Télévoteurs dans les classes de soins infirmières
Clickers in the Nursing Classroom

Par
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Essai présenté à la Faculté d'éducation
En vue de l'obtention du grade de
Maitre en éducation (M.Éd.)
Maîtrise en enseignement au collégial

mai 2009
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ABSTRACT

In nursing education there are limited opportunities for nursing students to exercise critical thinking in a controlled environment; one of the core attributes required to succeed at a professional level. This is further exacerbated by the reduced or inconsistent opportunities while practicing during clinical sessions because of increasing demand and differences among the wards and hospitals at which the students are trained and practice clinical skills.

Traditional teaching methods in the classroom also limit opportunities for student engagement due to large class sizes and the desire to ensure students receive all of the material required in a particular session. It has been documented that the use of Information Technology (IT); in particular “clickers,” can increase student participation, improve knowledge retention and assist in stimulating critical thinking in a classroom setting. However, the introduction of IT, on top of normal teaching demands, can be problematic as it requires changes to course planners, IT training, support staff and additional funding, all of which have been documented in research. Wolski and Jackson (1999) have postulated that success is a function of the usefulness and the ease of use of a particular technology for faculty members. Research has shown that classroom technology is simply a tool to be used by educators as one of many. Those who tend to use it well are already innovative and technically adept (Zhao, Pugh, Sheldon & Bryers, 2002).

Given the commitment required and the key role that faculty members would play in the introduction of “clickers” into the nursing classroom, this research focused on determining the preparedness of a nursing faculty to integrate “clickers” into the classroom. The research had two main components: a voluntary presentation session on “clickers” to faculty members followed by an anonymous survey on their attitudes to IT and “clickers”; and interviews with instructors from a different faculty who had experience in the use of “clickers” in the classroom.
The presentation, conducted as an interactive lecture with faculty members representing the students, was well received with enthusiastic participation by the participants. In the post-presentation questionnaire faculty members acknowledged the positive benefits of “clickers” and IT in the classroom. However, faculty members also indicated that IT support and training was essential prior to introducing the technology into the classroom. Similarly, the interviews with instructors who had used “clickers” in the classroom emphasized the need for appropriate support. One even stated that his limited experience in using the technology in the classroom was marred by issues that could have been easily solved with appropriate support. The findings are consistent with previous studies reporting that technical, peer and administrative support are critical in the development and execution of IT into the classroom.

Figure 1: Example of Classroom Performance System (CPS) by eInstruction

Cps was created with the busy teacher in mind.

Our templates are easy-to-use and require little technical knowledge.
Browse through the following pages to see how simple it is to build class rosters, create questions, and grade tests.
RÉSUMÉ

Peu d’opportunités existent pour les étudiants en nursing d’exercer leur pensée critique, malgré que celle-ci soit un prérequis à leur succès professionnel. Ceci est principalement dû aux différences qui existent entre les salles et les hôpitaux où les étudiants sont formés, et où ils exercent leur compétences clinique, mais est aussi aggravé par le manque de constance dans ces opportunités lorsqu’elles se présentent dans le cadre de stages.

Les méthodes d’enseignement traditionnelles en cours magistral ont aussi tendance à limiter l’engagement et la participation des étudiants dû à la taille souvent excessive des classes, mais aussi à cause du désir de l’enseignant de vouloir s’assurer de la transmission du contenu pédagogique complet. Il est bien documenté que l’usage des nouvelles technologies, en particulier les télévoteurs («clickers»), peut accroître la participation des étudiants, améliorer la rétention de l’information mais aussi de stimuler, dans le contexte académique, la pensée critique. Malheureusement, tel que démontré par la recherche, l’introduction de ces nouvelles technologies pose un problème lorsqu’additionné aux contraintes normales d’enseignement puisque qu’elle nécessite des changements à la planification des cours, requiert une formation spécifique, un support additionnel ainsi que le financement nécessaire. Wolski and Jackson (1999) ont postulé de plus que le succès de l’implantation d’une nouvelle technologie était fonction de son utilité et de sa facilité d’utilisation par les membres de la faculté. Il a aussi été démontré que la technologie de l’enseignement en classe n’était en fait qu’un outil de plus à la disposition des enseignants, et que ceux qui avaient tendance à bien l’utiliser étaient de fait innovateurs, possédant des capacités techniques (Zhao, Pugh, Sheldon & Bryers, 2002).

Étant donné l’engagement requis de même que le rôle clé que les membres de la faculté seraient appelés à jouer pour le succès de l’introduction des télévoteurs dans les classes de nursing, cette recherche s’est penchée sur la détermination de l’état de préparation de la faculté de nursing quand à l’intégration en classes de cette technologie. Ceci fut accompli à l’aide de deux éléments d’étude principaux: un sondage anonyme auprès des membres de la faculté, suivant une participation volontaire à une présentation, concernant leur attitude à l’égard des technologies de l’information (TI) et du télévote, et des entrevues avec des enseignants d’une autre faculté ayant une expérience préalable avec l’utilisation des télévoteurs en classe.

La présentation, effectuée tel un cours interactif livré à des membres de la faculté représentants les étudiants, fut fort bien reçue et généra une participation enthousiaste. Les résultats du questionnaire soumis à la suite de la présentation ont révélé que les membres de la faculté reconnaissaient les effets positifs des télévoteurs et des technologies de l’information en classe. Par contre, les membres de la faculté ont aussi indiqué qu’un support concernant les TI et l’entraînemt pertinent étaient essentiels et devaient être fournis avant l’introduction de la technologie en classe.
D’autre part, les entrevues avec les enseignants qui avaient fait usage des télevoteurs ont aussi révélé une insistance sur le besoin d’un support adéquat, un de ceux-ci ayant même affirmé que des problèmes qui auraient été facilement résolubles avec un support approprié ont nuit à son expérience limitée avec la technologie. Les résultats sont en accord avec ceux d’autres études qui ont conclu qu’un support technique, des pairs et de l’administration était essentiel au développement et à la mise en place des TI en classe.
ACKNOWLEDGEMENTS

I would like to acknowledge Dr. Shehrnaz Choksi, my thesis advisor for her guidance and support. I would also like to acknowledge Mr. Peter La Riviere for his support and for providing the clicker systems that were used in research project.
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<td>Blackboard</td>
<td>Computerized Course Management System</td>
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<tr>
<td>CEGEP</td>
<td>Collège d'enseignement général et professionnel which is a post secondary education institution exclusive to the province of Quebec in Canada</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>JAC</td>
<td>John Abbott College</td>
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<td>OSCE</td>
<td>Objective Structured Clinical Examination</td>
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<td>RN</td>
<td>Registered Nurse</td>
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INTRODUCTION

1. BACKGROUND INFORMATION

Education absorbs significant government and individual resources with an expectation that students, and eventually society, will gain some tangible benefit. Part of that expectation is that the time spent in the classroom leads to an understanding of the subject matter by students that cannot be learned by reading textbooks or interactive online courses. However, a common thread in research and commentary of post-secondary education is the inability of teachers to engage students in a meaningful manner; particularly in larger classes that have students of different cultural backgrounds and academic preparation (Chávez, 1998 & Mikol, 2005).

Interaction in the classroom between students, the instructor and each other is necessary to ensure a deeper understanding of the material being presented. Dynamic interaction allows students to build meaning in terms that relate to their own experiences. A lecture style that is unrelated to the cultural and experiential levels of the students does not allow constructivism in learning and if learning is not personal it is less likely to be retained and transferred to long term memory (Hake, 1998).

The nursing program at John Abbott College is based on an interaction among academic, laboratory and clinical instruction. The overwhelming majority of those who enter the nursing profession will practice in a clinical or hospital setting (Canadian Nurses Association, 2006). Thus the knowledge and skills learned during their training is focused on application in direct patient care. As the primary care giver, the nurse is required to integrate knowledge and experience into understanding complex interactions (patient care as well as institutional and familial relations) to ensure that the client has the best possible care with minimum distress.
In nursing, critical thinking is the term that is usually applied to the integration of complex interactions and then proceeding with the correct actions. Unfortunately, the opportunities where students can be observed or given the opportunity to think critically are rare, especially in the early stages of their training. As shown in Figure 2, the ideal place to engage students in critical thinking or knowledge integration is in the classroom because it makes up the majority of college hours in the program and it is 'safe.' In this context 'safe' implies not placing patients in danger through nursing student inappropriate actions or inactions. In addition, it allows students the 'safety' for more free thinking because they are not placed in situations where instructors or nursing staff have to intervene to protect patients, but still need to apply assessment and technical skills for appropriate patient intervention.

**Figure 2 – Opportunities for Critical Thinking in the Nursing Program**

- **Clinical setting**
  - Can be too much pressure
  - Try to avoid mistakes
  - Back-up always there

- **Previous experience**
  - Need to ensure it is appropriate

- **Laboratory**
  - Provides skills, but not the critical thinking

- **OSCE**
  - Excellent approach, but only get experience

- **Classroom**
  - Large classes
  - Lecture format
  - How do we shake it up?

*Note: OSCE (Objective Structured Clinical Examination) Clinical type scenario that requires student decision-making in a time & information constrained environment*
Observations of the nursing program at John Abbott College, where class sizes of 60 to 90 students is common, indicate that:

a. more importance is given to delivering content than ensuring concepts are well understood;

b. few students tend to participate in class discussions and pre-reading is frequently not completed;

c. some students do not pay attention, may be disruptive and appear to have little motivation to be in class except to ‘get the notes’; and

d. except for quizzes and tests, it is difficult to confirm whether students understand the taught material and concepts.

Recent studies indicate that it is possible to improve classroom interaction and minimize the impact of cultural and educational disparity by using technology in the classroom; specifically clickers. The studies to date have not been in the nursing area as most of the initial work has been conducted in the sciences; Mazur (1997) at Harvard was the pioneer in his use of clickers in freshman Physics lectures. Some recent literature from Vanderbilt (Rivers, 2006) and Purdue (Evans, 2005) is indicating success in the use of clickers in nursing. Similarly, at John Abbott College some classes in the Chemistry, Physics and Nursing departments have used clickers to encourage student engagement in the classroom.

Figure 3, below, illustrates some of the areas in educational theory where clicker interaction can have a role. The most obvious is the positive reinforcement of success that the student can achieve in the safety of the classroom in an anonymous environment. It opens up the opportunities to use Socratic Method of constant questioning and answering as well as collaborative learning through group study and peer instruction. There is also positive reinforcement by members within a team recognizing specialized knowledge contributed by the key members in the health care team. Not to be overlooked is the added benefit of overcoming self-esteem barriers that can occur in a diverse classroom. This is achieved by students responding to
questions through clicker transmitters that are logged by the instructor’s computer which is fitted with a receiver. Once all students have responded, the results can be immediately collated and displayed for instructors and students alike to review the results.

**Figure 3 - Educational Theory and Clicker Technology**

To achieve these benefits, clickers may be used in variety of ways that allow: immediate assessment of understanding; enable peer instruction and dialogue on difficult concepts by opening discussion because they are identified immediately in class; and encourage wider participation by allowing responses to be anonymous. As
a benefit, they are relatively inexpensive and easy to use with minimal IT investment and are widely available. Additionally, there is growing experience in a number of different disciplines that can provide templates on appropriate introduction of the clickers into the nursing classroom (Mazur, 1997; Evans, 2005; Rivers, 2006).

To illustrate how clickers might be used in the classroom a pilot session was conducted in a second semester nursing class at John Abbott College. The results were encouraging. As shown in the following figures that reflect results from a post-session questionnaire, the majority of the 2\textsuperscript{nd} semester students (49 respondents) in this demonstration class embraced the use of clickers in the classroom.

**Figures 4: Class responses on the use of clickers in the classroom**  
(Total Response population – 49)

- **Top left graph:** Lectures are more interesting
- **Top right graph:** Class is a more enjoyable experience
- **Bottom left graph:** Participation in class without embarrassment
- **Bottom right graph:** Clickers wastes class time
2. PROBLEM STATEMENT

Change in the classroom is not easy to achieve. Reforms in education are very difficult to successfully implement. Successful reforms require full support by the administration as well as support by those at the ground level, the teachers. Although IT in the classroom has been available for years, the use of it beyond some basic aspects (computer projection for PowerPoint) has had limited impact. In the past there has been problems getting appropriate hardware and software for classroom use, but through the use of a number of initiatives that is slowly being removed as an obstacle.

