The Effects of Training, Experience, and Attitudes on Students' Assessment of Classroom Response Systems

by

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Disclaimer

The findings and conclusions are the author's alone and do not represent the views of Fanshawe College.

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Abstract

This research project explores the role of training, experience, and attitudes in student perceptions of classroom response systems. Five case studies of community college courses generated both quantitative and qualitative data through surveys, interviews, and observation. This data was collected at the beginning, mid-point, and end of a semester for the purpose of comparison. Study results suggest that faculty and student training, experience, and attitudes are not as significant in shaping the students' clicker experience as are other factors such as frequency of use.

Introduction

Instructional technology, in its many forms, has been embraced by post-secondary institutions. From the early and tentative introduction of computer-assisted learning into selected learning environments, to the recent and widespread adoption of classroom management systems such as Blackboard, instructional technology has, in the span of just over 30 years, become integral to the post-secondary learning environment. The classroom response system (CRS) is another instructional technology now gaining widespread acceptance at the post-secondary level. One manufacturer estimates 4 million students use its product in 100,000 classrooms (eInstruction, 2009).

While classroom response systems have been used in post-secondary institutions for over four decades, they have only become commercially available and therefore more mainstream since the mid-1990s (Freeman Herreid, 2006; Judson & Sawada, 2002). CRS technology was originally developed as a means of measuring employee, audience, and consumer response to training videos, television shows, and commercials but has since been adapted to other uses (Collins, 2007). Most familiar to the general public would be its use in the popular television show, *Who Wants to Be a Millionaire?*, to allow for audience polling. The primary impetus for their use at the post-secondary level, however, was the desire to increase engagement in large enrolment courses, particularly in first-year science courses (Judson & Sawada, 2002). Classroom response systems are now used at the post-secondary, secondary, and elementary levels with both small and large groups, and in a variety of disciplines (Caldwell, 2007).

Regardless of the educational context, the technology is consistent. Using either infrared or two-way radio frequency technology, a CRS transmits data from hand-held units (commonly referred to as “clickers”) to a receiver connected to a standard computer in the classroom.

Teachers prepare and ask questions, usually displaying the question and multiple choice responses through presentation software (e.g., PowerPoint) on a screen. Students answer using the hand-held units, either by pressing a button or entering data (e.g., words, numbers). Student responses may be anonymous or linked to individual students, depending on the application. The student responses are then displayed on a classroom screen, most often through a histogram. Responses may be linked to grades that are tracked by the CRS software, with students receiving points for correct (and sometimes incorrect) answers. Other uses of the CRS include attendance taking and in-class quizzing. The technology can be used with lap-top computers, cell phones, and PDAs. Notwithstanding these alternative technologies and uses, the most common CRS application has remained unchanged since the 1960s: student response to prepared multiple choice questions.

Judson and Sawada (2002), in their comprehensive review of CRS literature, found that early CRS research showed that this simple question-and-answer interaction between teacher and students increased the opportunity for formative assessment and increased student engagement. Some CRS studies have also shown a positive impact on learning outcomes, but a direct link is understandably more difficult to establish (Judson & Sawada, 2002). Studies of CRS implementation report an almost uniformly positive student response to the technology (Draper & Brown, 2004; Judson & Sawada, 2002). However, with very few exceptions (Trees & Jackson, 2007), these studies do not relate the student response to the training, experience, and attitudes of either students or teachers. Fewer still involve students and faculty at the post-secondary level outside of the United States. This exploratory study examines CRS implementation through five case studies at a Canadian community college, paying particular attention to the impact of training, experience, and attitudes on the student experience of clickers.

Literature Review

The major purpose of research in the area of instructional technology is to determine the effects of a technology on the learning environment and learning outcomes. A review of the classroom response system (CRS) literature from the late 1960s to 2009 reveals a focus on both the learning environment and learning outcomes and also parallels developments in pedagogy over the past 40 years.

Classroom response systems were first used in post-secondary institutions in the traditional lecture halls of the 1960s (Barnett, 2006; Collins, 2007; Judson & Sawada, 2002). During or at the end of a lecture, professors would ask students questions; students would then respond individually to the questions using a response mechanism, usually hardwired to their seat. The results provided immediate feedback to the professor and, depending on the product and professor inclination, to the students as well. While most questions gauged student comprehension of the lecture content, other questions related to the instruction itself, allowing students to comment on the pace of the lecture (i.e., too slow, too fast) or the content (i.e., need more examples). This use of the CRS was consistent with the then-predominant behaviourist approach to learning and stimulus-response theory (Judson & Sawada, 2002). Early research studying this particular use of the CRS provided no evidence of improved academic performance but did show that students endorsed the CRS (Judson & Sawada, 2002).

A subsequent increase in CRS use at the post-secondary level coincided with the growing interest in and eventual acceptance of constructivism (Piaget, 1953) and then social constructivism (Vygotsky, 1978) as valid approaches to teaching and learning. In the 1980s, these theories gave rise to a variety of pedagogies: hands-on learning, active learning, experiential learning, discovery-based learning, and collaborative learning. Formative

assessment took on new importance as teachers were encouraged to constantly assess the quality of learning and adjust the learning environment to meet the needs of the learners. At the post-secondary level, the emergence of these new theories challenged the long-held acceptance of the traditional lecture as the ideal learning environment.

Chickering and Gamson (1987) addressed these criticisms of higher education and the value of these new educational theories in their landmark article, *The Seven Principles for Good Practice in Undergraduate Education*, and subsequent book (1991). The authors stated that good practice in undergraduate education:

1. encourages contact between students and faculty,
2. develops reciprocity and cooperation among students,
3. encourages active learning,
4. gives prompt feedback,
5. emphasizes time on task,
6. communicates high expectations, and
7. respects diverse talents and ways of learning. (Chickering & Gamson, 1987, pp. 307)

Despite the widespread acceptance of these principles of good practice, largely critical of the traditional lecture, economic realities dictate the continued use of large lecture theatres at most post-secondary institutions. However, efforts were made to implement Chickering and Gamson's 'good practices' within the lecture format. The CRS is one example of how instructional technology was seen as a means of directly addressing at least the first four of Chickering and Gamson's principles within the constraints of a lecture hall. The CRS could, in theory, increase contact between students and faculty, create a collaborative and active learning environment, and provide prompt feedback (Martyn, 2007).

Correspondingly, CRS research published since the 1990s was based on the assumption that the traditional lecture model was inadequate largely because it could not accommodate the interaction required by constructivism, social constructivism in particular (Draper & Brown,

2004). The research also reflects that CRS use remained primarily in the physical sciences at post-secondary institutions. Four key studies, some directly related to CRS use but others more broadly focused on interaction within the lecture environment, were published at this time and they remain widely cited in the literature. Hake (1998) studied 6,000 students enrolled in an American undergraduate physics course, concluding that interactive engagement methods, some of which incorporated a CRS, produced better learning outcomes versus traditional (passive) methods. Because of its breadth and its examination of learning outcomes using standardized evaluation methods, Hake's study is often cited in CRS research as support for the value of interactive teaching methods within large-enrolment lectures.

Similarly, Crouch and Mazur's (2001) study of peer instruction incorporating CRS use is widely cited. Based on their ten years of experience with large-enrolment introductory physics courses, the authors conclude that peer instruction improves students' test scores and problem-solving skills. Like Hake's (1998) study, Crouch and Mazur's study measured student performance on standardized tests; however, unlike Hake, Crouch and Mazur also studied student attitudes, reporting a generally positive response to peer instruction (Crouch & Mazur, 2001). The results of Hake, of Crouch and Mazur, and of other researchers prompted Judson and Sawada to conclude that "recent studies have indicated there is significant student increase of conceptual gains in physics when electronic response systems are used to facilitate feedback in a constructivist-oriented classroom" (Judson & Sawada, 2002, p. 167).

A third widely cited study, published by Draper and Brown (2004), addressed the limited application of the above studies to CRS technology. Like their predecessors, Draper and Brown were motivated by a desire to improve the learning environment of the traditional lecture. However, this two-year study departed from the above studies in that it directly examined CRS

implementation across several disciplines and in several contexts in an effort to generalize the findings beyond physics education. Furthermore, its focus was less on outcomes and more on faculty and student evaluations of CRS. The authors concluded that CRS "does provide a modest but worthwhile augmentation in the quality of the learning and teaching in lectures in the opinion of both learners and teachers" (Draper & Brown, 2004, p. 88). They found the most promising CRS applications in a lecture environment were within interactive engagement (echoing Hake above) and 'contingent teaching,' defined by Draper and Brown as having teaching "depend on the actions of the students, rather than being a fixed sequence pre-determined by the teacher" (Draper & Brown, 2004, p. 91).

The Draper and Brown study was a landmark study that supported the findings of earlier studies of a smaller scope and prompted many researchers to replicate its findings. The positive impact of clickers in various post-secondary settings, primarily in terms of increased student engagement and improved formative assessment, is supported by many studies that preceded and followed Draper and Brown (c.f., Conoley, Moore, Croom, & Flowers, 2006; Cutts, Kennedy, Michell, & Draper, 2004; Dufresne, Gerace, Mestre, & Wenk, 1996; Fies & Marshall, 2008; McConnell, Steer, & Owens, 2003). However, there are studies that have reported inconsistent results, primarily with regard to the impact of clickers on learning outcomes, the result being the suggestion of caution on the part of some researchers (c.f., Crossgrove & Curran, 2008; Mayer, et al., 2009; O'Donoghue & O'Steen, 2007; Watkins & Sabella, 2008; Willoughby & Gustafson, 2009; Yourstone, Kraye, & Albaum, 2008).

The fourth key study, published by Trees and Jackson (2007), has pointed CRS research in new directions and, surprisingly, challenged the dismissal of the lecture as a poor learning environment. Trees and Jackson (2007) focused on the social and educational infrastructure

needed for a successful CRS implementation in assessing the survey responses of over 1500 undergraduates. The authors conclude that several factors influence students' perceptions of CRS, including the students' attitudes towards the learning environment. For example, a student who dislikes lectures and prefers a more active learning environment is more likely to embrace the CRS; however, a student who prefers the more passive lecture environment is less likely to respond favourably to the CRS. These conclusions, argue the authors, "suggest a tempering of the arguments supporting RS [response system] adoption in university classrooms" (p. 34).

