignment of the material delivery with the assessment style and guidelines (Biggs & Tang, 2007).

Limitations

This small study does have some limitations. Although the aim of the pictorial quiz was to present information across many different modes, the primary means of delivery was visual. However, students were asked to discuss the pictures, and discussion with the lecturer to provide context and linkages between pictures was undertaken. There was also an effort to present pictures of items related to the scenario, which may have crossed into providing an element of kinaesthetic involvement as students may have visualised or rehearsed utilising such items in an effort to understand their use. Furthermore only one cohort of students was assessed, providing only one set of data, and several cohorts of students would provide a larger data set and more validity to these results. In addition, the method of statistical analysis was limited, with only two categories of response determined (agree, disagree) and a limited number of questions.

This study did provide a valid snapshot of what this cohort of students thought about the quiz, however a more in depth analysis such as focus groups or interviews may provide information which helps further refine the development of the tool. As an example, exploring constructs such as the students' depth of understanding following the use of the quiz tool would also contribute to validating this as a method of improving student learning (Biggs & Tang, 2007).

Conclusion

This project outlines the implementation of a novel lecture based teaching tool. In this instance the tool, a mid-lecture pictorial quiz, was utilised to provide student engagement through several different methods in an effort to improve student learning and therefore performance. Second year nursing students were surveyed regarding their perspective relating to different elements of the quiz, with the vast majority of students finding it a positive addition to their learning experience. This indicates the potential usefulness of a pictorial quiz during nursing science lectures, and suggests that the utilisation of this novel technique needs to be further examined to establish appropriate parameters for use and delivery.

The overall aim of this project was to enhance the learning experience of the students, and results indicate that - to some extent - this has been successfully achieved. The quiz type tool could also be modified in various formats to provide ongoing varieties of learning stimulation for students, thereby exploring the tool to investigate whether a 'most efficacious' form of delivery is apparent. Adopting a more generalised perspective, this tool may have the potential to both improve science teaching for nurses and other groups that traditionally have difficulty learning science based subjects. Its applicability is not only limited to science, however, and it may also prove useful as a generic tool for engaging students over a broad spectrum of subjects. Therefore, its applicability is widespread and as such the quiz-based tool may be a useful adjunct for teachers in a variety of settings.

Addendum

This study was presented in poster format at the 2010 annual conference of Tertiary Education and Research New Zealand (TERNZ), where it was awarded the prize for best poster.

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