Introduction of clickers into the classroom needs to be supported by instructors and cannot take place in a random fashion in any department as it will lead to confusion and most likely another failed initiative. The key is both the ability and willingness of the instructors to incorporate clickers into their lectures, requiring a change in class planners, instructional material and classroom interaction. With these changes it is possible to assist in the creation of a more interactive classroom with greater opportunity for students to question material leading to the type of critical thinking necessary to better prepare nursing students for their profession.

This study will address the following four questions:

1. Which IT approaches do nursing teachers use in their teaching?

2. What methods do nursing faculty members at John Abbott College use to promote interactive learning in the classroom?

3. On completion of an introductory session on the use of clickers in the classroom, will nursing faculty members at John Abbott College be receptive to learning more about the subject and indicate a willingness to use clickers in the classroom to promote interactive learning?

4. What is the experience of teachers who have successfully introduced clickers in their classroom?
CHAPTER ONE
REVIEW OF THE LITERATURE

The literature available on the integration of information technology into teaching has become more prevalent in the past few years. A review of the literature related to IT shows a preponderance of research focused on using technology in support of distance / online education. However, more attention is being shifted to assisting educators in the classroom with information technology methods. There are a number of themes apparent in the literature that have an impact on successful integration of clickers into a classroom and have been examined from a number of perspectives. These include:

The Advantages of using clickers;
Disadvantages of using clickers;
Successful implementation of clickers into the classroom; and
Challenges of integrating clicker technology into the classroom.

1.1. ADVANTAGES OF USING CLICKERS IN THE CLASSROOM

Researchers in many fields wish to be involved as change agents. The integration of leading edge communication and application technology into the classroom, which also fosters better teaching and learning, is attractive to many educators. This research and many of the news items posted in the press emphasize the advantages of IT in the classroom.

Hafner (2004) and Horowitz (2003) both emphasize that student motivation is improved when employing clickers in the classroom. This has been studied through observations of student attentiveness / responsiveness in a lectured, facilitated and clicker/interactive classroom.; resulting in more active engagement in the classroom. Horowitz (1988) shows that clickers can be used as a means to introduce Socratic
teaching and D’Inverno, Davis & White (2003) and Beekes (2006) indicate that clickers can be used to break-up extended classroom periods into manageable mini-lectures. Woods & Chiu (2003) relate how students get enthused in class because it is similar to the game show “Who Wants to be a Millionaire!”

As part of their rationale for introducing clickers into the nursing classroom at Purdue, Moredich & Moore (2007) stated that classroom quizzes induce students to be better prepared for class. Participants in a lecture delivered by Latessa & Mouw (2005) reported that they were more attentive, learned more and enjoyed the learning when they were able to use clickers. Judson & Sawada (2002) show that classes that rely on frequent use of clickers enjoyed higher attendance than those classes that did not use them or only used them on an infrequent basis.

Since students are expected to respond in an anonymous manner, Montgomery (2004) indicates that students enjoy classes more and remain more alert when clickers are used. Slain, Abate, Hodges, Stamatakis and Wolak (2004) showed that not only do pharmaceutical students have improved results in exams when compared to peers that do not use the clickers they also feel that they had a better understanding of the class content and were more active than in the traditional classroom. Uhari, Renko & Soini (2003) reported similar, positive results for students being taught pediatrics.

The improved interaction in the classroom has a beneficial impact by stimulating learning as Mazur (1997) has noted during his ten years of experience in using clickers and encouraging peer instruction. In the nursing environment, Moredich & Moore (2007) note that clickers “...can invite critical thinking and sharing of clinical experiences” by reviewing the answers to questions and if a significant number of students “...have selected an alternative answer, the instructor can assign small groups to discuss it” (p.114). Horowitz (1988, 2003) shows that short term retention and classroom attentiveness are both positively influenced by the
way the teacher facilitates the class (such as employing clickers) versus the traditional lecture style. The focused learning provided by clickers in a large classroom appears to have a lasting impact on students similar to that achieved by smaller interactive classes (Schackow, Chavez, Loya, & Friedman, 2004). Wood (2004) indicated that the use of techniques such as clickers can allow classroom interaction at large research universities (large classes) similar to that found at primarily undergraduate institutions (smaller classes). Judson & Sawada (2002) conclude that peer instruction using clickers gives the largest measurable benefit because “...it is more beneficial for a student, who has just arrived at a new conceptual understanding, to explain to peers how he/she struggled and his/her new rationale” (p.178).

The technology of clickers also allows students and teachers to get immediate feedback which is one of the principles of active learning (Moredich & Moore, 2007). D’Inverno et al. (2003) explained that one can immediately see that up to 40% of the class answer class problems wrong; thus clickers can be an aid to an instructor in changing teaching approaches. Beekes (2006) and Moredich & Moore (2007) expand on this theme saying that discussion / debate can be used when a significant portion of the students get a question wrong to help clear up misinformation or misconceptions immediately. Montgomery (2004) notes that students gain more confidence in the material because they get the immediate feedback by having ‘gotten’ an answer correct. Russell (2003) reinforces the student understanding aspect when using clickers by referring to a student account noting there was similarity of questions between those in class and those on the exam. The student indicated that being able to answer questions in class anonymously in a real time class environment helped with his confidence in his abilities. In other classroom environments the student would not have attempted questions, thus losing the educational opportunity.

Faculty and students in Montreal need to be aware of cultural diversity and the impact in the classroom; however, campuses everywhere have students who may come from cultures or circumstances which do not encourage participation (Beekes,
2006) or whose first language is not the language of instruction and worry about ridicule during class participation (Moredich & Moore, 2007). This is especially important in the nursing programs where many non-traditional Canadian cultures are represented in the classroom; further reinforcing the benefits of being able to answer questions in class anonymously. As an aside, in a “typical” intake of 88 nursing students at John Abbott College at least 30% had a mother tongue that was not English and there is even more cultural variation due to many being first or second generation Canadians.

The learning that is encouraged by the use of clickers promotes self-assessment and improved decision making skills (deeper learning) (Horowitz, 1988; D’Inverno et al., 2003) including the critical thinking skills required in nursing (Moredich & Moore, 2007). One way this is achieved is using the clickers to open discussion on issues that are not clearly right or wrong and then using the feedback obtained from the class to open a dialogue on the value of different positions (especially useful in ethical issues).

To use a nursing example, the class could be asked an ethical question that has no clear textbook response, such as, an elderly patient is in severe pain and is becoming increasingly agitated. Staying in a hospice unit she requests “something for the pain.” A review of orders shows that she can be given a narcotic, but in her overall condition it may cause complications that may eventually lead to her death. The following options are presented to the students:

a. Give the maximum dose to reduce the pain quickly;
b. Give an interim (breakthrough) dose and monitor the effects even though she may suffer for a few more hours;
c. Give an alternative medication that is not a narcotic and is less effective; or
d. Give her nothing and call the doctor to make the decision.
There is no straight forward answer and this can evoke productive peer and facilitator discussion on the relative merits of each choice based on the student answers. This can lead to an increase in creativity if an unconventional environment is used (ChanLin, Hong, Horng, Chang & Chu, 2006); and the ability to identify and solve problems (Holland & Lide, 2006).

The possible advantages of using clickers follow the concepts outlined in Holland and Lide’s (2006) four integrated attributes required to optimize learning in that they are:

- Learner centered – classrooms centered on knowledge, skills and attitudes of learner, teacher more a coach to guide students in activities and thinking – interactive engagement (Hake, 1998)
- Knowledge centered – learning must be centered on critical thinking skills in order to achieve higher level of learning not just factual memory eg. Eric Mazur, 1997; uses clickers for peer instruction (think, pair, share) individual thought then group discussion
- Assessment centered – prompt feedback
- Community centered – learning facilitated through student discussion and problem solving, foster increase in critical thinking.

1.2. DISADVANTAGES ASSOCIATED WITH THE USE OF CLICKERS

There are a number of individually marketed systems available that introduce clicker technology (Personal Response System [PRS], Classroom Response System [CRS], Classroom Performance System [CPS], Classroom Communication System [CCS], Electronic Response System [ERS], Audience Response System [ARS] (Moredich & Moore, 2007)). There is a tendency for researchers who deal with these systems to readily incorporate technology into the classroom, thus the majority of
literature relating to the topic will remain positive. However, a number of papers do include issues where clickers may detract from the educational experience.

Technology introduction to the classroom is not a magic pill that will immediately improve things unless it is used to augment imaginative instructors. As cited by Alphonso (2005) in her article:

Many professors are increasingly looking to technology to supplement what they're already doing in the classroom. 'I don't for a second think it's a panacea. You can't say technology is a single answer to changing what the student is going to think about quality of teaching. You can teach very badly with technology. It's not a solution. It may be part of the solution some of the time.'

Beekes (2006) and Alphonso (2005) identify that costs are not insignificant for the students ($30 – 50 / year). In addition, there are the costs associated with the software and infrastructure required in the classroom, teaching and information technology support personnel. Evans (2005) highlighted an additional concern that when the clicker system selected corresponds with a particular textbook publisher, unless there is very good coordination students may be left with needing multiple clickers (and paying multiple fees). Lightstone (2006) further details the dangers of the textbook publisher option, by indicating that it can affect the secondhand textbook market thus further disadvantaging students because new fees are required to be directed back to the publishers to register the clickers so that they may be used by follow-on students.

Beekes (2006) also points out that there is a time penalty to set up the system and the loss of time associated with technology failure. For this reason, Becker (2000) makes the point that a class has to have a certain minimum length of time to make use of the technology worthwhile. It is easier to employ clickers usefully over a three-hour period than trying to get information passed in multiple one-hour sessions. It also makes it easier to recover lost time if there are delays due to
equipment problems. Burnstein and Lederman (2001) reported that on implementation of clickers into the classroom, three 50-minute sessions were replaced by two 75-minute sessions because of the inability to build cohesive classes in the shorter timeframe.

Horowitz (1988) also identified that unless class sessions were designed with care, the questions and response selections were clear and well defined and the instructor was fully conversant in the system’s use, then the dramatic improvement expected by employing the technology would not be realized.

1.3. SUCCESSFUL IMPLEMENTATION OF CLICKERS INTO THE CLASSROOM

Boswell (2006) introduces a number of guidelines on how to use questions effectively in the classroom and not to “overdo a good thing.” Robertson (2000) reinforces this view; well designed questions and an anticipated understanding expected answers while using clickers in the classroom is essential to ensure the maximum benefit for learners is achieved. Becker (1994) noted that exemplary computer-using teachers find ways to use the technology to evoke deeper learning which includes careful use of questions and interactive discussion during class. But this must be more than a single teacher initiative. Judson & Sawada (2002) report in their Meta study on clickers that frequent users of the system are more inclined to be positive about the system than infrequent users.

Beatty (2004) points out that the most effective use of clickers is by building a solid understanding of core concepts, as opposed to touching everything, allowing students to fill in the details with pre- and post-classroom readings. He further states that the class time must be rooted firmly in pedagogical objectives to ensure that deeper understanding of issues occurs and not just a checklist of right and wrong
answers to questions. In a similar manner, Burnstein and Lederman (2001) lay out how they would approach a class and a variation on the Likert Scale that might engage students more than the traditional use. They emphasize that preparation by students and instructors is vital for the system to work successfully and seamlessly. Lightstone (2006) cautions that some content that normally was covered quite quickly in introductory courses now takes longer because clicker responses indicate that up to 30% of students get questions from the material wrong. Thus, sufficient time must be set aside to cover these unexpected issues. Again, the overall approach is to ensure understanding of key concepts and not present a list of facts to the students.

In most of the research, the key aspect becomes the types of questions to ask and the expected behavior of the class and instructor after the answers have been received. The more complex clickers today have a myriad of possibilities, but the idea is not to confuse but improve communication.

Moredich and Moore (2007) indicate that it is beneficial to commence slowly with clickers to allow both students and teachers to understand its strengths and weaknesses. Technical support can be sought through the vendors to ensure all aspects of the system are understood prior to full scale implementation. They even make the point that technical support from the institution should attend the first class to help with demonstrations and answer questions directly with students and staff.