In essence, Trees and Jackson advocate for the thoughtful implementation of CRS technology, emphasizing that good CRS practice places pedagogy first and technology second. The failure of institutions and educators to place pedagogy first is at the heart of some researchers' critiques of the CRS in particular (Bujega, 2008) and instructional technology in general (Clark, 1983). However, more common among researchers is agreement that CRSs are beneficial and "the benefit does not depend simply on the technology but on how well it is used on each occasion to promote, through learner interactivity or contingent teaching or both, thought and reflection in the learners" (Draper & Brown, 2004, p. 93). Many other studies have resulted in similar findings (c.f., Beatty, Gerace, Leonard, & Dufresne, 2006; Fies & Marshall, 2008; Graham, Tripp, Seawright, & Joeckel, 2007; MacGeorge, et al., 2008; Watkins & Sabella, 2008; Willoughby & Gustafson, 2009). This general consensus among CRS researchers is noted in the most recent comprehensive reviews of CRS literature. Fies and Marshall (2006) conclude that "there is great agreement that CRSs promote learning when coupled with appropriate pedagogical methodologies" (p. 106), and Simpson and Oliver (2007) state that "as noted repeatedly in the literature, the potential of these systems depends on the skills and approach taken by the teachers" (Impact on staff, ¶ 1).

These same literature reviews, and most CRS studies, highlight the need for more research into CRS applications. Fies and Marshall, for example, conclude that "there is insufficient research on what constitutes optimal conditions of use" (p. 101). Others suggest that "further exploration of factors relating to teacher attitudes and experience, course content, and student expectations would be beneficial" (Trees & Jackson, 2007, p. 37). Given the CRS is a relatively new technology, it is not surprising that there are gaps in the research.

Methodology

This research project features the case study approach using pre- and post-surveys of faculty and students, as well as observation and interviews. Case studies allow for a more comprehensive analysis of the context of each classroom response system (CRS) implementation than can be provided by survey data alone. Furthermore, five case studies at one institution allow for comparisons of both qualitative and quantitative data. Below is a brief project overview followed by a description of the research methodology, including a discussion of participants, data collection, and data analysis.

Project Overview

This research project explores the use of CRSs at Fanshawe College of Applied Arts and Technology (London, Ontario) in fall 2007 and addresses the following question: What impact do training, experience, and attitudes have on student perceptions of CRSs? Through five case studies, the project assesses the following: faculty training on clicker use, faculty and student experience with instructional technology in general and CRS in particular, and faculty and student attitudes towards information technology in general and clicker use in particular.

Fanshawe College is one of the largest of Ontario's 24 colleges of applied arts and technology, with a full-time enrolment of 15,000 students (Fanshawe College, 2008). Like all of Ontario's community colleges, Fanshawe offers career training through over 100 certificate, diploma, and applied degree programs. Fanshawe's main campus is in London, and satellite campuses are located in four smaller regional centres, including Woodstock. Each campus offers a limited selection of courses and programs in response to local need. Of the five case studies, three were situated at the London campus and two were at the Woodstock campus.

Participants

The research project involved five faculty volunteers and approximately 130 student volunteers from three courses at the London campus and two courses at the Woodstock campus of Fanshawe College. Faculty volunteers were recruited from among those intending to use a CRS and show variation in training, experience, and attitudes with regard to the CRS. In this way, the participating faculty determined the courses involved, as well as the student participants.

Data Collection

Five distinct cases are the focus of the research. The case study method generated both quantitative and qualitative data, facilitating triangulation through surveys, observation, and interviews. Furthermore, data was collected from faculty and students at the beginning and end of the semester. This research design is used in very few CRS studies, the majority of which use survey data collected only at the end of the semester (c.f., Crouch & Mazur, 2001; Draper & Brown, 2004; Hake, 1998; Trees & Jackson, 2007).

Two 10-minute anonymous surveys were administered to students and faculty, one in September prior to the introduction of the CRS and the second in December at the end of the semester. (See Appendix A: Research Instruments.) Most of the data collected through these pre- and post-surveys were quantitative in nature, with students providing demographic data and responding to statements through a five-response Likert scale, with choices ranging from Strongly Agree to Strongly Disagree. The pre-survey statements pertained to student and faculty experience with and attitudes towards instructional technology in general and clickers in particular, (e.g., "I am comfortable using instructional technology" and "Clickers will help me learn"). Post-survey statements explored the CRS experience for both faculty and students (e.g., "I would choose to use a classroom response system in another course" and "Clickers increased my participation in class"). The survey focused on student engagement but reframed the question using different terminology (e.g., "participation" and "engagement") and also specifically addressed student-teacher interaction as well as student-student interaction. Faculty surveys also included statements related to clicker training (e.g., "I received adequate training in the use of our classroom response system"). In addition, students and faculty were given the opportunity to provide comment at the end of both the pre- and post-survey.

The balance of data was gathered through observation and interview. Classes of participating faculty were observed once during the semester. (See Appendix A: Research Instruments for the classroom observation guide.) In addition, a one-hour, semi-structured interview was conducted with each participating faculty member at the end of the semester. (See Appendix A: Research Instruments for interview questions.) Interviews with faculty provided an opportunity to probe areas of interest; the results of the pre- and post-surveys were unknown at

the time of the interviews to ensure that survey results did not influence the focus or direction of the interviews.

In accordance with the ethics review board requirements at both Fanshawe College and the University of Alberta, all participants signed a consent form. (See Appendix B for Information Letters and Consent Forms.) The methodology allowed for student anonymity and the withdrawal of any participant (both faculty and student) from the study at any time. This study was categorized as low risk by both approving bodies.

Methods of Data Analysis

Quantitative methods of analysis were used for most survey data and some observation data, and qualitative methods of analysis were used for the balance of the survey data and observation data, as well as for the interviews. Quantitative data generated through the student pre- and post-surveys were grouped by case and input into a software application, SPSS 16.0 for Windows (SPSS Inc.), for simple statistical analysis, including cross-tabulations. Quantitative data generated through faculty surveys (e.g., demographics) and classroom observation (e.g., number of CRS questions asked in the class) were organized by case and simply recorded in a matrix and then analyzed manually. Pre-survey results were also compared with post-survey results to measure change over the semester for faculty and students.

Qualitative data from the faculty and student surveys (i.e., comments) and from the classroom observation (e.g., student behaviour) were recorded in a matrix, organized by case, and then coded. Interview data were similarly transcribed, organized, and coded for manual analysis. Information on faculty training, experience, attitudes was identified, and this information was then compared with the information provided by each faculty member in his or her pre- and post-surveys.

To facilitate linking of faculty with the corresponding student data, necessary because of the case study approach, faculty surveys were not anonymous. This allows faculty data to be linked to his or her students for both the pre- and post-surveys. However, the findings as presented here do not identify the faculty participant. Student surveys were anonymous but grouped by case, again to allow faculty and student data to be linked. Therefore, findings report aggregated data of the students as a case (or a class) but do not provide individual results (e.g., the change in a particular student's attitude over the semester).

Project Significance

With its focus on training, experience, and attitudes, this research project directly addresses some gaps in current research. Previous studies have typically focused on student perceptions of the CRS in isolation, without relating these perceptions to variables such as training, experience, and attitudes. This project focuses on these variables for both faculty and students, and includes both pre- and post-surveys to allow for a comparison over the semester, relatively rare in CRS research (MacGeorge, et al., 2008). In addition, in contrast with most CRS research at the post-secondary level, this study is conducted in Canada and in a community college. Finally, unlike most studies, this study is not authored by a faculty participant, and the faculty participants, like most community college faculty, are not engaged in academic research. In these ways, this research project attempts to make a unique contribution to the growing body of CRS research.

Findings

Research findings reveal very different classroom response system (CRS) experiences for the five groups. Following a brief discussion of the procedures used to sort, code, and interpret

the data, case data will be presented in detail. The five groups (teacher and students) will be identified as Case A, Case B, Case C, Case D1, and Case D2. (Case D1 and D2 share the same student population but have different faculty; the same group of students used clickers in two courses.)

Aggregate data was generated for both the pre- and post-survey, providing baseline and summative data. However, the primary focus of the analysis is on frequencies and descriptive statistics for each case; data was processed for each group of students for both pre- and post-surveys, allowing for a comparison of pre-survey and post-survey aggregate results for each group, and some comparisons between groups. Software was also used to determine statistically significant differences between group results for the post-survey data. For summary purposes, the "Agree" and "Strongly Agree" responses were grouped and identified as a positive response, and the "Unsure", "Disagree" and "Strongly Disagree" responses were grouped and identified as not positive.

Demographics

All five faculty participants were over the age of 40, two were female and three male, and four professors had over 20 years of teaching experience. The faculty members taught courses in business communications, human resources, geography, fitness, and nutrition. (See Table 1.)

The total number of student respondents ranged from 130 (pre-survey) to 141 (post-survey). (See Table 1.) In both surveys, the response rate ranged from a low of 52 to a high of 94 percent for each group. The overall response rate was 65 percent for the pre-survey and 71 percent for the post-survey. The age and gender composition of the aggregate remained constant for the pre- and post-surveys; however, there was variation across the groups. Across all student groups for both the pre- and post-surveys, 89 percent of students were 25 and under. Similarly,

across all student groups for both surveys, the majority (70 percent) of students were female. All students were enrolled in two-year, undergraduate diploma programs, and all but one group (Case B) were in the first year of their program. (See Appendix C and D for full demographic data for student pre- and post-surveys respectively.)

Table 1
Student Pre-Survey and Post-Survey Details

Case	Campus	Diploma Program	Level	Course Enrolment	Pre-Survey Respondents	Post-Survey Respondents
A	Woodstock	Business – Human Resources	First Year	35	29	31
B	Woodstock	Business – Human Resources	Second Year	30	23	25
C	London	Tourism and Hospitality	First Year	36	34	23
D1*	London	Fitness and Health Promotion	First Year	48	44	36
D2*	London	Fitness and Health Promotion	First Year	50		26
TOTALS				**199**	**130**	**141**

* Cases D1 and D2 share the same student population but have different faculty; the same group of students used clickers in two courses.

Implementation and Logistics

CRS implementation was handled differently at the two Fanshawe College locations. At the London campus, where three courses were delivered, students purchased a Turning Point radio frequency clicker manufactured by Turning Technologies. The clicker was packaged with required course resources, adding $20-$30 to the cost of the course materials. Students registered their clickers online at no additional cost and were responsible for bringing the clicker to class. In these three courses, therefore, not all students had a clicker in each class as some did not buy the textbook and others forgot to bring their clicker.

At the Woodstock campus, where the remaining two courses were delivered, CPS radio frequency clickers, manufactured by eInstruction, were provided to students in class when they were needed. This approach ensured that each student was equipped with a clicker. The average student participation rate for individual clicker questions at each of the campuses, as noted in the classroom observation, was in the 70 percent range despite the different implementation models. There was significant variation, however, across the cases. The average student participation for group clicker questions at the Woodstock campus approached 100 percent; group questions were not asked at the London campus.

All students enrolled in the five courses, regardless of whether they purchased a clicker and whether they participated in class, were given the opportunity to complete the pre- and post-surveys.

Aggregate Results

A summary of the aggregate student data from the pre- and post-surveys follows. In the pre-survey, only one quarter of all respondents had any experience with CRS. Positive (i.e., "Agree" and "Strongly Agree") responses to the three Likert-style survey statements are shown in Table 2. Overall, the aggregate data indicate a high level of comfort with instructional technology, less confidence in the helpfulness of instructional technology in general, and even lower levels of confidence in the helpfulness of clickers in particular. Full pre-survey results for each case are provided in Appendix C.

TABLE 2
Student Pre-Survey Aggregate Responses

Pre-Survey Statement	Agree and Strongly Agree %
I am comfortable using instructional technology. *n=130*	82
Instructional technology enhances my learning. *n=130*	54
Clickers will help me learn. *n=127*	37

Post-survey results are summarized in Table 3 and full results are provided in Appendix D. Again, only positive (i.e., "Agree" and "Strongly Agree") responses to the survey statements are shown. Over the semester, the students maintained a high level of comfort with instructional technology and showed only a very slight increase in their belief in the ability of instructional technology to enhance learning (from 54 percent to 67 percent). Just over half of the students felt that the CRS enhanced their learning, despite a greater majority of students agreeing that the CRS increased their classroom participation, increased student-teacher interaction, increased student interaction, and increased their level of engagement in the class and with the course materials. Surprisingly, while 60 percent of respondents would recommend a clicker class, only 30 percent would take another clicker class themselves.

Aggregate data representing a composite of all student groups seem to present a more negative student assessment of clickers than most CRS studies. However, specific case data reveals sizeable differences among the student populations, which is the focus of this research project. The following case data is presented in the sequence it was gathered for each group: Pre-Survey, Classroom Observation, Post-Survey, and Interview. (See Appendices C through F for full student and faculty survey results. See Appendix G for Faculty Interview Transcripts.)

TABLE 3
Student Post-Survey Aggregate Responses

Post-Survey Statement	Agree and Strongly Agree %
I am comfortable using instructional technology. *n=140*	89
Instructional technology enhances learning. *n=141*	67
Clickers helped me learn the material better than if they had not been used. *n=141*	53
Clickers increased my participation in class. *n=140*	73
Clickers increased student-teacher interaction in my class compared to similar classes. *n=141*	63
Clickers increased interaction among students in this class compared to similar classes. *n=140*	57
Clickers increased my level of engagement in the classroom compared to similar classes. *n=141*	67
Clickers increased my level of engagement with the course material. *n=141*	62
I would recommend a class that uses a clicker to other students. *n=141*	60
I am more likely to take a class if I know clicker will be used. *n=141*	30

While the students in Case D were involved in two clicker implementations, there were no statistically significant differences between the post-survey results for Group D1 and Group D2. Therefore, for the purpose of comparison with the other student groups, Group D1, the larger of the two groups, will be used to avoid giving undue weight to the students in Case D.

Case A: Woodstock Campus – First-Year Human Resources (Clicker Not Purchased)

Professor Pre-Survey. Professor A is a female with over 20 years' teaching experience. In the pre-survey, Professor A indicated that she was comfortable with instructional technology and PowerPoint and "strongly agreed" that instructional technology enhances learning. She had previous clicker experience but "very little" training. With regard to the CRS, she felt prepared to use the system in her own classroom and agreed that it would enhance learning. She

commented that implementing a classroom response system can be "time consuming" and that more training is required to generate "complex reports" from the software. Despite identifying these drawbacks, Professor A had a positive attitude toward instructional technology and the CRS, and was confident in her ability to use the system based on her experience and training.

Student Pre-Survey. Group A was one of the older groups of students, with a higher percentage of students in the 21-25 year range versus the 20-and-under range. The female/male ratio of approximately 60:40 is similar to the composition of two other groups. Only one student had previous experience with a CRS, making this an inexperienced group. Most of students (76 percent) expressed comfort with instructional technology (choosing either "Agree" or "Strongly Agree); however, only half (55 percent) agreed that instructional technology is helpful. With regard to the CRS, only one third of students (35 percent) believed clickers would be helpful, with the majority (62 percent) unsure.

Observation. Group A was observed in Week 6, almost mid-way through the 14-week semester. The CRS was used in two ways in the Group A classroom on the day the class was observed: 1) group activity ("Jeopardy"-like game) and 2) individual activity (review quiz of commonly misspelled words). The participation rate based on students present was 100 percent for the group activity and ranged from 66 to 86 percent for the individual review, depending on the question. Questions and aggregate results were displayed on a screen. No grades were associated with either activity and participation was largely anonymous. The CRS data was not saved by the professor. Some students/teams were unsure if their units were functioning properly, which required professor intervention.

The group activity tested students' knowledge of key concepts through 16 multiple choice questions. During the game, the professor interacted with students outside of the CRS,

asking the class probing questions (e.g., "Why is this answer wrong?") and following up if the majority or even a significant minority of students chose the wrong answer. Students were silent when reading the questions, but vocal and animated when discussing the question among themselves. Overall, students appeared engaged, laughing and eager to explain their correct answers. They asked to see team "standings" mid-game and applauded the winning team at the end; members of the winning team stood and raised their arms. Later in the class, students participated in a 15-minute individual activity (spelling quiz), which also featured multiple choice questions. Students were attentive and silent during this quiz; however, not all students participated despite having been provided with a clicker.

Considered together, the group activity and the individual activity directly addressed the first four of Chickering and Gamson's principles for good practice in undergraduate teaching. They encouraged contact between students and faculty, developed reciprocity and cooperation among students, encouraged active learning, and provided prompt feedback.

Professor Post-Survey and Interview. Post-survey data is not available for Professor A; however, she did participate in an interview at the end of the semester. (See Appendix G for Faculty Interview Transcripts.) Professor A, the professor with the most CRS experience of the two professors with experience, recalled that she had started the semester with a positive attitude based on her previous CRS use. Professor A identified two reasons for her positive outlook: the implementation model (clickers provided by the College versus purchased by the students) and less preparation required because of her prior use in the same course. Her original training, four to five years prior, as well as ongoing support had been provided by a self-taught colleague who had taken on an informal trainer role at the Woodstock campus. The manufacturer had not provided any formal training over the five years, but had been available by phone for

troubleshooting. Professor A used the CRS five times over the semester, often dividing the class into groups for a content review structured as an ungraded team competition. Professor A characterized the CRS as another tool in the teacher's toolbox and cautioned against its overuse, commenting, "I didn't get the impression that they wanted me to do it more or less." Professor felt that the CRS had a positive impact on both student engagement and learning, noting in particular the value of instant feedback for teacher and student.

Student Post-Survey. Group A students demonstrated a positive attitude toward the CRS when compared with students in the other groups. (See Table 4 for a summary of survey results and a comparison with the results of the other groups. Appendix D provides full post-survey student data.) First, with regard to instructional technology, all of Group A respondents indicated that they were comfortable with instructional technology, an increase from the pre-survey result (76 percent), and a more positive post-survey response than that of the other groups.

A large majority of respondents found the CRS to be helpful in this course, significantly higher than the average of the other groups at only 49 percent. This very favourable response is particularly noteworthy given that in the pre-survey, only a third of Group A students felt that CRS would be helpful; this is a significant change in attitude over the course of the semester. Not surprisingly, most Group A students would recommend a clicker class to other students; however, only a third would take another clicker class and almost half expressed uncertainty about taking another clicker class.

TABLE 4
Student Post-Survey Responses: Comparison of Group A with Other Groups

Post-Survey Statement	Group A % Agree and Strongly Agree	Groups B, C and D1 % Agree and Strongly Agree
I am comfortable using instructional technology.*	100 *n=31*	87 *n=84*
Instructional technology enhances learning.	74 *n=31*	71 *n=84*
Clickers helped me learn the material better than if they had not been used.*	77 *n=31*	49 *n=84*
Clickers increased my participation in class.	87 *n=31*	71 *n=84*
My sense is that clickers increased student-teacher interaction in my class compared to similar classes.	74 *n=31*	67 *n=84*
My sense is that clickers increased interaction among students in this class compared to similar classes.	74 *n=31*	55 *n=84*
Clickers increased my level of engagement in the classroom compared to similar classes.	77 *n=31*	68 *n=84*
Clickers increased my level of engagement with the course material.	74 *n=31*	61 *n=84*
I would recommend a class that uses a clicker to other students.	74 *n=31*	61 *n=84*
I am more likely to take a class if I know clicker will be used.	36 *n=31*	36 *n=110*

* statistically significant ($p<.05$)

No students provided comments in the post-survey.

Group A ranked anonymity highest among the aspects of the CRS that they liked best, with half of the students choosing “My responses are anonymous” from the list of CRS features. Approximately one quarter of the students chose “I see immediate results” and slightly fewer chose “I can provide immediate feedback”. (See Appendix D.)

Case B: Woodstock Campus – Second-Year Human Resources (Clicker Not Purchased)

Professor Pre-Survey. Professor B is a male with between 6 and 10 years' teaching experience. Like Professor A, in the pre-survey Professor B indicated that he was comfortable with instruction technology and PowerPoint, and "Agreed" that instructional technology enhances learning. With regard to the CRS, he had previous clicker experience and training, felt prepared to use the system in his classroom, and felt that it would enhance learning. Also like Professor A, Professor B was critical of CRS technology, commenting that a "drawback" of the CRS was the requirement to import questions into the software. Overall, however, this professor had a positive attitude toward instructional technology and CRS, and approached the CRS implementation with confidence based on his prior experience and training.

Student Pre-Survey. Group B is the only second-year cohort in the study, and as would be expected, is the oldest cohort, with approximately 80 percent of students over age 20 and one quarter over 35. The gender composition was 70 percent female and 30 percent male, similar to that of the other groups. Of all the groups, Group B is the only group that can be characterized as experienced with a CRS, with almost all students responding that they had prior classroom experience with a CRS. (Significantly, the prior exposure had required the purchase of the clicker, but very little CRS use in the classroom.) All respondents indicated that they were comfortable with instructional technology, and three quarters of respondents believed instructional technology to be helpful. The majority (65 percent) believed the CRS to be helpful; presumably, this opinion was based on their previous CRS experience. In summary, Group B is the oldest group, the only group with CRS experience, and the most positive group with regard to their attitude toward instructional technology and CRS at the beginning of the semester.

Observation. Group B was observed in Week 11, in the last quarter of the semester. Professor B used the CRS in two ways on the day the class was observed: 1) in a group activity ("Jeopardy"-like game) and 2) individual activity (introduction of key concepts and discussion prompt). The participation rate was 100 percent for the group activity and ranged from 83-100 percent for the individual activity. Questions and aggregate results were displayed on a screen. No grades were associated with participation in either activity. The CRS data was not saved by the professor.

CRS responses were not truly anonymous in this classroom. Because Professor B wanted to ensure that the hand-held units were functioning, he asked "Who's got Number 4?", referring to clicker number 4. He also asked, after students had responded to a controversial question ("Who has falsified a resume?"), for students to explain their answer. Students experienced minor issues with some the "new" units in that an extra click was required when responding. The professor conducted a quick test at the outset of class to ensure that all units were functioning.