1.4. CHALLENGES TO INTEGRATING CLICKERS INTO THE CLASSROOM

ChanLin et al. (2006) indicate that there are four major factors that influence the integration of technology into creative teaching strategies: environmental; personal; social; and curricular. This section will review the challenges related to introducing technology, specifically clickers, into the classroom based on the proposed four factors.
Environmental aspects relate to all of the issues related to the technology support required for the program including resources, training and policy related to information technology. Abate (2001) indicates that advances have been made in technology tools over the past 20 years but, there has been very little coordination among teacher educators, classroom practitioners and application developers. Thus, the teachers are left with the task of adapting the learning environment to the requirements of the IT tools. Kirschner & Selinger (2003) support this by stating that the Information and Communication Technology initiatives are more reactive than active thus leading to general confusion.

Personal factors relate to all issues related to the instructor including her/his comfort level with technology and the personal support mechanisms from friends and family. Beatty (2004) reinforces this view stating that instructors need to find new roles in the classroom by acting as a mentor or facilitator as opposed to one who dispenses knowledge. For many this loss of control is frightening (Beatty, 2004; Huxham, 2005). Many instructors only have rudimentary skills with computers and use them in the safety of their own office. Using more complex software applications in front of a critical audience, who often have more IT skills than the instructor, may lead to unwillingness to use the available tools (Becker, 2000).

Previously, Becker (1994) indicated that successful integrators of technology into the classroom tended to be individuals who had a personal interest in computing, had a wide variety of educational experiences and were disproportionately male. Zhao, Pugh, Sheldon & Byers (2002) concluded that the educators that had the greatest success in introducing innovative technology into the classroom: were naturally innovative; had a high level of technological proficiency; could integrate technology with their pedagogical beliefs; and could navigate the social dynamics required to introduce change.
Wolski and Jackson (1999) prepared a model that shows that technology acceptance is based on a combination of perceived usefulness and perceived ease of use. Finley & Hartman (2004) reviewed faculty resistance to technology integration. Faculty will be receptive to technology integration if it is consistent with how they teach, they have the appropriate training and skills to use it, they are supported and adequately recognized for using it and it shows benefits in the classroom.

Social factors relate to peer, authority, student and community support for the use of information technology in the classroom. Becker (1994) reinforces the view of the support mechanisms required to ensure success with technology in the classroom. Although finding that an elite environment is not required to have exemplary computer-using teachers, he did find “they taught in schools and districts where resources had been used to nurture and support the kind of teaching practice we classified as exemplary” (p.289).

Cuban (1999) further expands on this concept. In a survey of teachers who were asked about their use of technology in the classroom, they found that the primary use was for word processing and low end applications. He further indicates that many are technologically competent but there are disincentives such as lack of firm direction on how to use the technology, poor working conditions, outside demands, equipment or application unreliability and lack of support by administration.

Curricular factors include the balance of including technology with the demands of the program as well as integrating it across the various teaching strategies necessary to deliver with government guidelines. Becker (2000) acknowledges the difficulty that teachers may have in adopting another tool into their class planners when the government controlled curriculum already seems to have too much content to pass on in the limited number of session with students. Cortright, Collins & DiCarlo (2005) also indicate there are fears that content will not be covered in class if
there is more focus on active learning activities and it takes too long to prepare. Although they dismiss these concerns, it remains a challenge to motivate instructors to adopt new approaches that conflict with how they have been trained or how they were taught.

Huxham (2005) also discusses the reduction in content and makes further reference to additional teaching time lost and the potential for reduction in accuracy when students derive answers. Knight & Wood (2005) explain the actual challenges encountered when moving from a lecture based course to active participation with its inherent reduction in content. Kirschner & Selinger (2003) relate that IT use in curriculum development, teacher education and pedagogy have been considered as separate issues leading to fragmentation. Similar concerns are voiced by Abate (2001) and Tearle (2003). McCarney (2004) joins in making a request that more emphasis be placed on pedagogy and IT.

In summary, clickers can be used in larger classrooms to encourage dialogue and explore important concepts to deeper levels than by the use of lecture alone. However, clickers must be used judiciously in a measured manner in a well-structured class where the format and content will need to be revised by the instructor. Given the low level of technology introduction into the classroom, predictors such as the Theory of Reasoned Action and Technology Acceptance Model (Wolski & Jackson, 1999) have been used to indicate if success might be likely. They propose that when a new technology is offered that the perception of its usefulness and its perceived ease of use will dictate an adopter’s attitude towards the system and whether it will actually be used. Sahin and Thompson (2007) have taken a step further by using questionnaires to assess key factors as to whether staff will adopt technology. Their findings indicated that key indicators to successful adoption of IT are: use of IT tools as informational sources; high degree of collegial interaction; and use of data analysis tools.
Experience at John Abbott College has shown that receptiveness to IT initiatives is not uniform across the nursing faculty. The nursing program is unique in John Abbott College curricula due to its split between clinical experience and classroom lecture. The majority of instructors in the program spend their time in clinical and only a few have classroom responsibilities, where classroom teaching is done as a team. There is some resistance by instructors to IT use, in general. For example few use the online course management system thus reducing its overall effectiveness. Similarly, not all instructors regularly use e-mail which hinders communications because of the lack of co-location at the college. That attitude of faculty members is a primary hurdle for the introduction of new technology is highlighted by Burnstein and Lederman (2001) who state “the principal barrier to further use and evaluation of …” clickers ”... is simply inertia on the part of the faculty” (p.11).

The real issue may be the availability of time or “head room” for teachers to take on another responsibility with little or no real support from peers, administration or government. Research has shown that teachers “...will experiment with technology integration if they feel it is consistent with their teaching style, if they feel they are knowledgeable and competently skilled, if they are supported and rewarded for doing so, and if they can see how it is pedagogically useful” (Finley & Hartman, 2004. p.328-329). It remains the job of innovative leaders to build consensus among their peers, administration and students to move forward and take on the new educational challenges.

What underlies this concept is how to effectively use the time available for classroom preparation. Personal experience indicates that significant non-classroom available time is used in faculty meetings (from 25-30%) during a semester where very little of the time is used in either determining classroom strategy or developing content. There appears to be increased pressure to spend hours “doing” as opposed to “thinking” or “planning” which ultimately reduces the ability of organization to make
changes. Becker (1994), Cradler, Freeman, Cradler & McNabb (2002), and Finley &
Hartman (2004) indicate that investment is required in training, infrastructure and
planning in order to successfully incorporate change; curriculum or course content
changes must be regarded in this manner.
CHAPTER TWO
METHODOLOGY

2.1. INTRODUCTION

The study addresses four questions related to the introduction of clickers into the John Abbott College nursing faculty classrooms:

1. Which IT approaches do nursing teachers use in their teaching?
2. What methods do nursing faculty members at John Abbott College use to promote interactive learning in the classroom?
3. On completion of an introductory session on the use of clickers in the classroom, will nursing faculty members at John Abbott College be receptive to learning more about the subject and indicate a willingness to use clickers in the classroom to promote interactive learning?
4. What is the experience of teachers who have successfully introduced clickers in their classroom?

The key elements of the study will be a questionnaire delivered to the faculty members following a voluntary introductory session that includes a participative demonstration of how clickers may be used in the classroom. Data collected in the study will be anonymous.

The data required to address the research questions was obtained from the following sources:
Research Question 1: Questionnaire Part A – Questions 1, 2, 3, 4, 5
Research Question 2: Questionnaire Part A – Questions 6, 7, 8, 9
The concept of interactive learning has been operationalized in the questionnaire by requesting feedback from the study participants, using a Likert scale, with Part 1, questions 6 through 8 as well as an open-ended
question 9, on the issue of interactive learning and the response to this question will be content analyzed with the use of a coding system.

Research Question 3: Questionnaire Part B – Questions 1, 2, 3, 4 as well as attendance and participation at the introductory session

Research Question 4: Questionnaire for Clicker Practitioners

The target population in this study may be viewed as the nursing faculty members at CEGEPs across Quebec. The sample is a purposive sample and is comprised of the nursing faculty at John Abbott College who were invited to attend a presentation and complete a questionnaire. All members of the John Abbott College nursing faculty were invited to attend the presentation; however, the attendance and the completion of the survey is on a voluntary basis and anonymous. As this survey was intended to understand attitudes towards employing a technology in the classroom, non-attendees were also surveyed for their input on interactive learning and on their attitudes towards the use of technological tools. The information gathered in this study was then used to assess faculty readiness at John Abbott College to employ clickers. The results may provide evidence to support research of this nature in other college nursing programs in Quebec as well as being placed in the general body of knowledge for employing IT and / or clickers into academic programs.

In-depth interviews were also conducted with two instructors, in support of Research Question 4, who have already used clickers in the classroom. Their experience and expertise provided useful information on understanding the success to date of introduction of clickers into the classroom. They were also interviewed to determine if similar concerns and / or advantages were raised in their departments as in the Nursing Department at John Abbott College.
2.2. INSTRUMENTS

There are two primary instruments for this study:

1. A questionnaire in two parts administered to the subjects of the study, nursing faculty members at John Abbott College.

2. Two in-depth interviews conducted by the researcher of experienced practitioners who have used clickers in the classroom.

The questionnaire administered to the nursing faculty members consisted of two parts: the first related to the use of interactive learning by the subjects in their classroom teaching; and the second concerned their views on the clickers after participation in the introductory session.

2.2.1. Instrument – Interactive Learning (Appendix A)

The Instrument for Interactive Learning includes questions of the questionnaire presented during the introductory session on clickers. In part A, questions 1 & 2 are used to assess the familiarity of and use by participants of Information Technology. Questions 3 & 4 are used to inquire on the participants’ attitude towards technology in a teaching and learning environment. Responses to question 5 can indicate the willingness of participants to experiment into areas in front of a group where they might not have complete knowledge. Questions 6, 7 and 8 of Part 1 are discussed in the next section.

Faculty members’ attitudes and understanding of what constitutes interactive learning will be measured by questionnaire administered at the conclusion of the introductory session.
2.2.2. Instrument – Willingness to use Clickers (Appendix A)

Part 2 of the questionnaire is used to focus on the receptiveness and understanding of the participants on clicker use in the classroom after being introduced to the technology. As discussed in the literature review, widespread use of the technology in the classroom improves its effectiveness and thus this questionnaire will indicate whether there is a positive or negative reception to clickers within the faculty.

The interview portion of the study provided a qualitative perspective from instructors who already have had experience in the classroom with clickers. The two interviews were carried out in order to gain a deeper insight into and potential validation of the variables being assessed in the questionnaire from the introductory session.

2.2.3. Instrument – Interviews with Clicker Practitioners (Appendix B)

The instrument for use during the interview with Clicker Practitioners is a questionnaire that attempts to draw on the instructor’s personal experiences with the use of clickers and whether the information learned in the literature review lines up with actual practice. It is also used to gain insight on the interpretation of the results obtained in the Instruments applied to the members of the nursing faculty by validating assessments of advantages and disadvantages proposed by faculty members against the ones identified by clicker practitioners. On a more practical sense, the answers may also assist in the development of courses using clickers if the nursing department decides it is an appropriate strategy to adopt.
2.3. PROCEDURE

2.3.1. Procedure – Data collection from John Abbott College nursing faculty members

Figure 5: Procedure to collect data from John Abbott College nursing faculty members
A few months in advance of a regularly scheduled faculty meeting it was announced that an introductory session on the use of clickers in the classroom was to be held. The subjects, the Nursing Faculty of John Abbott College, were informed that the presentation would consist of an overview of clickers, their benefits of use in the classroom and then conclude with instructors gaining personal experience using clickers in the classroom with a demonstration. The session was held on a Monday morning in October immediately following a regularly scheduled faculty meeting.

Attendance was voluntary and the session was scheduled at the end of a faculty meeting. For faculty members that attended the introductory session on clicker use in the classroom there was an attendance record and a post- introductory session questionnaire (open and close – ended questions). The session was conducted in a classroom setting to give the nursing faculty the “feel” of being students, at the same time as introducing a new technology and teaching method. The scenario used in the “teaching” session was chosen to be non-threatening so that professional integrity would not be threatened by the scenario. In this case, ‘World Geography’ was the topic used.