The group activity included 25 questions designed to test students' comprehension of key concepts covered in the previous class. Teams were quiet and attentive during the game, with some consultation among team members before a response was given. The individual activity involved over 10 questions and was more informal in that questions were asked throughout the class. These questions served as a springboard to discussion, which was led by the professor but saw active participation from most students. A mix of question types was used in both the group and individual activities: yes/no and multiple choice. (Some questions required clarification from the professor.) Throughout the class, Professor B asked many oral questions in addition to CRS questions.

Like Case A, the two activities, when considered together, directly addressed the first four of Chickering and Gamson's principles for good practice in undergraduate teaching by

encouraging contact between students and faculty, developing reciprocity and cooperation among students, encouraging active learning, and providing prompt feedback.

Professor Post-Survey and Interview. Consistent with his pre-survey results, Professor B provided a very positive assessment of the CRS implementation in the post-survey, choosing either "Agree" or "Strongly Agree" in response to all statements.

In his interview, Professor B confirmed that he approached the CRS implementation with a positive attitude, based on his limited CRS use in the prior semester. (See Appendix G for Faculty Interview Transcripts.) He felt that his initial training two years earlier was not relevant because of the time lapse; much more relevant was the ongoing support and informal training provided by staff and faculty colleagues at the Woodstock campus. He also accessed online training to augment this informal support network. Professor B's use of the CRS included pre-set, structured multiple choice questions, on-the-fly questions, and structured games. The purpose was to review content and prompt discussion without any grades attached, and the CRS was used throughout the semester, but not in every class. Students answered individually or in groups but always anonymously in that the data was not saved. Professor B felt that the CRS had a "very strong" positive impact on both engagement and learning, citing anonymity as an especially attractive feature for the students "who don't want to sound dumb."

Student Post-Survey. Group B post-survey results are mixed. (See Table 5 for a summary of survey results and a comparison with the results of the other groups. Appendix D provides full post-survey student data.) Group B students rated their CRS experience more favourably than the other groups in almost all areas. Like Group A students, all Group B students expressed comfort with instructional technology in the pre-survey, and this result was unchanged in the post-survey.

A large majority (84 percent) of Group B students "Agree" or "Strongly Agree" that instructional technology is helpful, higher than the average of the other groups.

TABLE 5
Student Post-Survey Responses: Comparison of Group B with Other Groups

Post-Survey Statement	Group B % Agree and Strongly Agree	Groups A, C, and D1 % Agree and Strongly Agree
I am comfortable using instructional technology.	100 *n=25*	88 *n=90*
Instructional technology enhances learning.	84 *n=25*	69 *n=90*
Clickers helped me learn the material better than if they had not been used.	52 *n=25*	58 *n=90*
Clickers increased my participation in class.	76 *n=25*	76 *n=90*
My sense is that clickers increased student-teacher interaction in my class compared to similar classes.	80 *n=25*	66 *n=90*
My sense is that clickers increased interaction among students in this class compared to similar classes.	72 *n=25*	57 *n=90*
Clickers increased my level of engagement in the classroom compared to similar classes.	68 *n=25*	71 *n=90*
Clickers increased my level of engagement with the course material.	76 *n=25*	61 *n=90*
I would recommend a class that uses a clicker to other students.*	80 *n=25*	60 *n=90*
I am more likely to take a class if I know clicker will be used.	44 *n=25*	33 *n=90*

* statistically significant ($p<.05$)

Group B students were more positive than the other groups in several areas, giving higher ratings to the following statements: clickers increased student-teacher interaction, clickers increased student interaction, and clickers increased level of engagement with course material. However, Group B provided results at or close to the other groups' results with regard to their overall assessment of the helpfulness of clickers in assisting their learning, as well as their ability to increase participation and engagement in the classroom. Interestingly, this group of

experienced CRS users was somewhat less positive in the post-survey than in the pre-survey with regard to their assessment of the helpfulness of clickers. Despite the ambiguity of Group B responses, 80 percent of Group B students would recommend a clicker class to others, significantly more than the other groups (60 percent).

Only a few students provided comment, most of them favourable (e.g., "I think clickers are a good asset to a class as they can keep the student and teacher on the same page without having to be centred out"). Several students provided suggestions on clicker use (e.g., "It would be nice see them used more often but I would not base my class selection on clicker alone").

Group B ranked immediate results highest among the CRS features they liked best (48%), followed by anonymous responses (32%), and immediate teacher response to student feedback (16%). (See Appendix D.)

Case C: London Campus – First-Year Tourism and Hospitality (Clicker Purchased)

Professor Pre-Survey. Professor C is a female with over 20 years' teaching experience. In the pre-survey, she indicated that she was not comfortable with instructional technology but was comfortable with PowerPoint. She agreed that instructional technology enhances learning. She had no prior CRS experience, but agreed that a CRS would enhance learning. Professor C had received training but did not feel prepared to use the CRS in the classroom, commenting that the training has been very brief and confusing at times". Professor C had a positive attitude toward the CRS but, unlike Professors A and B, was not confident in her own preparation.

Student Pre-Survey. Group C is the youngest group of the five groups, with almost all students age 25 and under. Group C also had a higher proportion of female students when compared with the other groups (88 percent female, 12 percent male). Almost no students had CRS experience.

Significantly, almost all respondents indicated they were comfortable with instructional technology, highest of all groups, but less than half believed instructional technology to be helpful, with the other half unsure, and only a third believed clickers would be helpful, with two thirds unsure. Although they had a high level of comfort with instructional technology, they also had a high level of uncertainty regarding the usefulness of instructional technology and the CRS. This uncertainty among the students mirrors the uncertainty expressed by their teacher.

Observation. Group C was observed in Week 7, mid-way through the semester. In the class observed, the CRS was used to deliver a pre-test at the beginning of a unit. Sixteen CRS questions were asked, a combination of written prompts and photographs in multiple choice, true/false, yes/no formats. Questions and aggregate results were displayed on a screen. No grades were associated with participation in the pre-test, and the CRS data was not saved by the professor. The professor interrupted class at one point to check on a student's clicker in an attempt to increase participation; reinserting the batteries solved the problem.

Most students responded to clicker questions; the participation rate ranged from 88 to 92 percent. Of the 26 students in attendance, almost all had their handheld units with them. The class was quiet during the pre-test; groans and sighs were sometimes audible when results were displayed and the correct answer revealed. Although the pre-test was meant to be an individual exercise, there was some whispering among students during the questions, suggesting collaboration. The professor followed up each question with comments after results were displayed.

CRS use in this class directly addressed only three of Chickering and Gamson's principles for good practice in undergraduate teaching because, while the pre-test encouraged contact between students and faculty, encouraged active learning, and provided prompt feedback,

as an individual activity, the questions did not develop reciprocity and cooperation among students.

Professor Post-Survey and Interview. In the post-survey, Processor C provided a positive assessment of the CRS, but continued uncertainty with regard to her own clicker use. A comparison with the pre-survey results reveals that Professor C remained uncomfortable with instructional technology and comfortable with PowerPoint. However, her belief in the value of instructional technology strengthened from "Agree" in the pre-survey to "Strongly Agree" in the post-survey. Professor C continued to demonstrate a high level of uncertainty about her own mastery of the CRS; she was unsure of the adequacy of her training, unsure of her own comfort level with clickers, and unsure whether she would change the way she uses clickers in the future. This uncertainty is somewhat surprising given Professor C's positive response to all other statements regarding the impact of the CRS on the learning; she agreed that the CRS enhanced learning, increased participation, increased student-teacher interaction, increased student-student interaction, and improved student engagement. Professor C indicated that she would use the CRS again.

In her interview at the end of the semester, Professor C described herself as "definitely nervous" but "hopeful" at the outset of the semester. (See Appendix G for Faculty Interview Transcripts.) Although inexperienced with the CRS, she found the pre-semester training sessions to be unhelpful: "I didn't find that training particularly effective for my learning style." What she found more helpful was the ongoing support provided by the sales representative who attended her first class, provided training documentation, and responded to questions throughout the semesters. With this support she was able to train herself throughout the semester and build confidence. She emphasized that students used the clickers in every class except for the two

classes in which the students wrote tests, commenting, "I wanted to use them faithfully to make sure they knew it was worth their while to have them with them Monday and Friday mornings." Consistent with the classroom observation data, Professor C confirmed that she used the CRS for ungraded pre- and post-tests (multiple choice questions) in each unit. She found this use to be very effective for herself and the students. With regard to engagement, Professor C stated, "My gut feeling is that it was very positive for student engagement." She reported that students without clickers generally disengaged from active participation and, when she attempted to conduct a similar pre-test using a show of hands, participation dropped noticeably.

Student Post-Survey. Group C had the most positive CRS experience of all the groups, and exhibited the most striking change in attitude when comparing pre- and post-survey results. (See Table 6 for a summary of survey results and a comparison with the results of the other groups. Appendix D provides full post-survey student data.) In the pre-survey, less than half of respondents agreed or strongly agreed that instructional technology enhances learning; in the post survey, that figure increased to 78 percent, a significant increase over the pre-survey result for Group C and comparable to the other groups at 65 percent. Correspondingly, Group C students were most positive in their assessment of the CRS, again a significant change when compared with their pre-survey expectations. In the pre-survey, a minority of 30 percent agreed or strongly agreed that the CRS would help them learn; in the post-survey, that figure increased to a large majority (83 percent), the highest rating among the groups and significantly higher than the average of the other groups (50 percent). Group C students rated the CRS highly in all other indicators, with the responses more positive than the average response of the other groups in all areas except one (i.e., CRS impact on student interaction). A group-high of 91 percent would recommend a clicker class to other students (compared to the other groups at 58 percent)

and 61 percent would take another clicker class (compared to the other groups at 29 percent). Both of these differences are statistically significant.

TABLE 6

Student Post-Survey Responses: Comparison of Group C with Other Groups

Post-Survey Statement	Group C % Agree and Strongly Agree	Groups A, B, and D1 % Agree and Strongly Agree
I am comfortable using instructional technology.	91 *n=23*	90 *n=92*
Instructional technology enhances learning.	78 *n=23*	71 *n=92*
Clickers helped me learn the material better than if they had not been used.*	83 *n=23*	50 *n=92*
Clickers increased my participation in class.	87 *n=23*	73 *n=92*
My sense is that clickers increased student-teacher interaction in my class compared to similar classes.	78 *n=23*	66 *n=92*
My sense is that clickers increased interaction among students in this class compared to similar classes.	57 *n=23*	61 *n=92*
Clickers increased my level of engagement in the classroom compared to similar classes.*	96 *n=23*	64 *n=92*
Clickers increased my level of engagement with the course material.*	83 *n=23*	60 *n=92*
I would recommend a class that uses a clicker to other students.*	91 *n=23*	58 *n=92*
I am more likely to take a class if I know clicker will be used.*	61 *n=23*	29 *n=92*

* statistically significant ($p<.05$)

As expected given the above results, student comments were primarily positive (e.g., "I found the clicker very helpful esp. those who learn visually. I saw myself do a lot better using the clicker than classes I didn't. Thanks!!"). One student commented on technical problems (e.g., "The hardware itself gave me problems, having to rotate batteries to continue use was not convenient".).

Like Group A, Group C ranked anonymity highest among the aspects of the CRS they liked best (39 percent), followed by immediate results (35 percent) and immediate response of teacher (13 percent). (See Appendix D.)

Case D: London Campus – First-Year Fitness and Health Promotion (Clicker Purchased)

Case D involves one group of students registered in two "clicker" courses with two different professors, Professor D1 and Professor D2. Case D students completed only one pre-survey, but two post-surveys, one for each course/professor. Therefore, pre-survey data will be presented as Case D, but post-survey data will be presented as Case D1 and D2.

Professor Pre-Survey. Professor D1 is a male with over 25 years' teaching experience. In the pre-survey, Professor D1 indicated that he had a high level of comfort with both instructional technology and PowerPoint, replying "Strongly Agree" to each statement, and he strongly agreed that instructional technology enhances learning. He had no prior CRS experience but had received training. He felt fully prepared to use clickers and believed that clickers would enhance learning. Compared with the other professors, Professor D1 had the most positive attitude toward instructional technology and the CRS, and the most positive assessment of his own skill level and training.

Professor D2 is a male with over 20 years' teaching experience. In the pre-survey, he indicated comfort with instructional technology and PowerPoint and agreed that instructional technology enhances learning. Like Professor D1, he had no clicker experience but had received training. However, in contrast to Professor D1, he felt unsure whether he was prepared to use clickers in the classroom and unsure whether clickers would enhance learning. Professor D2 acknowledged his uncertainty, stating, "This is all very new to me and hopefully I'll gain

confidence as the semester unfolds." He also indicated his desire to "expand usage in the following semesters."

Student Pre-Survey. Like Group C, Group D is a relatively young group, with almost all of the students age 25 and under. The gender breakdown is 61 percent female and 39 male, identical to Group A. A minority (16 percent) indicated they had previous experience with clickers, the only group other than Group B with some clicker experience. Almost three quarters indicated they were comfortable with instructional technology and half believed instructional technology to be helpful. Only one third of Group D students believed clickers would be helpful, and two thirds were unsure. Overall, Group D, relative to the other groups, was not as positive toward instructional technology and clickers.

Observation. Group D1 was observed in Week 7, mid-way through the semester. In the class observed, the CRS was used to engage students in an assessment of a prior class activity that required students to perform specific exercises in the campus gym. Professor D1 asked 11 CRS questions, a mix of multiple choice and true/false, both types of questions used as prompts for discussion. Questions and aggregate results were displayed on a screen. No grades were associated with the questions and the CRS data was not saved by the professor.

The participation rate ranged between 44 and 70 percent of those students who were present. (Of the 34 students, eight students had forgotten their clickers.) CRS questions were interspersed throughout the class. (Students appeared engaged, sometimes giving an audible response when the results and correct answers were revealed. After each CRS question, Professor D1 led a three- to four-minute discussion during which he asked students oral questions.

A major technical problem, namely a delay in the tabulation and display of responses, required Professor D1 to skip over prepared questions in the interest of time. Clicker registration was also a problem. During these delays (while the professor attempted to address the problem), the students were not given another activity; however, the students appeared patient and helpful.

Group D2 was observed in Week 8, one week after Group D1, just past the mid-point of the semester. Professor D2 used the CRS for a quiz review, with the written quiz immediately following the review. Eleven clicker questions were asked, all true/false. Questions and aggregate results were displayed on a screen. No grades were associated with the quiz, and the CRS data was not saved.

The participation rate among those who had the clickers was 80 to 100 percent. Of those present, almost all had their clickers. CRS questions were positioned at the beginning of class, immediately before the quiz. Students appeared engaged, but there was some off-topic discussion among students seated in the back of the classroom. Interspersed with the CRS questions, were many oral questions, with a show of hands as a response.

Like Professor C, Professors D1 and D2, did not use the CRS as a tool to promote student interaction or collaboration and therefore addressed only three of Chickering and Gamson's principles for good practice in undergraduate teaching: encourage contact between students and faculty, encourage active learning, and provide prompt feedback.

Professor Post-Survey and Interview. In the post-survey, Professor D1 provided a less positive response, relative to the other professors, and high degree of uncertainty about the outcome of the CRS implementation. A comparison with the pre-survey results reveals no change in Professor D1's assessment of his own comfort with instructional technology and PowerPoint, and only a slight decrease in his assessment of the helpfulness of instructional technology

("Strongly Agree" in the pre-survey to "Agree" in the post-survey). While Professor D1 strongly agreed that he had adequate training and was comfortable with clicker use, he was "Unsure" whether the CRS enhanced learning, increased participation, increased student-teacher interaction, and improved engagement; he did not find that the CRS increased student interaction. Despite this assessment, Professor D1 indicated that he would use a CRS again, but was unsure if his use would change.

In the post-semester interview, Professor D1 described himself as an "early adopter" and eager to implement the CRS. (See Appendix G for Faculty Interview Transcripts.) He recalled his initial impressions of the CRS, stating, "When I first saw them demonstrated, it was very appealing. I thought it was a great participation opportunity that I was really anxious to try." He had no anxiety around the technology. New to the CRS, Professor D1 participated in one webinar training session and approached the sales representative for assistance throughout the semester. An in-house training session offered during the semester proved unhelpful because it was presented at an introductory level. As observed in the classroom, Professor D1 stated that the CRS was used in follow-up to a weekly group activity to survey student opinions with no grades attached. Professor D1 was uncertain whether the CRS increased student engagement, as he had conducted the same surveys through a show of hands. However, he felt that the CRS was a "modern" way of polling the students and that "students enjoy this kind of technology."

In his post-survey, Professor D2 provided a primarily positive assessment of the CRS. In a comparison with the pre-survey, Professor D2 was unchanged in his positive assessment of the helpfulness of instructional technology, as well as his assessment of his comfort level with instructional technology and with PowerPoint. With regard to the CRS, Professor D2 agreed that his CRS training was adequate and that he was comfortable with clickers. He also agreed that

clickers enhanced learning and strongly agreed that the CRS improved student engagement. However, he disagreed that clickers increased interaction among students and between teacher and students. Professor D2 indicated that would choose to use clickers again, although he would change the way he used clickers and listed alternative uses. Professor D2's post-survey comments summed up his positive assessment: "I believe it [clicker use for review] resulted in improved student grades."

Like Professor C, Professor D2 was inexperienced and nervous at the outset of the semester. In the interview at the end of the semester, Professor D2 stated, "I was very keen on using them [clickers] as a tool in the classroom but very stressed out about the technical aspect of it." (See Appendix G for Faculty Interview Transcripts.) Professor D2's only formal training was a training webinar that he accessed from his home computer; however, he commented that his training sufficed because he really had to "play with it" to master the technology. Like Professor C, Professor D2 valued ongoing support throughout the semester from the sales representative and colleagues. Professor D2 confirmed that he used the CRS in five classes over the entire semester, always for an interactive review (true/false questions) before a test to be given immediately after the review. The students received no marks for participation. Professor D1 felt that the CRS "definitely increases involvement and engagement in what's happening in the classroom."

Student Post-Survey. Students in Case D completed two post-surveys, one for professor D1 and another for Professor D2. Because there are no statistically significant differences between the post-survey results (Table 7) and D1 is the larger group (at 36 versus 26 students), only D1 post-survey results will be discussed and compared with the other groups' results, and will be referred

to as Group D. (See Table 8 for a summary of Case D1 survey results and a comparison with the results of the other three groups. Appendix D provides full post-survey student data.)

TABLE 7
Student Post-Survey Reponses: Comparison of Group D1 and Group D2

Post-Survey Statement	Group D1 % Agree and Strongly Agree	Group D2 % Agree and Strongly Agree
I am comfortable using instructional technology.	75 *n=36*	80 *n=25*
Instructional technology enhances learning.	58 *n=36*	46 *n=26*
Clickers helped me learn the material better than if they had not been used.	25 *n=36*	35 *n=26*
Clickers increased my participation in class.	58 *n=36*	60 *n=25*
My sense is that clickers increased student-teacher interaction in my class compared to similar classes.	50 *n=36*	39 *n=26*
My sense is that clickers increased interaction among students in this class compared to similar classes.	42 *n=36*	44 *n=25*
Clickers increased my level of engagement in the classroom compared to similar classes.	50 *n=36*	54 *n=26*
Clickers increased my level of engagement with the course material.	36 *n=36*	50 *n=26*
I would recommend a class that uses a clicker to other students.	28 *n=36*	42 *n=26*
I am more likely to take a class if I know clicker will be used.	14 *n=36*	4 *n=26*

NOTE: No comparisons between D1 and D2 were statistically significant at the .5 level.

Case D students had a negative CRS experience in both courses, providing ratings significantly lower than those of the other three groups in all areas. Group D students were less comfortable than the other students with instructional technology; only 75 percent indicated comfort with instructional technology, choosing either “Agree” or “Strongly Agree,” compared with the average of the remaining groups at almost 100 percent. Only 58 percent of Group D students agreed or strongly agreed that instructional technology enhances learning, compared

with the average of the other groups' responses at 79 percent. Both of these differences are statistically significant.

TABLE 8
Student Post-Survey Reponses: Comparison of Group D1 with Other Groups

Post-Survey Statement	Group D1 % Agree and Strongly Agree	Groups A, B, and C % Agree and Strongly Agree
I am comfortable using instructional technology.*	75 *n=36*	98 *n=79*
Instructional technology enhances learning.*	58 *n=36*	79 *n=79*
Clickers helped me learn the material better than if they had not been used.*	25 *n=36*	71 *n=79*
Clickers increased my participation in class.*	58 *n=36*	84 *n=79*
My sense is that clickers increased student-teacher interaction in my class compared to similar classes.*	50 *n=36*	77 *n=79*
My sense is that clickers increased interaction among students in this class compared to similar classes.*	42 *n=36*	68 *n=79*
Clickers increased my level of engagement in the classroom compared to similar classes.*	50 *n=36*	80 *n=79*
Clickers increased my level of engagement with the course material.*	36 *n=36*	77 *n=79*
I would recommend a class that uses a clicker to other students.*	28 *n=36*	81 *n=79*
I am more likely to take a class if I know clicker will be used.*	14 *n=36*	46 *n=79*

* statistically significant ($p<.05$)

With regard to the CRS in particular, only one quarter of Group D students believed clickers were helpful, compared with 71 percent of students in the other groups. A plurality of Group D students (47 percent) disagreed or strongly disagreed that clickers were helpful. On all other indicators, the Group D response is below the average of the other groups, and in all but one instance more students were clearly negative (choosing "Disagree or "Strongly Disagree") than "Unsure" on various aspects of clicker use. Only one third would recommend a clicker class

(44 percent would not), and only 14 percent would take another clicker class themselves (70 percent would not). In contrast, 81 percent of the students in the other groups would recommend a clicker class and almost half (46 percent) would take another clicker class themselves. All of these differences are statistically significant.