Any instructors that were unable to attend the session were approached to gain their input on interactive learning and the use of clickers in the classroom. Again, participation by completing the questionnaire was voluntary.

Distribution and collection of the questionnaires was through a third party to ensure anonymity. In addition, the results from the questionnaires were collated by a third party so that the researcher did not visually sight the questionnaires to further protect anonymity.
2.3.2. Procedure – Interview with Clicker Practitioners

Two clicker practitioners, known to the researcher, were interviewed using a prepared set of questions to assess their views on employing clickers in the classroom. As the recommendation at the end of the project is to state whether the John Abbott College nursing faculty is ready to implement clickers into the classroom, actual teaching experience with clickers will assist in making the final recommendation.

2.4. DATA ANALYSIS

2.4.1. Data Analysis – Interactive Learning

One of the goals of this study was to gain an understanding of how participants use innovation in large classrooms to gain the type of feedback and interaction that is expected from the use of clickers. As stated earlier, classroom interaction has positive results on deeper learning and ensuring that concepts are understood by students. Key factors in interactive learning are student feedback, student motivation and student participation. Feedback enables instructors to gauge student progress through regular assessment of understanding. Real time feedback is a means to gain an appreciation of students’ grasp of concepts and allows for changes in teaching to focus on critical learning deficiencies.

A monologue is not the most effective teaching method as it can be supplied by a textbook or well documented course notes. Dialogue infers two behaviours, motivation and participation. These seem to diminish as class sizes increase. Similar to the concept of democratic parliament, motivation can be gauged by the number of members who try to participate in the events while participation can be measured by the number who actually has an input.
The purpose of these questions is to determine if interaction is sought by instructors through question/answer sessions, the willingness of students to become engaged in this selective dialogue and finally whether the instructor uses non-traditional means to include more than the "usual" respondents into actively participating in the class. The answers to these questions will be examined in conjunction with the points made on interactive learning during the introductory session and tabulating responses with clickers during the session. These can be used to form a quantitative and qualitative view of attitudes towards and understanding of interactive learning based on the nursing faculty participation.

The analysis on interactive learning was based on:

1. The participation levels of faculty members during the introductory session both by discussion, use of clickers during the session and responses to the introductory session questionnaire.

2. The inclusion of faculty members that did not attend by administering the same survey as that administered at the introductory session to gain an understanding of their interactive teaching methods and attitude towards IT.

For this study, the focus was on familiarity with technology (through current use); attitude toward technology and change; and current innovation in the classroom. This is described more fully below in line with the research questions.
2.4.2. Data Analysis – Willingness to Use Clickers

Figure 6: Potential Impacts on Using Technology in the Classroom

A number of authors state that there are indicators as to whether teachers are ready to accept technology and change. Tearle (2003), as shown in figure 6, indicates that resources, knowledge, attitude and skills impact the use of technology in the classroom. Wolski & Jackson (1999) focus on attitude as a key contributor to technical innovation (figure 7).
Myhre, Popejoy & Carney (2006) also focus on attitude, but indicate an added dimension of a teacher's level of professional development. This level is independent of number of years of service or any specific initiative “... but rather to how the teacher viewed him or herself as a professional and the honesty with which they were able to examine their own practice” (p.1004).

In practical terms, receptiveness is a difficult measure as qualitative questionnaires may indicate positive results that may not be reflected in actual practice. As discussed in the literature review, Finley & Hartman (2004) reviewed faculty resistance to technology integration. They refer to a questionnaire that uses both Likert rankings and qualitative assessment. Wolski and Jackson (1999) prepared a model that shows that technology acceptance is based on a combination of perceived usefulness and perceived ease of use which they evaluated by an included questionnaire that could be altered and applied in this case. However, indicators will be classroom participation as well as faculty understanding and use of interactive learning.
The analysis on attitudes towards clickers will be based on:

1. The number of faculty that attend the clickers' introductory session. The session was conducted on the same day as a faculty meeting, with voluntary form part of the agenda of regular faculty meeting to encourage attendance. This was previously agreed and sanctioned with the Department Head.

2. The participation levels of faculty members during the introductory session both by discussion, use of clickers during the session and responses on an introductory session questionnaire.

3. The inclusion of faculty members that did not attend by administering the same survey as that administered at the introductory session to gain an understanding of their interactive teaching methods and attitude towards IT.

2.5 ETHICAL ISSUES

The following measures were taken to ensure individual confidentiality. Questionnaires were distributed on completion of the introductory session by someone independent of the study. The independent person also collected the completed questionnaires. The researcher did not have any direct contact with participants while they completed the questionnaires. As the researcher is familiar with the participants, the data collected was transcribed prior to being submitted to the researcher so questionnaire information was not accidentally subscribed to an individual through interpretation of handwriting.

As the participants: were informed ahead of time about what the research entailed; had the option by attendance whether they wished to participate or not; and had their anonymity assured, there was no requirement for individual consent. This has been agreed by the Innovation Research and Development Board at John Abbott College.

A similar process was taken with those that did not attend the session, but because they had only a single sheet questionnaire, unique coding was not required.
CHAPTER THREE
PRESENTATION OF RESULTS

3.1. CATEGORIZATION OF RESULTS

As stated in the methodology there were a number of different data sets to be collected that were handled in different ways:

1. Two interviews were conducted of knowledgeable users of "clicker" technology based on a scripted questionnaire. These were transcribed and formed a practical qualitative data set;

2. Participation in attending the presentation and participation during the presentation were quantitative indicators of interest and interaction;

3. Questionnaires had responses measured on the Likert Scale. There were some open ended questions where the responses were coded.

3.1.1 Interviews with Instructors who have used clickers in the classroom

Interviews with two instructors who had used clickers in the classroom were conducted in August and September 2007. The interviewees were both instructors in the Science Department at John Abbott College. Appendix C has the transcription of the interviews. One instructor had used them approximately 40 times in the classroom and the other on four occasions. One department had formally adopted the clickers whereas the other had not and thus was used on a trial basis only.

Each instructor used the clickers in their teaching practices for different purposes. Both used clicker technology to assess learning after teaching for a set period of time (approximately 15 minutes) but one used it as a tool to encourage interaction among classroom peers whereas the other used multiple choice to assess
comprehension and moved on from there. Both stressed that it was an additional tool as flash cards could do the job well enough but the key aspect was the ability to collate and feedback the data very quickly and anonymously which helped with participation. That was considered the major advantage of using the clickers.

The disadvantages were related to the logistics. There was little or no technical support and the technology used was an older wired technology that was laborious to set up and had a number of issues. There was also an interesting insight that an instructor should teach the course syllabus once to understand the issues with teaching it before trying to break it up into chunks that could be used with clicker interaction.

3.1.2 Presentation Participation

The presentation took place on 15 October 2007. Generally, faculty included the full time instructors as well as the heads of the intensive and regular nursing program. Based on these criteria 18 of a possible 29 attended (62%) the presentation and three that could not attend completed the first part of the post-presentation survey (72% total participation). In addition, all 18 of the faculty who attended the presentation were active participants; they participated in the qualitative discussions and they used the clickers as individuals during the “classroom portion” of the presentation.

3.1.3. Questionnaire Results

As stated earlier, the effective group in the nursing faculty for purposes of attendance at the presentation was considered to be 29. Eighteen attended the presentation completing parts A and B of the questionnaire with an additional three who were unable to attend the presentation completing and submitting part A.
Frequency response data on the sample of 21 part A questionnaires completed indicates that instructors have: a high level of use of information technology (95%) and frequently use questions as an interaction mechanism in the classroom (85%); a reasonably high level of use of the internet (75%) and believe that IT is good for student education (80%); and a moderate comfort level with IT (55%). There was a general indication that all teachers found that it was the same relatively small sample of students who participated during classroom dialogue.

Table 1: Questions related to use of IT

<table>
<thead>
<tr>
<th>I communicate or would like to communicate with my students and/or colleagues by email or using Blackboard.</th>
<th>I conduct searches on the internet for teaching and clinical material.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Very Frequently</td>
<td>12</td>
</tr>
<tr>
<td>Frequently</td>
<td>8</td>
</tr>
<tr>
<td>Occasionally</td>
<td>0</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2: Questions on attitude towards IT

<table>
<thead>
<tr>
<th>I think that working with IT would help me instruct my students.</th>
<th>I would be willing to use IT more often if I had adequate support and training.</th>
<th>If I were to use new information technology in the classroom this fact would make me anxious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>7</td>
<td>33.3</td>
</tr>
<tr>
<td>Agree</td>
<td>10</td>
<td>47.6</td>
</tr>
<tr>
<td>Undecided</td>
<td>3</td>
<td>14.3</td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>4.8</td>
</tr>
</tbody>
</table>
Table 3: Questions on student participation

<table>
<thead>
<tr>
<th>During a classroom session I ask questions that require student responses.</th>
<th>What percentages (%) of students typically volunteer answers?</th>
<th>When I ask a question during a classroom session typically it is the same students that raise their hands.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>Very frequently</td>
<td>15</td>
<td>71.4</td>
</tr>
<tr>
<td>Frequently</td>
<td>3</td>
<td>14.3</td>
</tr>
<tr>
<td>Occasionally</td>
<td>2</td>
<td>14.3</td>
</tr>
<tr>
<td>Rarely</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The quantitative data were also reviewed using SPSS tools and analyzed with Spearman’s rho to establish whether there were any interactions based on answers to the questions. The coefficients for Spearman’s rho tests show moderately strong associations between various responses. Positive associations were seen between the following questions / responses:

1. Who use IT (Blackboard and email) and those who believe it helps students learn (Spearman rho = 0.575);

2. Who believe IT helps students learn and would use more if technical support was available (Spearman rho = 0.567);

3. Who use questions with students and those who would use IT more if technical support was available (Spearman rho = 0.480); and

4. Who use questions with students and those who found the presentation interesting (Spearman rho = 0.655).

The results show a weaker relationship between those who found the presentation useful and those who are nervous with technically capable students (Spearman rho = -0.400) and a strong inverse association between those who found that the number of
students who volunteer and those that found that the same students always answer the questions (Spearman rho = -0.554). An interesting observation was noted with the Spearman rho showing a moderate relationship between those who communicate with IT and those that would use it more if there were more training (0.438). All the associations were statistically significant.
Table 4: Quantitative Results – Spearman’s rho