More students in Group D than in any other group chose to provide comment in the post-survey; eighteen students (half the total number of respondents), provided comment in the Group D1 post-survey and ten in the Group D2 post-survey. Almost all of the comments were critical of the CRS. A common theme that emerged in both post-surveys was cost versus frequency of use (e.g., "...I mainly feel that they were not worth the amount of money we spent on them," "Too much money. Not used enough," "Clickers being experimental and all were a total waste of money," and "We use them a maximum of 1X a week...I wish I could sell mine back").

Other students were generally critical of their use (e.g., "The clickers were not used well in this class. It wasn't for review ever it was just everyone's thoughts. I did not feel the clickers in [this] class were useful," "We only use the clickers to do review right before tests in this class. It is a good way for review but we are not getting much use out of them"). Some students included comments on the technical challenges (e.g., "They didn't work well in the class that we used them in. Technical problems"). A few students provided positive feedback, often with qualification (e.g., "Only helpful when we saw class results from experiences"). Finally, two students provided positive feedback specifically linked to anonymity and engagement (e.g., "I don't have to feel embarrassed by answering a question," "I like the clickers because I am able to answer questions anonymously and interact with the class").

Like Groups A and C, Groups D1 and D2 ranked anonymity as the aspect of the CRS that they liked best, followed by the immediate teacher response to student feedback. Rounding out

the list of aspects they like best are seeing immediate results (Group D1), providing immediate feedback, and feeling more involved in class (Group D2). (See Appendix D.)

Discussion

Research findings do not suggest that faculty and student attitudes, training, and experience are critical factors in students' assessment of a classroom response system (CRS) implementation. This conclusion is based on the review of the five cases in this study, in particular a comparison of the professor and student profiles at the start of the semester (pre-survey results) with the students' end-of-semester assessment of the CRS implementation (student post-survey results).

The initial profile gives a summary of the professors' training, experience, and attitudes, as well as the students' experience and attitudes. A summary of the pre-survey data is presented in Table 9 in terms of a case profile. (The attitude profile data is relative to the other professors and students in the study.)

Table 9
Case Profiles (Pre-Survey Results)

Case	Location	Professor			Students	
		Trained	Experienced	Positive Attitude	Experienced	Positive Attitude
A	Woodstock	YES	YES	YES	NO	YES
B	Woodstock	YES	YES	YES	YES	YES
C	London	YES	NO	NO	NO	NO
D1	London	YES	NO	YES	NO	NO
D2	London	YES	NO	NO		

A reasonable expectation is that cases with a trained, experienced, and more positive professor and with more experienced and more positive students would generate the most positive assessment of the clicker implementation at the end of the semester. Case B best fits this preferred profile, with Case A the next best fit. The parallel expectation is that cases with a less

trained, less experienced, and less positive professor and with less experienced and less positive students would generate the least positive assessment. Cases C and D2 most closely match this profile. (Case D1, while sharing the same inexperienced and negative students as in Case D2, had a more positive professor.)

The above expectations are not clearly supported by this study. Findings suggest that training, experience, and a positive attitude on the part of professors and students are not the only factors in a positive assessment. First, consider Case A and Case B, in which the pre-survey results indicate that both professors had CRS training and experience, and both had positive attitudes toward the implementation. The students in these groups can also be characterized as positive, but only Case B students had CRS experience. Consistent with the expectations outlined above, post-survey results for both groups were positive, particularly when compared with Case D results. However, Group A students (inexperienced) had a more positive assessment of the CRS than Group B students (experienced), inconsistent with the expectation. Furthermore, these two assessments were not the most positive among the five cases, which is counter to the outlined expectations.

Now consider Cases C, D1 and D2. The pre-survey for Cases C, D1, and D2 indicated the professors were trained but inexperienced. Professor D1 was more confident than Professors C and D2 who both exhibited uncertainty in several areas, including their comfort with instructional technology (Professor C), preparation for the CRS implementation (Professor C and D1), and the potential of CRS to enhance learning (Professor D2). The students in all three cases were similar in that they had virtually no CRS experience and had negative attitudes towards instructional technology and the CRS relative to the other groups. Post-survey results for these three cases do not support the expectations. Most significantly, in the post-survey, Case C

students gave the most positive post-assessment of the CRS of all five groups, despite their professor's inexperience and uncertainty and their own inexperience and initially negative attitudes. Case C students also exhibited the most significant change in attitude between the pre- and post-survey with regard to instructional technology in general and CRS in particular. In contrast to Case C, Case D1 students gave the most negative assessment of the CRS implementation of all five groups, despite the difference in attitude of the two professors. Professor D1 was confident and positive toward the clicker implementation while Professor D2 was uncertain about his level of preparation and the potential of CRS to enhance learning. Despite this difference, the student assessments of these two implementations were almost uniformly poor. Therefore, the post-survey results for Cases C, D1, and D2 do not support the above expectations: the research findings do not suggest that a professor's training, experience, or attitudes are reliable predictors of a positive student CRS assessment, nor do they suggest that the students' experience or attitudes are predictors of a positive student assessment.

Limitations

The case study approach used in this research project, while generating rich data, has two notable limitations. First, case data are sometimes challenging to generalize because of their qualitative nature. Second, because each case was a class of fewer than 50 students, the findings are not likely relevant to large enrolment courses, which are the most common focus of CRS research. In this way, the unique aspects of this study can also be characterized as a limitation. However, the purpose of the case study approach is not to generalize to the population, but to provide rich data for specific implementations.

Case studies also have inherent limitations because of their applied nature, and variables other than those studied may have had an impact on findings. This research project involved five very different implementations, five professors and five courses on two different campuses. For example, students in Case A and Case B used CPS clickers that were provided to students at no cost, while students in Case C and D purchased TurningPoint clickers at their own expense. The comments from Case D students in the post-survey clearly suggest that cost influenced their assessment. Case D students may also have been influenced by the two simultaneous implementations in which they were involved; perhaps a negative CRS experience with one professor biased their assessment of the CRS with the other professor. Likewise, Case B students, the only second-year students and the only students with CRS experience in the study, may have been influenced by their first CRS experience in either positive or negative directions and likely compared their two experiences. Several other factors may also have had an impact (e.g., professor's explanation of the CRS to students at the beginning of the class and subsequent comments, students' in-class "training" as provided by the professor, various CRS applications within the classroom, different hardware and software, technical problems). The role of variables other than those studied call into question the comparisons between the cases, particularly with regard to the post-survey; however, this would be a limitation in any comparative case study.

Another limitation relates to the faculty participants. In this study, all faculty participants voluntarily chose to implement CRS technology in their class and therefore their participation was on the basis of self-selection. One might reasonably expect that professors who chose to use a CRS would be more likely to have a more positive implementation than those who have this technology mandated in a large-scale institutional adoption. A more representative sample of faculty would also include faculty who were mandated to use CRS technology, perhaps in a

multi-section introductory course with standardized delivery. This reliance on faculty participants who have volunteered to introduce CRS technology is a limitation of most CRS research and limits any generalizations to others.

The research instruments and the methodology might be characterized as a limitation as well. The pre- and post-survey statements were written in the affirmative (e.g., "Clickers increased my participation in class"). This language may have influenced students and faculty responses because the statements by their nature declare the expected benefits of the CRS. This approach forced less satisfied respondents to take a contrary position; therefore, the social desirability response bias may have caused a more positive assessment than might otherwise result with a mix of affirmative and negative statements (Marlowe & Crowne, 1961). Of course, surveys measure only what the researcher has identified at the outset of the study and fail to capture the detail that can only be revealed through in-depth interviews with students and continuous observation of classroom over an entire semester.

Finally, this study design makes it difficult to determine what role, if any, was played by the novelty effect for Cases A, C, and D because of the timing of the classroom observation and the post-survey later in the semester (Clark, 1983). However, just as Draper and Brown observed in their 2004 study, there is some evidence of the reverse of the novelty effect: in the post survey, Group C students, who were initially the most cynical and uncertain of instructional technology and the CRS, became advocates of both, long after the novelty effect would have been present.

Directions for Future Research

In their review of CRS literature, Fies and Marshall (2006) called for a "concerted research effort, one that rigorously explores conditions of CRS use across diverse settings and

pedagogies" (p. 101). This call for further research into how the CRS is used is supported by the findings of this study, which suggests that CRS use might have a stronger effect on students' assessment of the CRS than training, experience, or attitude. Future research should examine the effects of specific uses of the CRS, perhaps in a controlled study, to determine which uses have the most positive impact on student assessment.

In this study, observation data and faculty interviews indicated that the CRS was used in the following ways: unit pre-test and unit post-test, test review, content review (unrelated to test), and discussion prompt. Faculty did not vary their use over the semester. For example, Professor C used the CRS for pre- and post-tests and for no other purpose, and Professors D1 and D2 used the CRS for student opinion polling and test review respectively. Faculty did not stress its use in formative assessment or in "contingent teaching" although interviews suggested that this occurred (Draper, 2004, p. 92). Only Cases A and B featured the collaborative use of the CRS, which may have contributed to the relatively positive student assessment in both Cases A and B, a finding that would be consistent with CRS research (Crouch & Mazur, 2001).

Study findings also suggest that frequency of use might also be a factor, perhaps even outweighing sound pedagogy, in the students' CRS assessment. Professor C used the CRS only for unit pre- and post-tests (ungraded), an individual versus group application, but she used the CRS on a regular and frequent basis: Case C students gave the CRS the highest rating among all five groups. In Cases A and B, in which the students were provided with the clickers, the assessments were positive although the frequency of CRS use was low; in Cases C, D1, and D2, in which the student purchased the clicker, the assessments varied significantly, with the most positive assessment provided in the class where CRS was used most frequently (Case C).

Research exploring the effects of different types of CRS use should also consider frequency of use, linking frequency to cost to student and use in multiple courses.