<table>
<thead>
<tr>
<th>Spearman's rho</th>
<th>Communicate with email or BB</th>
<th>Search on internet for material</th>
<th>Working with IT helps instruct students</th>
<th>Use IT if more support and training</th>
<th>Students with more IT knowledge make me anxious</th>
<th>Questions that require student response</th>
<th>Percentage of students who volunteer</th>
<th>Some students who volunteer to answer questions</th>
<th>Presentation was useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate with email or BB</td>
<td>Correlation Coefficient: 1.000</td>
<td>0.189</td>
<td>0.575**</td>
<td>0.438*</td>
<td>-0.272</td>
<td>0.031</td>
<td>0.009</td>
<td>0.268</td>
<td>-0.046</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.413</td>
<td>0.006</td>
<td>0.047</td>
<td>0.234</td>
<td>0.894</td>
<td>0.969</td>
<td>0.240</td>
<td>0.843</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Searches on internet for material</td>
<td>Correlation Coefficient: 0.189</td>
<td>1.000</td>
<td>0.361</td>
<td>0.189</td>
<td>-0.102</td>
<td>0.164</td>
<td>-0.323</td>
<td>0.429</td>
<td>0.088</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.413</td>
<td>0.108</td>
<td>0.412</td>
<td>0.660</td>
<td>0.477</td>
<td>0.153</td>
<td>0.052</td>
<td>0.705</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Working with IT helps instruct students</td>
<td>Correlation Coefficient: 0.575**</td>
<td>0.361</td>
<td>1.000</td>
<td>0.567**</td>
<td>-0.135</td>
<td>0.305</td>
<td>-0.153</td>
<td>0.124</td>
<td>0.144</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.006</td>
<td>0.108</td>
<td>0.007</td>
<td>0.558</td>
<td>0.179</td>
<td>0.507</td>
<td>0.591</td>
<td>0.534</td>
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<td>N</td>
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</tr>
<tr>
<td>Use IT more if support and training</td>
<td>Correlation Coefficient: 0.438*</td>
<td>0.189</td>
<td>0.567**</td>
<td>1.000</td>
<td>-0.112</td>
<td>0.480*</td>
<td>-0.330</td>
<td>0.130</td>
<td>0.219</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.047</td>
<td>0.007</td>
<td>0.002</td>
<td>0.628</td>
<td>0.028</td>
<td>0.144</td>
<td>0.573</td>
<td>0.340</td>
<td></td>
</tr>
<tr>
<td>N</td>
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</tr>
<tr>
<td>Students with more IT knowledge make me anxious</td>
<td>Correlation Coefficient: -0.272</td>
<td>-0.102</td>
<td>-0.135</td>
<td>-0.112</td>
<td>1.000</td>
<td>-0.325</td>
<td>-0.017</td>
<td>-0.141</td>
<td>-0.460*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.243</td>
<td>0.660</td>
<td>0.558</td>
<td>0.628</td>
<td>0.151</td>
<td>0.941</td>
<td>0.541</td>
<td>0.036</td>
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<td></td>
</tr>
<tr>
<td>Questions that require student response</td>
<td>Correlation Coefficient: 0.031</td>
<td>0.164</td>
<td>0.305</td>
<td>0.480*</td>
<td>-0.325</td>
<td>1.000</td>
<td>0.178</td>
<td>-0.270</td>
<td>0.665**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.894</td>
<td>0.477</td>
<td>0.179</td>
<td>0.028</td>
<td>0.151</td>
<td>0.439</td>
<td>0.236</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>21</td>
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<td>21</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Percentage of students who volunteer</td>
<td>Correlation Coefficient: 0.009</td>
<td>-0.323</td>
<td>-0.153</td>
<td>-0.330</td>
<td>-0.017</td>
<td>0.178</td>
<td>1.000</td>
<td>-0.554**</td>
<td>0.189</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.969</td>
<td>0.153</td>
<td>0.507</td>
<td>0.144</td>
<td>0.941</td>
<td>0.439</td>
<td>0.009</td>
<td>0.412</td>
<td></td>
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<tr>
<td>N</td>
<td>21</td>
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<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Same students who volunteer to answer questions</td>
<td>Correlation Coefficient: 0.268</td>
<td>0.429</td>
<td>0.124</td>
<td>0.130</td>
<td>-0.141</td>
<td>-0.270</td>
<td>-0.554**</td>
<td>0.100</td>
<td>-0.090</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.240</td>
<td>0.052</td>
<td>0.591</td>
<td>0.573</td>
<td>0.541</td>
<td>0.236</td>
<td>0.009</td>
<td>0.697</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>21</td>
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<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Presentation was useful</td>
<td>Correlation Coefficient: -0.046</td>
<td>0.088</td>
<td>0.144</td>
<td>0.219</td>
<td>-0.460*</td>
<td>0.665**</td>
<td>0.189</td>
<td>-0.090</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.843</td>
<td>0.705</td>
<td>0.534</td>
<td>0.340</td>
<td>0.036</td>
<td>0.001</td>
<td>0.412</td>
<td>0.697</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the .01 level (2-tailed).  * Correlation is significant at the .05 level (2-tailed).
Content analysis was performed on the qualitative results. These were coded to look for any similarity in responses. On completion of the coding, any coded response that represented more than 10% of the answers recorded (given that there were multiple answers from individual respondents) was identified separately with the remainder grouped as others. The actual comments were examined in greater detail.

The questionnaire had five qualitative questions, one in Part A and four in Part B. The codified results are summarized in Figures 8. On the question on encouraging group participation in class, the most common means were to set up games such as "jeopardy" or group activities, using directed questions and constructing case studies in OSCE type scenarios. The key advantages of clickers were seen to be greater participation, the immediate feedback and the improved classroom environment (fun); whereas the negatives focussed on two distinct areas: a concern that the students would lose focus and waste time and the issues of the practical aspects of integration with technical issues, training and cost being the prime concerns.

On the subject of whether the clickers could help with core competencies, instructors thought that they would help keep students participating and alert while providing direct feedback to show understanding. There was a distinct indication that the instructors felt that teaching with clickers was somewhat subject dependent.

On the final question on whether clickers could be useful in engaging students in large class sizes there was positive feedback that students would be more engaged and participative by answering questions and that it would make interactions much more private and less threatening.
Figures 8: Codified responses to Qualitative Questions

Q9 - How do you motivate and get students to participate?

Part B Q2B **Negatives with Clickers**

- Lack of seriousness or focus: 15%
- Other: 26%
- Technical problems: 20%
- Time waster: 12%
- Training & IT familiarity: 15%
- Cost: 12%
- Other: 26%
Figures 8: Codified responses to Qualitative Questions (continued)

Part B Q2A - **Positives with Clickers**

- **fun**: 11%
- **feedback**: 24%
- **participation**: 30%
- **Other**: 35%

Part B Q3 - **Clickers can help with core competencies?**

- **subject dependent**: 20%
- **participate/alert**: 35%
- **feedback**: 30%
- **Other**: 15%
Figures 8: Codified responses to Qualitative Questions (continued)

Part B Q4 - **Clickers help promote participation in large classrooms?**

- **Privacy / non-threatening:** 45%
- **Multiple can answer / use as group:** 23%
- **Other:** 32%


Figure 9 – Questionnaire Results on classroom questions

(Confidence = 95%)

Questionnaire responses for questioning in classroom
(mean response level with error bands – sample = 21)

Figure 9 features the results from Part A of the questionnaire, questions 6, 7, & 8 (Appendix D). It shows that questions are used from a frequent to a very frequent basis in classes but only a moderate to low percentage of students respond or volunteer to respond. Therefore, although this method is employed in the classroom by the majority of respondents it also appears as if it does not engage a large number of the students.
CHAPTER FOUR
DISCUSSION OF RESULTS

The discussion will be broken into a few themes to help understand the data collected. As the intention of this paper was to review whether the faculty is ready to introduce clicker technology into the classroom; particularly clickers, then understanding the data gathered in terms of the theory of reasoned action is appropriate. There are two factors that need to be considered when a change is being contemplated: perceived usefulness and perceived ease of use (Wolski & Jackson, 1999).

Another consideration is whether the data collected actually reflects the actual intentions of the faculty. Earlier in the paper, there was reference to Myhre, Popejoy & Carney’s work (2006) which indicated that in order to embrace change, especially with the efforts required to introduce technology into the classroom, a certain amount of reflection of practice needs to take place. This is not an easy attribute to assess given its close ties with a person’s concept of self, but is crucial for nurses as part of the assessment of students as based on self-evaluation to ensure that they recognize and thus do not exceed their own level of competence and thus endanger patients. Reflection of practice relates to both usefulness and ease of use as it will influence individual perceptions of both.

4.1. PERCEIVED USEFULNESS

One of the findings was related to the actual level of attendance and participation. The presentation immediately followed a scheduled faculty meeting. In many cases the nursing staff is required to conduct other business immediately following faculty meetings; however, in this case all who attended the faculty meeting also stayed for the
clicker presentation. This indicates at least curiosity and potentially a level of interest in pursuing more fully the idea of more information technology, in general, and clickers, in particular, in the classroom. This was reinforced by the post-presentation questionnaire in which the respondents indicated that the presentation was very useful (14) or useful (4).

It was also encouraging to note that many of the respondents (19 of the 21 respondents) to the questionnaire felt that they employed techniques that encouraged interaction in the classroom. The most frequent responses to this question were the use of:

a. directed questions;
b. grouped study or a “Jeopardy” style game; and
c. case studies / OSCE type scenarios.

Directed questions or general questions result in very few individuals being able to actually interact. This viewpoint is backed by the responses on the three questions related to class interaction which show that relatively few students attempt to answer questions posed in class.

From experience and direct observation the Jeopardy game is generally used for the class review near the end of the semester. Grouped study is used more frequently, but there is always the danger that the groups are dominated by the stronger, more outgoing students and thus actual participation may be lower than it initially appears.

Case studies are used to good effect by many teachers, but can suffer from the same limitations as group work if conducted in groups or are individual assignments if conducted as homework. Like the Jeopardy game, OSCE type scenarios are typically used once per semester as a student preparation for the RN exams where it is a provincial requirement.
Therefore, the primary means used to promote interaction in classroom currently, only touches a limited number of students. This would indicate that clickers would be perceived as useful to encourage participation. Based on some of the responses in the fourth question in part B of the questionnaire it would seem that nursing colleagues agree that clickers are: a "good way to elicit opinions in a way that is non-threatening" and "Yes, the shy ones more likely to participate and decrease likely to worry about failure if they can participate anonymously." That these statements were made after the instructors were participants in a classroom situation similar to that experienced by their students showed how positive an experience it must have been as they discovered the freedom that clickers give students in a classroom.

The two clicker users from the science department who were interviewed also indicated that the anonymity was a key factor in the advantage provided by clickers in the classroom as well as the ease with which the students (and teacher) got feedback leading to a better understanding of whether the students "were getting it." Additionally, the instructor who had used the clickers most extensively indicated that even though he did not have a significant group of students who were consistently exposed to peer centered learning (using clickers or using flash cards) showed similar or better results to those that received traditional classroom learning in a control group.

However, traditional teaching practices cannot be assessed as innovative and yet technology acceptance in the classroom is reliant on innovators and thus a review of classroom practice is required to understand if innovation is present. One of the instructors interviewed, who has used clickers in the classroom, emphasizes the point made earlier in the literature review that "it is not the technology itself, but the pedagogy behind the technology that is important." This was also brought in the questionnaire responses such as "clickers like overheads, if not used appropriately will be just as useless" and "this is a gadget that can be used as one of a number of classroom strategies. Like any strategy, overuse becomes tedious for students and teachers alike." These statements appear to focus on the technology and not the message of incorporation of innovation.
Innovation in teaching is not a gimmick. It relies on a student centered approach that allows sufficient flexibility to accommodate the classroom needs. This requires more preparation and introduction of methods that discourage rote teaching. Responses from the subjects indicate that the nursing classroom is dominated by the same students answering questions and there are a low percentage of students volunteering to answer questions. Despite the use of techniques that should assist in an increase in student participation there is a strong indication that the majority of students are not actively participating in classes.

There was a high level of participation in the introductory session by faculty members. Their attendance combined with their positive feedback and participation during the session reinforced the view that clickers have a capability to improve classroom interaction. However, some teachers remain concerned that clickers may be used as a crutch or worse, after the expense of implementation is undertaken by the school and students, that students might find them to be a gimmick making the clickers useless as the novelty wore off. Although overall clickers received a positive response there remains some concerns on effectiveness within the faculty.

4.2. PERCEIVED EASE OF USE

It is a large step to move from the perceived usefulness of a tool and its introduction. It is one thing to observe how well it works when the only requirement in the classroom is to push a button, it is quite another to be the one responsible for developing the course material, setting up the technology, running the technology and then using the provided analytical tools. In the frequency data there is a strong desire for training and technology support (100% strongly agreed or agreed). The need for this is backed up by the interview of one of the instructors who stated that he “should have had a mentor to help as I felt abandoned and I could not get help from anyone. And I had a lot of problems and it was frustrating.” This was reinforced in the qualitative responses
such as the "computer may not work and therefore disrupts class. If can't use the clickers but we had planned a class around them" and "may take time delivering clickers, sorting out technical problems." This indicates a couple of issues: that training and support is a must for the program and that the ingrained thought process is still one of very fixed delivery content as opposed to the innovation that leads to flexible thinking. Based on the literature one of the things that is favorable for their introduction into the nursing classes is that these classes tend to be longer (usually two to three hours) thus minor technical problems can be absorbed by rearranging the class within the allocated class time.

Another theme within the responses was the time element. This manifests itself in two distinct ways that are interrelated. The nursing program class planners are focused on content delivery. A review of the majority of the classes shows long PowerPoint presentations that discuss the technical issues related to the subject in minute detail to the point that often the first question asked by students is: "will the slides be available on Blackboard?" A positive answer then leads to the conclusion that the student does not need to pay attention in class as it is content only and the notes with the content will be made available. This is important because some of the feedback such as "time is tight" and "may be more time consuming than straight lecture" indicates that teachers are worried about delivering content and not looking for innovative ways to promote alternative learning. Thus, the clickers would be an impediment.