A related area for further research is students' ratings of different CRS features as they relate to demographics. Data gathered in this and other studies suggest that anonymity is a highly valued feature of the CRS. However, data gathered in this study also suggest that the value placed on anonymity may be linked to age and experience. Among the five student groups, the only group not to rate anonymity highest was Group B, which was the oldest group, the only second-year group, and the only group with CRS experience. Group B students rated viewing immediate results as a more valuable feature, perhaps because of their relative maturity, comfort with the learning environment (having studied together as a cohort for the prior two semesters), and their clicker experience. In addition, a study of CRS features should also link students' ratings of most-liked features to the implementation. For example, if clickers are not used collaboratively, students would not likely rate this aspect of their use highly. Conversely, if professors emphasized the anonymity of responses in an ethics class, this aspect of the CRS would likely be highly rated.

While this study does not suggest that faculty training has a strong impact on the students' CRS experience, faculty interview data highlights the importance of ongoing support during the CRS implementation, with prior training playing a secondary role. Three professors in particular stressed the importance of support in bolstering their confidence as they experimented with the CRS over the semester. This support can be provided by faculty colleagues, on-site technicians, and publishers' representatives, Future CRS studies could explore the role of technical support in shaping faculty attitudes as well as the student experience,

Unexpected results also suggest areas for further research: At the end of the semester, why would significantly more students recommend a clicker course to other students than would choose to take another clicker course themselves? Why would a group of students with clicker experience be less positive about clickers at the end of the course than at the beginning? The novelty effect may be influencing these findings.

A final area for further research relates to the faculty participants. Studies of a CRS implementation across multiple sections of one course and involving multiple teachers would generate new data in two significant areas. First, such a study would include a more representative cross-section of faculty, both those who would be more and those who would be less supportive of the CRS implementation. Fanshawe College is instituting a division-wide CRS implementation involving over 30 faculty teaching five courses to 1000 students; other institutions are no doubt considering similar institutional implementations of the CRS. Such an implementation, usually the result of having the clicker packaged with a textbook rather than available for stand-alone purchase, would be ideal for a study and would yield vastly different results than typical CRS studies. Second, such a study would involve faculty other than the researcher/author. While studies of all CRS implementations are valuable, there are too few CRS studies that explore an implementation by a professor not directly involved in the research. The participant-researcher is heavily invested in ensuring the implementation is a success; otherwise, the study will document a failed implementation for which he or she could have been at least partially responsible. Many more faculty at the post-secondary level use instructional technology than study it; this is particularly true at the college level where faculty are not required to conduct research. The Fanshawe College faculty involved in this study chose to implement the CRS in their classrooms, obviously hoping for a positive impact; however, the findings of this

study show that a CRS implementation, even involving faculty who voluntarily implemented the CRS, is not always a positive experience for students and faculty. CRS studies that mine new territory will add valuable data to existing research.

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Appendices

Appendix A: Research Instruments

Appendix B: Information Letters and Consent Forms

Appendix C: Student Pre-Survey Results

Appendix D: Student Post-Survey Results

Appendix E: Faculty Pre-Survey Results

Appendix F: Faculty Post-Survey Results

Appendix G: Faculty Interview Transcripts

Appendix A
Research Instruments

Student Pre-Survey

1. Age

2. Gender

3. Have you used clickers in a classroom before?
   A. Yes
   B. No

4. I am comfortable using instructional technology (e.g., online learning systems, FanshaweOnline, CD-ROMs, interactive computer games, clickers).
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

5. Instructional technology enhances my learning of the material being taught compared to classes that don't use instructional technology.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

6. Clickers will help me learn.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

Student Post-Survey

1. Age

2. Gender

3. Had you used clickers in the classroom before this semester?
   A. Yes
   B. No

4. I am comfortable using instructional technology (e.g., online learning systems, FanshaweOnline, CD-ROMs, interactive computer games, clickers).
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

5. My sense is that instructional technology (e.g., online learning systems, FanshaweOnline, CD-ROMs, interactive computer games, clickers) enhances learning.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

6. Clickers helped me learn the material better than if they had not been used.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

7. Clickers increased my participation in class.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

8. My sense is that clickers increased student-teacher interaction in my class compared to similar classes.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

9. My sense is that clickers increased interaction among students compared to similar classes.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

10. Clickers increased my level of engagement in the classroom compared to similar classes.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

11. Clickers increased my level of engagement with the course material.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

12. I would recommend a class that uses a clicker to other students.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

13. Everything else being equal, I am more likely to take classes if I know clickers will be used.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

14. What aspects of clickers did you like best? (Choose ONE.)
    A. My response is anonymous.
    B. I can provide immediate feedback.
    C. I see immediate results.
    D. My teacher can respond immediately to student feedback.
    E. Clickers make me feel more involved in the class.

15. When presented with the opportunity to use the clickers, how often did you respond?
    A. Always
    B. Most of the time
    C. Sometimes
    D. Never

16. I changed the way I used clickers over the semester.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

Faculty Pre-Survey

1. Age

2. Gender

3. How many years' experience do you have as a teacher?
   A. less than 1 year
   B. 1-5 years
   C. 6-10 years
   D. 11-15 years
   E. 16-20 years
   F. 21-25 years
   G. Over 25 years

4. Have you used a classroom response system before Fall 2007?
   A. Yes
   B. No

5. Have you received training in the use of classroom response systems?
   A. Yes
   B. No

6. I am comfortable using instructional technology (e.g., online learning systems, FanshaweOnline, CD-ROMs, interactive computer games, clickers).
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

7. I am comfortable using PowerPoint.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

8. I feel prepared to use our classroom response system.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

9. My sense is that instructional technology enhances learning.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

10. My sense is that classroom response systems will enhance learning in my class.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

Faculty Post-Survey

1. Instructional technology enhances learning.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

2. I am comfortable using instructional technology in my teaching.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

3. I am comfortable using PowerPoint.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

4. I received adequate training in the use of our classroom response system.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

5. I am comfortable using our classroom response system.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

6. Our classroom response system enhanced learning in my class.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

7. My sense is that the classroom response system increased student participation (i.e., the number of students participating and the frequency of participation) in my class as compared with similar classes I've taught.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

8. The classroom response system increased student-teacher interaction in my class as compared with similar classes I've taught.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

9. My sense is that the classroom response system increased interaction among students as with similar classes I've taught.
   A. Strongly agree
   B. Agree
   C. Unsure
   D. Disagree
   E. Strongly disagree

10. My sense is that the classroom response system improved student engagement in my class with similar classes I've taught.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

11. I would choose to use a classroom response system in another course.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

12. I would change the way I use a classroom response system in future classes.
    A. Strongly agree
    B. Agree
    C. Unsure
    D. Disagree
    E. Strongly disagree

Classroom Observation Guide

Date: _____ Section: _____

Professor: _____

# of Students Present: _____

Type of Classroom Response System: _____

1. Total Number of Questions (related to lesson) Asked During Class by the Instructor

_____ via clicker

_____ other (oral, blackboard, whiteboard, overhead, PowerPoint)

2. Responses to Clicker Questions (versus students present: _____)
   Average Participation Rate: _____

3. Timing of Clicker Questions (tally)

4. Types of Clicker Questions (yes/no, opinion, multiple choice, other)

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5. Faculty Responses/Feedback to Questions

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6. Clicker Problems Observed

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7. Observation of Clicker-Related Interactions

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8. Other Uses of Clickers

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9. Other Observations

Faculty Interview Guide

1. How did you feel about using a classroom response system *before* the semester started?

2. How did you use the classroom response system? (describe how often it was used per class, any grade attached to student use, etc.) What worked? What didn't work?

3. How did your use of the classroom response system change over the semester?

4. How did your students' use of the classroom response system change over the semester?

    - Was this as expected?

5. What was the impact of your training on your use of the classroom response system?

6. How did your previous experience with classroom response systems affect your use of the system? (if applicable)

7. What do you think was the impact of the classroom response system on student engagement?

    - On what do you base your opinion?

8. What do you think was the impact of the classroom response system on student learning?

9. What problems did you encounter with the classroom response system?

10. Describe the ideal environment for a classroom response system.

11. If given the choice, would you use a classroom response system again? Why or why not?

12. What was the system well suited for? What was it not well suited for? (e.g., to review for tests, to prompt discussion, to test comprehension)?

13. What existing features would you like to use in future classes that you didn't use in this class?

14. What new features would you like to see for use in the future?

Appendix B
Information Letters and Consent Forms

CLASSROOM RESPONSE SYSTEM RESEARCH PROJECT
Faculty Information Letter and Consent Form

Description and Purpose of Research
You are invited to participate in a research project exploring the use of classroom response systems (often referred to as "clickers"). The proposed research project will study faculty use of classroom response systems in a variety of courses at Fanshawe College in Fall 2007. The project will explore the relationship between faculty use of clickers and student engagement, paying particular attention to three variables: faculty training on clicker use, faculty experience with clickers, and faculty attitudes towards clicker use. Through both quantitative and qualitative data analyses, the study will identify effective practices for the implementation and use of clickers in a community college environment.
The Principal Investigator is Dee Morrissey (519-672-8386 or dmorrissey@fanshawec.ca). This research project is being conducted in partial fulfillment of a Master of Arts in Communications and Technology at the University of Alberta and is partially funded by Fanshawe's Centre for Applied Research, Innovation, and University Partnerships.

Method
This research project will involve faculty and students. Both quantitative and qualitative data will be collected through observation, surveys, interviews, and focus groups. Faculty participation is outlined below.

- Classes of participating faculty will, periodically throughout the semester, be observed by the Principal Investigator, who will be known to the students and teachers. Observation will focus exclusively on the use of the classroom response system.
- Two 10-minute surveys will be administered to students and faculty in September and December. Most of the data collected through the surveys will be quantitative in nature; however, subjects will have the opportunity to provide comments.
- One-hour, semi-structured interviews will be conducted with each participating faculty member at the end of the semester.

Three 90-minute student focus group sessions will be conducted at the end of the semester. Approximately 24 student volunteers (eight students per session) will be recruited with the aim of ensuring equal representation across the six course sections. Subjects will be provided with a light lunch. Audio recording devices may be used to assist in data collection.

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Faculties of Education, Extension and Augustana Research Ethics Board (EEA REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the EEA REB at (780) 492-3751. It has also been reviewed and approved by the Fanshawe College Research Ethics Board (REB). For questions, contact the Chair of the Fanshawe College REB at (519) 452-4108.

Benefits and Risks
Participation in this project presents no anticipated personal benefits or risks; however, participation may indirectly benefit you in your future use of classroom response systems. Participation is totally voluntary and will in no way affect your status at Fanshawe College. The Principal Investigator will comply with the University of Alberta Standards for the Protection of Human Research Subjects and those of the Tri-Council.

Withdrawal
Faculty and students have the right to not participate in this research project. Furthermore, faculty and students have the right to withdraw without penalty. Because faculty surveys and interviews are not anonymous, faculty data can be withdrawn from the project. Your withdrawal will in no way affect your status at Fanshawe College. The deadline for withdrawal is January 15, 2008.