Another time element relates to the preparation time for the lecturer. The survey questions elicited answers such as "Need to learn new program plus all its functionality," "A lot of work for teacher," "time constraints - teaching students/ staff" and "teacher time to learn and develop use of clickers" indicate that teachers feel that they would need IT support to understand and introduce the technology and there would be a large amount of work to alter class planners to integrate the less structured portions of the class with the traditional elements.
The cost of incorporating clicker technology in the classroom was also raised as an issue. Instructors mention it as a negative factor and there is also a concern that it may amount to resources being wasted for both the college and the students if the introduction does not work out well.

Place on top of this the lack of comfort that some instructors may have with IT: "intimidation to me since I do not feel confident with IT," and given the technical difficulties that will most likely occur at times when trying to present and there are some serious structural issues that need to be resolved to put clickers in the classroom.

In terms of ease of introduction or use of clickers in the classroom, there appear to be a number of issues that would make implementation difficult. Based on input from experienced users and results from the survey, strong IT support for both instruction in the clicker use and set-up in classes would be required. In addition, there would need to be a significant and consistent effort on class planner modification to accommodate a more interactive classroom as well as a philosophical change in content delivery as less "facts" and more discussion would need to take place in the classroom.
CHAPTER FIVE

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1. CONCLUSIONS

The ultimate aim for using clicker technology in the classroom at John Abbott College is to augment the practical training for nursing students. This would enable students to retain some of the key concepts and employ critical thinking inside the classroom. “Clicker” technology has been documented as a tool that helps in these aims as reported by Moredich & Moore (2007), Judson & Sawada (2002), Horowitz (1988) and D’Inverno et al. (2003). However, the key to being able to introduce the technology lies in the readiness of the faculty to effectively use clickers which relies on a number of factors discussed earlier in this document including the Theory of Reasoned Action (Wolski & Jackson, 1999), support and recognition for their efforts (Finley & Hartman, 2004) and fear of technology (Becker, 2000). This specific study set out to evaluate four questions that are considered necessary precursors to technology implementation into the classroom:

1. Which IT approaches do nursing teachers use in their teaching?
2. What methods do nursing faculty members at John Abbott College use to promote interactive learning in the classroom?
3. On completion of an introductory session on the use of clickers in the classroom will nursing faculty members at John Abbott College be receptive to learning more about the subject and indicate a willingness to use clickers in the classroom to promote interactive learning?
4. What is the experience of teachers who have successfully introduced clickers in their classroom?

Based on the data collected, the majority of teachers show an interest in trying to engage students interactively in the classroom; however, the techniques were employed sporadically and had limited effect given that only a few of the students appeared to be
engaged during the most commonly used interactive technique of direct questioning. There also appears to be a wide variation on the classroom techniques employed by John Abbott College nursing faculty. Many rely on traditional methods that require extensive lecturing to "cover the material" as noted in survey results although mandatory questions and quizzes allow some interaction. However, there is little evidence of extensive interaction or that the feedback is used proactively to redirect lectures or class planners in line with student needs even though this has been shown to be effective in improving knowledge retention (Beekes, 2006 and D’Inverno et al., 2003).

Comments such as it "may be more time consuming than straight lecture" or that the core concepts can be taught, "but this is subject dependant to some degree" indicate that the tools available may not be well understood and more fundamental changes are required. This is reinforced by one of the teacher’s interviewed who struggled with the technology and pedagogy of including "clickers" in the classroom. The traditional methods of teaching are time dependent and rely on management of rote type reading and the responses to the low level interaction in classes seems to indicate that there is still much of this occurring in the classroom that is not innovative. However, there are some good instances of use of case studies, group studies and games to improve classroom interaction which could form the basis for further innovation by the introduction of technology.

Therefore, on balance it appears that genuine efforts are made to engage the students in class, but there is a concern that material needs to be covered to ensure that a minimum requirement for knowledge transfer is met as was highlighted by Knight & Wood (2005) in moving from a traditional curriculum. Becker (2000) also highlights the increasing demands teachers experience with government directed content.

On the second question of willingness, the information indicates some very positive responses to the concepts and enthusiasm in taking a class in which "clickers" were employed based on the positive impact of the "lesson" during the presentation to the faculty instructors. However, there are two key concerns discovered during this research:
1. The amount of time available in class to cover the material and the additional time and effort required to adopt the class planners to a new system in class.

2. The training in the technology as well as the IT support available for the hardware and software when first introducing clickers into the classroom.

Therefore, we conclude that even though there is a lot of interest in clickers in the John Abbott College nursing faculty and there is a perceived benefit in their use in the classroom there are two major stumbling blocks to implementation in the classroom. The first concerns the time required to update course planners including the fundamental redesign to move from a content driven to knowledge based interactive approach in the classroom. The second concerns the limited technology support for both learning the technology application and front line IT support for application software and hardware when using it in the classroom. This last concern was also clearly brought out during the in-depth interviews conducted with those who had experience in using clickers in the classroom.

As such, the timing of introduction may be better suited to when the nursing faculty moves to new facilities where the IT technology can be better integrated into the classrooms and time will be needed to make a "fresh start" to coincide with new surroundings.

5.2. LIMITATIONS

This study had a number of limitations:

1. The sample size was small and the ability to collect objective data (as opposed to questionnaire responses) was limited; and

2. The sample was a purposive sample that was confined to a single faculty at the CEGEP level.
3. It would have been beneficial to have a pre-introductory session questionnaire for the nursing faculty to assess whether there was a shift in thought after receiving the technology demonstration. However, due to faculty members' availability, the availability of the clickers (which were on loan) and the small size of the group, it was determined that it was more important to obtain the data than to risk not having the attendance or equipment to proceed with the demonstration.

Even so, the sample could be considered to be representative of the demands and the concerns that would be expressed at other nursing institutions because of the extreme pressure to deliver sufficient health care content over a very short period within the health sciences faculties. As such, the results of this study may be applicable to other colleges in the Montreal area. There is also a similarity with the university level programs as the Registered Nursing examinations, which grant the right to practice, are common to both CEGEP and university trained nurses in Quebec and there is similarity of content with the rest of Canada and the American systems.

5.3. RECOMMENDATIONS

Based on the findings of this study it is recommended that course planners could be reviewed to include more interactive content and thus assist in the development of critical thinking in the classroom. By starting to restructure the class planners, hopefully it will develop a different classroom style that would then allow more interaction between students and instructors as well as increase peer instruction as a learning mechanism among students. This is an opportunity to set up an appropriate structure that includes classroom interaction and student pre-class preparation as proposed by Boswell (2006), Becker (1994), Robertson (2000), and Lightstone (2006).

With that necessary step taken, it then would be opportune with the move to the new science building to ensure the technical infrastructure is in place as well as create the atmosphere for teacher continuing education to develop a strategy to introduce more technology into the classroom; one of which may be the implementation of clickers. This study has provided some evidence that clickers could be used in nursing teaching
allowing more dialogue in an interactive environment that might open the classroom to critical thinking opportunities.
REFERENCES


APPENDIX A

QUESTIONNAIRE FOR JOHN ABBOTT COLLEGE NURSING FACULTY
Faculty Use of Information Technology and Clickers in the Classroom Questionnaire

The following questionnaire is being used in conjunction with a presentation on clickers to the Nursing Faculty at John Abbott College. I will not be present during the administration or collection of the questionnaire. The responses will be transcribed by a third party and the information passed to me after transcription to preserve anonymity. For questionnaires that are not collected after the presentation please put them in the provided envelope and submit to xxxxx. Responses to this questionnaire are anonymous. Thank you for participating in my research project.

**PART A - Information Technology** - Select the response that best reflects your situation.

<table>
<thead>
<tr>
<th></th>
<th>I communicate or would like to communicate with my students and/or colleagues by email or using Blackboard.</th>
<th>Very frequently</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>I conduct searches on the internet for teaching and clinical material.</td>
<td>Very frequently</td>
<td>Frequently</td>
<td>Occasionally</td>
<td>Rarely</td>
<td>Never</td>
</tr>
<tr>
<td>3</td>
<td>I think that working with IT would help me instruct my students.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Undecided</td>
<td>Disagree</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>4</td>
<td>I would be willing to use IT more often if I had adequate support and training.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Undecided</td>
<td>Disagree</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>5</td>
<td>Several studies point out that students, today, have superior IT skills to instructors. If I were to use new information technology in the classroom this fact would make me anxious.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Undecided</td>
<td>Disagree</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>6</td>
<td>During a classroom session I ask questions that require student responses.</td>
<td>Very frequently</td>
<td>Frequently</td>
<td>Occasionally</td>
<td>Rarely</td>
<td>Never</td>
</tr>
<tr>
<td>7</td>
<td>What percentages (%) of students typically volunteer answers?</td>
<td>Large percentage</td>
<td>Moderate percentage</td>
<td>Low percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>When I ask a question during a classroom session typically it is the same students that raise their hands.</td>
<td>Very frequently</td>
<td>Frequently</td>
<td>Occasionally</td>
<td>Rarely</td>
<td>Never</td>
</tr>
</tbody>
</table>
What methods do you use to try and ensure student motivation and ensure that large numbers of students participate in the classroom. Explain briefly and please point out how they help in these areas.
PART B - Clickers in the Nursing Classroom - Select the response that best reflects your situation.

1. I found this presentation on clickers useful
   - Strongly agree
   - Agree
   - Undecided
   - Disagree
   - Strongly disagree

2. Please identify 2 positive and 2 negative aspects/issues regarding the use of clickers in your classroom.

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

3. After this introductory session, do you believe that using clickers in the classroom will help students to learn core concepts better? Why or why not?

4. After this introductory session, do you believe that clickers would enable students to participate in classroom discussions in larger numbers and more frequently? Why or why not?
APPENDIX B

QUESTIONNAIRE FOR CLICKER PRACTITIONERS
### Interview Questionnaire

1. How many classes have you taught using clickers?

1a. **Follow-on:** Has your department formally adopted the use of clickers or have you used them on a trial basis only?

2. During classes were clickers were used did you find that students were more alert and engaged?

2a. **Follow-on, if the answer is yes:** In what way? Can you provide some illustrations?

3. What sort of response system did you use alongside the clickers? For example, were the responses of the form, yes/no / true/false; Likert; multiple choice or some other way?

4. Did using clickers lead to follow-on discussion that might not normally occur or a situation which allowed peer instruction?

5. In the process of using clickers in the classroom did you have the opportunity or the means to collect any objective evidence that show that clickers improve interactive learning?

5a. **Follow-on, if yes:** What was the nature of the objective evidence and was it documented?
6. On the basis of your experience can you point to some key advantages of using clickers in the classroom?
   A.

   B.

   C.

7. What major disadvantages of using clickers can you point to?
   A.

   B.

   C.

7a. **Follow-on if not specifically mentioned above:** Specifically, did you find it difficult to finish the expected amount of material in the class planner or course curriculum.

7b. **Follow-on if the answer above was yes:** If that was the case, were you able to make up the time to cover the course material? If so, how? (recover to ensure the students were exposed to the “lost” material?)

8. To your knowledge, does anyone else in your faculty use clickers in the classroom?

8a. **Follow-on if the answer above was yes:** How often?
9. Have members of your faculty shown any interest in your experience with the use of clickers? If so would they be ready to use clickers in the classroom?

9a. **Follow-on:** What factors, do you believe, account for such attitudes on the part of your faculty towards the use of clickers?

10. Do you think that your institution is willing to provide support and funds to enable more teachers to use clickers in the classroom?

10. On the basis of your experience what kind of advice would you give someone who wanted to use clickers in the classroom for the first time?
APPENDIX C
CLICKER INTERVIEWS

1. INTERVIEW #1 (PHYSICS) Aug/Sept 2007

*How many classes have you taught using clickers?*

I have been using peer instruction (using clickers) approx 40 classes since fall 2004.
2 NYA and 2 NYB each of NYA – 20 lectures each (40) and NYB 25 total 50 classes.

Uses peer instruction with clickers does not use clickers on its own analogy of using
a hammer. Not the technology it is the means or the pedagogy behind
Means of using the technology

*Has your dept formally adopted the use of clickers?*

Dept until this semester no formal adoption. PHYSICS He is only teacher has used
them. Bought 200 clickers of infrared? Radio frequency older technology. Have computer
projection machine now in their dept with laptop. *Faculty has had a demo.* Dept is moving
to peer instruction using whiteboard, cards, raise hands or clickers. Using student centered
interactive teaching methods. Actual clicker is being worked on. All faculty use some form
of peer instruction.

*During classes where clickers were used did you find that students were more alert and engaged? Give examples.*

Students were more engaged (not just from using clickers) because they had to
choose an answer, talk and think about it before responding. Flash cards worked the same
but % of students got right was better with the clickers. The students were more engaged
because I was engaging them not because of the clickers.

Clicker good for data

It will change your course dynamics. Boring teacher before, you will be boring
using clickers. Forces you to give the floor more to students.

Clickers force the teacher to stop talking. Turn over control of the classroom to the
students. What do you think? YOU don’t know what will happen. Everyone gets the same
message use clickers turn over control to the students.

Move from teacher centered to student centered.
What sort of response system did you use along with the clickers? Responses in form of yes/no, true/false, likert scale, multiple choice etc?

How do you use, true, false, likeart scale, used only peer instruction 10-15 min formal lecture then once then understand? Throw conceptual question and talk to each other and deconstruct each wrong answer and show why it is wrong or right.

Pressure on new teachers to use if they are not comfortable. Absolutely I would not recommend a new teacher to use. You have to go thru the content once fully to understand all the different particularities of your curriculum. Once you have gone thru it once then week 1-15 we need to relearn the content. Look at all the content and pitfalls the students will have and now you understand the curriculum and then you can break it down into chunks. I will lecture 15min here and then ask conceptual questions. Teach once and break into chunks and make conceptual concept questions using clickers.

Did you collect objective data that support the clickers are useful.

Yes, it improves learning. Marks are slightly better in the final but I did not have enough to make it statistically significant. But they were not worse. This was compared to a control group which learned the traditional way. Didactic lecture. I also had a class with flash cards. Learning with clickers and flash cards was absolutely the same. But did better than the control group. It engages students same as whiteboard or flash cards but it is more practical to use. And tabulate the response. The focus is to move away from the traditional lecture mode where the teachers stands and lectures. And make it more student focused. Get away from "I'm in front, you are to sit and listen. Here is a question, I am not going to tell you the answer, think but you have to be thinking about it and showing that you are integrating the knowledge. We are trying to shift the way we are thinking.

Can be used for drill and practice, rote memorization, can be used to prevent students from learning. Switch responsibility of learning onto the student. Not about the clicker but the pedagogy underlying the clicker. Textbook of 25 definitions or terms and you have 10 min to see if the students knows them. Students are not engaged No tranference of info from short-term to long-term memory.

Key advantages to using clickers.
- Quick and precise assessment of voes
- Other students don't see their response - anonymous - Lack of peer pressure
- Forces you to reconsider your content, how you will present using clickers. The best method moving towards student centered

3 disadvantages of using clickers in the classroom
- Panacea - not the solution for everything
- Technical problems
- ?cost not a big problem
Did you find it difficult to finish the material in class time?

No, due to creation of course notes which had all the information in them, written on the slides. All class notes after class go online so I don’t have to wait for them to take notes. So I can cover the same amount of material in slightly shorter amount of time. Just enough to compensate for the discussions. Other disciplines you may not be able to compensate for the amount of time then you need to give out readings and tell the students that they have to come to class prepared and have done your readings.

Have members of your faculty shown any interest in your experience with the use of clickers? If so would they be ready to use clickers in the classroom?

Many teachers want to try and use clickers but so far they have not we now have he resources.

Be prepared, create lecture notes. Advice to ones who want to use clickers in the future. Try the technical aspects before the class to make sure they know how to work the equipment, how to setup and run the presentation.

Thank you
2. INTERVIEW #2 (CHEMISTRY)  Aug/ Sept 2007

How many classes have you taught using clickers? I have used it in 1 course and I used them on 4 separate occasions.

Has your dept formally adopted clickers? Chemistry – No
Anyone else using them – No

In the classes you used them did you find the students more alert and engaged? They were more engaged?

Why? They thought it was a novel approach and so they had fun. Idea to push buttons and answer questions. They may have been more engaged because it was more of an anonymous situation. They could answer questions without me knowing what they had selected. Were not threatened. The did not feel threatened I think. I think they had fun, pressing buttons, but in my class they repeatedly pressed button and their answers were kicked out. Because they got locked out. They realized that pressing 8-15 times was not a good thing.

Were more engaged and looking forward to more opportunities to using the clickers. How were they used? True/false, yest/no, multiple choice etc.

I used it for the most part as multiple choice. Basically I would cover some content in class, and to judge their comprehension I would ask a multiple choice question. I gave them some type of time limit to answer the question. They would answer the question, I would reveal the answer, then I would reveal the class response and distribution. I think I revealed the answer and then went over the answer.

Did using clickers lead to more discussion that might not have occurred if you did not use peer instruction?

I didn’t use peer instruction it was individual response. I’m not sure it lead on to more discussion. Certainly I was more aware if students or the majority answered the question wrong. Questions I tended to ask were not too probing it was basic concepts. To see if they got the basic concept. For the most part the vast majority of students got it. The basic concepts. If there were questions where a significant number got it wrong gave me the opportunity to review.

Evidence that clickers improve interactive learning?

I did not because I only used them for 4 classes and mostly I was studying student perceptions about the use of clickers in the classroom. So I surveyed students as the end and ask them “do you think you learnt more?”
In the classes that clickers were used. Do you think you were more actively engaged, linked to perception do you feel you were able to learn the content at a deeper level due to the clicker use?

I never actually evaluated their learning. I was more interested in evaluating their perceptions.

I wrote a paper.

Key advantages of using clickers in the classroom

- engaged the students anonymously, although it does not have to be anonymous but in my class it was.
- Gave immediate feedback to me and to the students
- Students had fun, looked forward to coming to class to use the clickers.
- Further engaged them
- Many students have used them in Nathanial’s class

Key disadvantages of using clickers in the classroom

- Software issues
- Used rf infrared technology it was a pain to set up receivers, wires, computers, it took time and I had technical problems which was discouraging I spent time making the presentation and ppt and it didn’t work and I didn’t like it.
- It was further complicated because I had to go and get the clickers, from Nathanial’s office, get a key if he was not there, get them out, set it up and return, it was a lot of running around.
- We had back to back classes so I had to wait till he was finished to I could get them out. It was logistically difficult. Software was not user friendly, lot of setup, no support in setting up the software.
- Misuse of clickers, students interference blocked by students head due to infrared need sight line to receiver. If two signals came in simultaneously then they would be cancelled. If this happened I would not get their answers and the students would not know. If there answers had accepted
- I think there is a way but I didn’t set it up to know if students had responded or not.
- Because it was anonymous I didn’t set it up that way
- I barely got more than 80% response rate. Even thought I am pretty sure I got 100% response rate.
- Even though it was anonymous students were exchanging clickers. I don’t know why and I asked and they said “It is just for fun” It could be an issue if they were not anonymous
- I am moving away from technology, ppt, projectors etc multiple choice
- Clickers is going in a direction I don’t want to go
- I do want to encourage interaction
How do you know if students understand the material – only through quizzes or exams.

Feedback traditional delayed

Did you find it difficult to cover the expected material for that class – it is more difficult I think but it depends on how you go about it. It takes time to set up, have them answer question, put up the answer and then the graph discuss why some selected the incorrect response.

It does take time but I don’t think it is a negative. But what I do now takes more time so it is not negative.

How do students make up lost material. I give separate assignments and I do other online quizzes using BB. A lot of quizzes or readings are assigned. Does anyone in your faculty use clickers? No,

Has any faculty expressed interest in using clickers and would they be willing to try them? When I was doing it I think people were curious, but when they saw the technical issues of setting up receivers and wires etc I think they were put off by it. If the technology changed like the new RF radio frequency ones where there was no wires all over the class they may be prepared to try them.

Do you think the college will provide support for people to use clickers? I think the college is open to setting up clicker classroom that are preset with software and wires built in. The new RF have the receiver unit that is plugged into the USB port of your computer. Clickers in the classroom in a cupboard with computer projection machine so you don’t have to get the computer and projector and bring to the class. I think things have gotten easier technologically but I think the classroom setup with wheeling in computer and projector. I think in the new science building it is possible.

Advice you can give someone who wants to use clickers in the classroom. Should have a mentor. To help I felt abandoned I could not get help from anyone. And I had a lot of problems and it was frustrating. And it became a very negative experience and I had to think “Why am I doing this” If I had not have been doing this as a project for my course I would have abandoned it. I could have done something else. Need someone to help you with questions, mechanics, software and make sure the technical issues are ok. I was checking batteries and I don’t want to do that for 40 clickers. I want someone to do that for me. Technical help and pedagogical help. How are going to do with the clickers. How are you going to create your questions/ class.
APPENDIX D
QUESTIONNAIRE RESULTS

Faculty Use of Information Technology & Clickers in the Classroom
Total Respondants: (21)

PART A - Information Technology

1. I communicate or would like to communicate with my students and/or colleagues by email or using Blackboard.
   Very Frequently (12)  Frequently (8)  Occasionally (0)  Rarely (0)  Never (1)

2. I conduct searches on the internet for teaching and clinical material.
   Very Frequently (6)  Frequently (10)  Occasionally (5)  Rarely (0)  Never (0)

3. I think that working with IT would help me instruct my students.
   Strongly Agree (7)  Agree (10)  Undecided (3)  Disagree (0)  Strongly Disagree (0)
   No Response (1)

4. I would be willing to use IT more often if I had adequate support and training.
   Strongly Agree (12)  Agree (9)  Undecided (0)  Disagree (0)  Strongly Disagree (0)

5. Several studies point out that students, today, have superior IT skills to instructors. If I were to use new information technology in the classroom this fact would make me anxious.
   Strongly Agree (2)  Agree (4)  Undecided (3)  Disagree (11)  Strongly Disagree (1)

6. During a classroom session I ask questions that require student responses.
   Very Frequently (15)  Frequently (3)  Occasionally (3)  Rarely (0)  Never (0)

7. What percentages (%) of students typically volunteer answers?
   Large Percentage (0)  Moderate Percentage (10)  Low Percentage (11)
8. When I ask a question during a classroom session typically it is the same students that raise their hands.

Very Frequently (7)  Frequently (13)  Occasionally (1)  Rarely (0)  Never (0)

9. What methods do you use to try and ensure student motivation and ensure that large numbers of students participate in the classroom? Explain briefly and please point out how they help in these areas.

- Questions on Powerpoint presentations itself as class progresses. Situations/Example – case scenarios with information given. Short videos – 10mins. Followed by Critical Thinking questions to answer (in small group form) and hand to teacher.

- I frequently (1) Role play and prompt their responses; (2) Ask questions; (3) put multiple choice practice exam questions on the overhead at the end of each section. So # (2) & (3) could be adapted to clickers.

- Case Studies – Use Case Studies with group work. Group work – more students participate – peer learning exists and students have to take the lead to present group work. Asking questions – frequently same students eager to answer, but teacher can develop ways to elicit responses from other students.

- Involve the students in having a stake in learning this information. They know they need to use it because they will use it right away. I ask specific students, and vary whom I ask. I like to bring up questions in a controversial way – so sometimes the students argue a bit and then we pull all the threads together for both sides. They have to view things from a new point of view. I split them into groups of three to discuss some things - then to report to the whole class. We laugh quite a bit – they really like it!!!

- Group activities – I use these frequently to ensure maximum participation of students and application of theory. Planned questions during lectures – I salt my lectures frequently with questions planned to elicit student participation.

- I ask questions that allow them to participate which allows for open forum. I like to guide them in group work and discussions afterwards.

- Verbal questions: do not change some students who have hand up all the time; sometimes choose students from class list if questions is not difficult. Written exam questions throughout class and at the end of series of classes an overhead on Powerpoint. Students vote by show of hand if multiple choice then distractors reviewed. If short answer, students put up hand to answer.

- I do post class content, review questions at end of most classes to help students gauge their understanding and immediately address areas poorly understood. I try to choose students
other than the regular few hands up to answer questions whenever possible. I use open ended questions and answer periods.

- Group work with groups they already know and feel at ease with. Keeps students active in discussions and lets them feel at ease. Have used clickers as trial and found active participation and feedback. Students were very attentive.

- I use a case study approach. I group students and have them answer questions. One representative of each group will answer. I sometimes pose questions (multiple choice) in the middle of class/content delivery. I find it difficult to engage students at times. Group work helps but posing questions does not entice students. Some students tend to monopolize my time as well.

- Have them work in groups of 4 to 5 students. Ask questions frequently that require students to answer. Ask their opinions. These methods gets the students involved and keeps their attention.

- Give an overview of lecture. Ask questions (on Powerpoint) along the way (very few slides). Try to include discussion on some controversial issue to engage whole class. Ask for personal experiences from clinical setting. Have multiple choice ques at the end (and perhaps a few at the beginning).

- Vary teaching strategies during a long class (more than 2 hours). Starting with a presentation then moving on to group work and having students present their work at the end of class ensures their participation.

- Questions on screen. Work in pairs or groups and report back. End of class - hand in questions re class (to prepare for the next day) ie. A point to discuss again. Review games – ie. Jeopardy.

- Asking questions re topic material – more interactive, make students think and try to decrease potential boredom of just listening to someone.
  - Break into small groups and the group discusses a specific topic, answers & questions. More difficult to do with a large group or in an amphitheatre seating arrangement therefore, not always possible to do. But, when possible it allows interaction among students which makes them think, search for answers, etc. Also allows them to have input or discuss their feelings. Downside can be that some group members do all the talking, etc.
  - Show videos (DVD’s) pictures to illustrate a point – may generate more questions, more discussion than just words. Helps visual learners.
  - Practice when possible and or use props. Eg. Breastfeeding class everyone has a doll/teddy bear to practice holding “the baby” in the correct positions – helps it be more real like, see if they actually understand what the written descriptions tell them to do.

- Moving around and using different presentation methods ie. Blackboard – drawings, keywords explain pathway, PP presentation/overhead use @ times. Asking questions to different students, regardless if their hand is raised.
  - Use laser pointers to get their attention
  - Mix up theory and practical applications to increase variety
• Lights not always off during presentations and use of technology or else students get sleepy especially after lunch
• Standing beside talking students to question them and to focus more not allowing same students to answer questions
• Encourage broader participation of class
• Handouts – notes given so does not tie them from writing notes; ie. Slides and Powerpoint presentation
• Asking students to help with presentation to increase participation.

• Ask questions – open ended questions: try to relate content to their clinical experience.
  - Case studies – apply information
  - Short Answer or Multiple Choice questions at end of lecture/presentation
  - Group work – engage students hopefully!
  - Individual work – example: Ask student to write down answer than pass to another student to read their answer; have students take to each other and discuss answers.
  - Jeopardy Game: for review class – teams discuss answer and have a spokesperson give the answer.

• Interpretation within a Powerpoint presentation. I will include multiple choice questions that the students will answer and then we discuss the correct answer based on the material presented prior to the question.
  - I use case studies that students may work in a small group on and then they present (if there is time) or we collate answers together as a large group.
  - I often will try to get their perception on a topic before the class begins so the clickers would be a good way to do this anonymously without them feeling judged or self-conscious.

• Question & Answer throughout the class to stimulate interaction and thinking
  - “Supervise” Exam Quest at end of class to test retention and comprehension
  - Blackboard – Practice Short Answer/Multiple Choice on BB and then use: questions discussed in class to challenge and promote critical thinking.
  - “OSCE” type simulations with myself as actor: student as “nurse” to help students visualize nursing stations
  - Overhand Illustrations – for students who are more visual learners – pictures are memorable.
PART B - Clickers in the Nursing Classroom (Total Respondants: 19)

1. I found this presentation on clickers useful

   Strongly Agree (14)  Agree (4)  Undecided (1)  Disagree (0)  Strongly Disagree (0)

2. Please identify 2 positive and 2 negative aspects/issues regarding the use of clickers in your classroom.

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will have more fun with interactive technology</td>
<td>Students may not necessarily take them seriously – lack of concentration in entering true answer</td>
</tr>
<tr>
<td>Immediate feedback on their understanding of knowledge/reading, etc</td>
<td>Other students may marage someone’s clicker; therefore not necessarily that student’s answer may skew results if being tabulated informal way.</td>
</tr>
<tr>
<td>Entice more participation; motivate the students.</td>
<td>Cost issue</td>
</tr>
<tr>
<td>Incorporate IT learning to generation of students that are supportive of technology</td>
<td>May take time delivering clickers, sorting out technical problems.</td>
</tr>
<tr>
<td>Students learn &amp; are engaged</td>
<td>Technical difficulties</td>
</tr>
<tr>
<td>Students pay attention and enjoy the class.</td>
<td>Getting other faculty members on board.</td>
</tr>
<tr>
<td>Positive motivator for students</td>
<td>$$$</td>
</tr>
<tr>
<td>May increase participation (therefore increase success)</td>
<td>Need to learn new program plus all its functionality</td>
</tr>
<tr>
<td>Student involvement</td>
<td>Intimidation too me since I do not feel confident with IT.</td>
</tr>
<tr>
<td>A type of evaluation of my success.</td>
<td>Time is tight</td>
</tr>
<tr>
<td>Student participation is required</td>
<td>Teacher participation</td>
</tr>
<tr>
<td>Probably promotes student attention</td>
<td>Difficult to elicit Critical Thinking pathways – designed for concrete answers areas that don’t have an answer ie. Ethics.</td>
</tr>
<tr>
<td>I do not know how to work the equipment on the trolley, But if I did I think it would be great fun.</td>
<td>See positive remark re equipment</td>
</tr>
<tr>
<td>I heard there is a program to help one make Powerpoint.</td>
<td>The idea is intriguing. I wonder if the students would get tired of it?</td>
</tr>
<tr>
<td>Students enjoy hand-held game-like devices</td>
<td>Possible failure of technology</td>
</tr>
<tr>
<td>Immediate feedback</td>
<td>?? students may focus on “what did you answer”?</td>
</tr>
<tr>
<td>Increases chances of participation</td>
<td>Computer may not work and therefore disrupts class. If can’t use the clickers but we had planned a class around them.</td>
</tr>
<tr>
<td>Students may enjoy using this technology</td>
<td>A lot of work for teacher</td>
</tr>
<tr>
<td>Instant feedback</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Accurate feedback</td>
<td>See potential for abuse if use for attendance</td>
</tr>
<tr>
<td>Instantaneous feedback</td>
<td>May discourage or student who is getting the answers wrong.</td>
</tr>
<tr>
<td>Keep the classroom alert and involved</td>
<td>Time constraints – teaching students/ staff and cost</td>
</tr>
<tr>
<td>Individual students know where they stand with respect to the rest of the class</td>
<td>Careful not to overuse</td>
</tr>
<tr>
<td>Holds their attention better</td>
<td>Limitation to yes/ no type answers</td>
</tr>
<tr>
<td>Students participation</td>
<td>Cost</td>
</tr>
<tr>
<td>Student and Teacher feedback</td>
<td>IT difficulties</td>
</tr>
<tr>
<td>All respond – students and teacher know level of understanding</td>
<td>May be more time consuming than straight lecture</td>
</tr>
<tr>
<td>Must commit to an answer therefore know if right or wrong.</td>
<td>Time could be wasted with technical difficulties that occur.</td>
</tr>
<tr>
<td>Increase everyone’s participation</td>
<td>Technology not working as expected</td>
</tr>
<tr>
<td>More interactive than just listening</td>
<td>Teacher time to learn and develop use of clickers</td>
</tr>
<tr>
<td>Engage students</td>
<td>I don’t think I would use it for quizzes due to difficulty to control cheating.</td>
</tr>
<tr>
<td>Promotes discussion among peers.</td>
<td>May be too “trendy” student gets tired/bored with over use.</td>
</tr>
<tr>
<td>Interactive component increasing retention</td>
<td></td>
</tr>
<tr>
<td>Very visual therefore taping into another modality</td>
<td></td>
</tr>
<tr>
<td>Fast verification of student retention of new knowledge</td>
<td></td>
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<tr>
<td>Survey student opinions on ethical issues</td>
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PART B

3. After this introductory session, do you believe that using clickers in the classroom will help students to learn core concepts better? Why or Why not? (Total respondents: 18)

- It definitely has potential to help students learn care concepts, since it may invite them to develop more insight regarding what they understand. If they don't hopefully, it will motivate them to read/study more before or after class.

- Yes, it allows for more participation and provides another method of learning. It incorporates learning theory.

- It would enhance the learning that already takes place I believe, or at least make the learning more enjoyable.

- Yes, but this is subject dependant to some degree.

- Absolutely – reinforces content in an active manner.

- It depends – seems good for “knowledge based” questions.

- Yes, I do. It really makes you think, keeps you alert.

- Possibly, I think it depends on the concept. Some concepts are more directed at socialization (eg. Professional & legal issues) and tend themselves more to discussion. Clickers could be useful for looking at learning of knowledge, rather than critical thinking.

- Yes, allows them to respond privately/honestly to answers and may assist them to better understand their learning needs.

- Undecided.

- Yes, because they get a sense if they understood it or not.

- Yes, I believe the action of reading the Q, (They have to, to “play” the game and thinking and responding as well as checking the answer helps to commit the correct response to memory.

- It will ensure that a concept is well understood by the majority of students before moving on to more complex concepts.

- Yes, more engaged (must pay attention) – want to know the right answer – will know if they know the material and promotes discussion and deeper understanding.
• Yes, increases participation – students can see how they are doing in comparison to others – may motivate them to study more and we (as teachers) if students are understanding the concepts being taught.

• Depends on the concepts! Can help in certain cases.

• Yes, because it encourages revision of introduced concepts and allows for discussion and consolidation as a results.

• Perhaps yes if students could have a printout or have results emailed to them then students can see where extra studying of core concepts is needed. However, if students only see results for a few seconds, may not recall where deficits are.

PART B

4. After this introductory session, do you believe that using clickers would enable students to participate in classroom discussions in larger numbers and more frequently? Why or Why not? (Total respondents: 18)

• Yes, it might motivate the student to speak up more easily; especially when they find out they know the correct answer. But students are often enabled or not, not sure if clicker would help this issue, but would make classroom more fun and this is a good thing!

• It would allow for more students to participate. The anonymous value would also facilitate “the shy students” to answer/participate.

• Yes, if the classroom instructor sets up the lecture in that way only through. Clickers like overheads, if not used appropriately will be just as useless.

• Yes, the shy ones more likely to participate and decrease likely to worry about failure if they can participate anonymously.

• Yes – if guaranteed to be anonymous. Some students are paranoid they would and could be used against them.

• Having never used it – I am not sure – My case studies plus small group work is a method that works well.

• Yes, they are so shy most of them.

• I think this is a gadget that can be used as one of a number of classroom strategies. Like any strategy, overuse becomes tedious for students and teachers alike.

• Yes, it may allow all students who have a clicker to respond/participate. However, other times only a selected few get to respond to questions posed by the teacher due to time constraints.
• Yes, can base discussion on feedback – I enjoyed your presentation good luck!

• Yes, because even sky students would not hesitate to participate. It is fun; almost like playing Trivial Pursuit.

• It would motivate them to participate because they can plan answers in groups and individuals are not signaled out and silent as a result.

• Yes, I believe that when used appropriately it should increase student participation and their recall of prior knowledge and validating what they think they know and understand.

• Yes – all must answer. A technology that students may have experienced with computer games.

• Yes – Autonomous answers – don’t have to speak out with your answer. The feeling that they are one of a group answering questions.

• Have seen clickers in use in the classroom and have seen students participate! Thanks. Great presentation Judith!!

• Yes, because of the anonymity, as well as the fact that it is “new” technology for them and viewed as “fun”. I think the teacher still needs to use good communication skills to encourage discussion of answers as this is a time when students feel “judged” as well.

• Yes with ethical issues – good way to elicit opinions in a way that is non-threatening.