Privacy, Anonymity, and Confidentiality
Faculty participation in the project will likely be public, not private, given the nature of the project and the small group of faculty participating. Furthermore, faculty surveys will not be anonymous given that following individual faculty members over the course of the semester is critical to the research. Finally, to protect the privacy, anonymity and confidentiality of subjects, names and any identifying indicators will be removed from transcripts and both final reports. Although we will make every effort to protect the anonymity of the faculty subjects, because of the small sample group we cannot guarantee anonymity.

Security of Data
During the study and for a period of five years following the completion of the study, paper data will be stored in a locked filing cabinet in the office of the Principal Investigator at Fanshawe College, and all electronic data files will be stored on the password-protected computer of the Principal Investigator, with backup copies saved on a dedicated storage device. Only the Principal Investigator will have direct access to those files. After five years, the Principal Investigator will shred all hard copies of data files and delete all electronic data files.

Dissemination
Faculty subjects will be provided with a copy of the brief recommendation report provided to Fanshawe College that focuses on effective practices for the implementation and use of classroom response systems. Only an extended abstract of the comprehensive report submitted to the University of Alberta will be publicly available, and only aggregate data will be used and any identifiers removed.

Other Uses
The data from this research project may be used in research articles, presentations, and workshops. Data for all uses will be handled in compliance with the University of Alberta Standards for the Protection of Human Research Subjects & Tri-Councils.

Questions?
If you have any questions or concerns, please contact:
Principal Investigator: Dee Morrissey (519-452-4430 x 4047 or dmorrissey@fanshawec.ca)
University of Alberta, Supervisor: Stanley Varnhagen (780-492-3641 or stanley.varnhagen@ualberta.ca)
University of Alberta, Faculty Dean: Katy Campbell (780-492-1858 or katy.campbell@ualberta.ca)
Fanshawe College, Chair: Mary Pierce (519-452-4430 or mpierce@fanshawec.ca)

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I have received information on the **Classroom Response System Research Project** and agree to participate with the understanding that my participation is voluntary.

____
Name (Print)

____________________________________ ______________________________
Signature Date

Please print two copies of the Information Letter and Consent form, one to be signed and returned to the Principal Investigator and one for your own records.

CLASSROOM RESPONSE SYSTEM STUDY
Student Information/Consent Letter

Description and Purpose of Research
You are invited to participate in a research project exploring the use of classroom response systems – "clickers". The project will explore the relationship between faculty use of clickers and student engagement, and then identify effective practices for the implementation and use of clickers in community colleges. The Principal Investigator is Dee Morrissey (519-672-8386 or dmorrissey@fanshawec.ca). This research project is being conducted in partial fulfillment of a Master of Arts in Communications and Technology at the University of Alberta and is partially funded by Fanshawe College. The data from this research project may also be used in research articles, presentations, and workshops.

Methodology
This research project will involve both faculty and students. Students can choose their level of involvement:

- **Observation:** Classes of participating faculty will be observed.
- **Surveys:** Two 10-minute surveys will be administered in September and December.
- **Focus Groups:** Ninety-minute focus group sessions – with a light lunch – will be conducted at the end of the semester.

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Faculties of Education, Extension and Augustana Research Ethics Board (EEA REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the EEA REB at (780) 492-3751 or the Chair of the Fanshawe College REB at (519) 452-4108.

Your Involvement
Participation is totally voluntary, presents no direct benefits or risks, and will not affect your grades or your status at Fanshawe College. You have the right to withdraw without penalty; however, if you withdraw after having completed a survey or participated in a focus group, **your data** can not be withdrawn because individual contributions cannot be identified. Data from this study will be kept confidential by the Principal Investigator: the surveys are anonymous, the data from observation will be reported by section and by the student group as a whole, and the focus group data will be reported with no identifying information. Furthermore, names of student focus group subjects will not be shared with teachers and the focus groups will be held after classes are over. However, although the Principal Investigator will ask that the identity of subjects and discussion be kept confidential – and make this a condition of participation – she can not guarantee that focus group participants honour that request.

Security of Data
Paper data will be stored in a locked filing cabinet in the office of the Principal Investigator at Fanshawe College, and all electronic data files will be stored on the password-protected computer of the Principal Investigator, with backup copies saved on a dedicated storage device. Only the Principal Investigator will have direct access to those files. After five years, under the

supervision of the Dean of Applied Research, Fanshawe College, all hard copies of data files will be shredded, and all electronic data files and copies will be deleted.

Questions?
If you have any questions or concerns, please contact:
Principal Investigator: Dee Morrissey (519-672-8386 or dmorrissey@fanshawec.ca)
Supervisor: Stanley Varnhagen (780-492-3641 or stanley.varnhagen@ualberta.ca)
Faculty Chair: Katy Campbell (780-492-1858 or katy.campbell@ualberta.ca)
Fanshawe College, Chair: Mary Pierce (519-452-4430 or mpierce@fanshawec.ca)

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I have received information on the **Classroom Response System Research Project** and agree to participate as indicated below with the understanding that my participation is voluntary.

☐ I am willing to be observed in class by the Principal Investigator throughout the semester. *(First consent form only)*

☐ I am currently willing to participate in the anonymous surveys regarding clickers.

☐ I am currently willing to participate in a focus group that will be held in December, if contacted. Please contact me at ______________________________________ (e-mail address).

____
Name (Print)

______________________________ ______________________________
Signature Date

You are being provided with two copies of the Information Letter and Consent form, one to be signed and returned to the Principal Investigator and one for your own records.

Appendix C
Student Pre-Survey Results

NOTE: Not all columns total 100 due to rounding error.

1. Age

Case Group	20 and under %	21-25 %	26-30 %	31-35 %	Over 35 %
Group A *n= 29*	38	48	0	0	14
Group B *n= 23*	22	44	9	0	26
Group C *n=34*	82	15	3	0	0
Group D *n=44*	91	5	5	0	0
Aggregate *n=130*	65	24	4		8

2. Gender

Group	Female %	Male %
Group A *n= 29*	62	38
Group B *n= 23*	70	30
Group C *n= 34*	88	12
Group D *n= 44*	61	39
Aggregate *n= 130*	70	30

3. Have you used clickers in a classroom before?

Group	Yes %	No %
Group A *n= 29*	3	97
Group B *n= 23*	96	4
Group C *n= 34*	3	97
Group D *n= 44*	16	84
Aggregate *n= 130*	24	76

4. I am comfortable using instructional technology (e.g., online learning systems, FanshaweOnline, CD-ROMs, interactive computer games, clickers).

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 29*	31	45	24	0	0
Group B *n= 23*	70	30	0	0	0
Group C *n= 34*	32	59	9	0	0
Group D *n= 44*	23	48	27	2	0
Aggregate *n= 130*	35	47	17	1	

5. Instructional technology enhances my learning of the material being taught compared to classes that don't use instructional technology.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 29*	24	31	41	3	0
Group B *n= 23*	22	52	26	0	0
Group C *n= 34*	12	30	56	0	3
Group D	7	46	39	7	2

n= 44					
Aggregate *n= 130*	15	39	42	3	2

6. Clickers will help me learn.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 26*	19	15	62	4	0
Group B *n= 23*	22	44	30	4	0
Group C *n= 34*	6	24	68	0	3
Group D *n= 44*	0	30	64	7	0
Aggregate *n= 127*	9	28	58	4	1

Pre-Survey Student Comments

Group A

- Not sure if it will or won't.

Group B

- I have been in many classes that use clickers (George Brown College) and I believe as well as my fellow peers at the time that they are a waste of time. They do not help me learn more, and I believe that the College's money could be better spent.
- Clickers are great when doing review for tests and exams. It lets you see where your strengths are. Should be provided (we had to purchase for first semester and didn't use much).
- I think that clickers are an extra part to enhance your knowledge of what you have recently or already learned within the classroom, but doesn't necessarily help you learn.
- The clickers are OK in my opinion. We had used them for another class. She said she was going to take up our responses with us, but it didn't happen. In my opinion the clickers are OK.
- I do believe that clickers help me learn because I get a good sense of where I am in my learning process. I also get a good idea of where I sit with regards to the rest of my class.
- I thought clickers will help me learn when going through reviews for tests or exams. It was a good preview for me see if I was on the right track.
- I was under the impression that we would be using this device regularly and purchased and activated. After doing so I found that this device was rarely used and thought it was a waste of money.

- I like using the clickers, but I hate paying for them, and I cannot tell if they help me learn the material better than traditional class. I don't think that the clickers should be used during quizzes because people say out loud what they are answering.
- I had no problems using the clicker in previous classes. I did find the expense of it to be unreasonable, $10.00, a program to [unreadable] up.
- For myself I learn better with computer and web-enhanced things, as opposed to lectures.
- I can see it helping in larger classes. However, at this point being in such a small class I could see the students raising their hands instead of spending the $ on "clickers". I think it's a great idea for larger lecture settings.
- Clickers help because of the class discussions that follow each question. It helps to identify where your thinking may be off, so that you can learn the material for the real test. Plus it has the added bonus of being anonymous so you don't have to be embarrassed by the wrong answer. The only think I don't like is when the clickers aren't provided by the teacher – and we buy them, there is a class registration fee only payable by credit card in American dollars. But overall, it is a fantastic teaching tool.
- I think clickers help when there is a practice test because it gets me used to the material, and ready for the tests. I don't think they would be a good tool for tests that are marked, because they don't always work [unreadable].
- Clickers help me learn because they provide an interactive environment, which aid me because I am involved. It retains my interest and I don't drift off during class/lecture. However, they are an added expense in an already tight budget, so don't make us purchase and activate it unless we are going to use it on a consistent basis. Not impressed that this has already been the situation.
- I find the clickers to be interactive and somewhat helpful for learning. I find them more useful for test practice. My only issue is buying a clicker when they are not used enough to balance out the cost.
- I think clickers help the teachers perhaps more than the students (if the clickers are registered.) Although I myself consider the technique "fun" many of my peers consider it as chore. I am also not sure what other applications the clickers are/can used for besides the "multiple choice" question periods we've had in class. I also did not like the online process I undertook to purchase my clicker. Students need more information about the system and process (of the clickers) before mandatory purchases (which was required of us).
- I like the fact that you get a chance to decide what you think about something without being singled out in class. You have a chance to pick your answer to a question without having to be nervous about getting it wrong in front of everyone.

Group C

- Hands-on demands more focus! More focus leads to success in the class ☺
- This is hard for me to justify because I have never worked with a clicker in the past.
- I can use the clicker but I do not agree to buy it. Not for a poor student. I can learn without if for sure, but the clickers make the class fun.
- I'm not sure if they would because I've never used one and I don't know how they work or even what they do.

- I think they will help us learn because it's an anonymous question/answer, the class will participate more readily. The teacher then can see what areas they will need to go over.
- I believe the clickers will be an interactive way to get everyone interested in the learning material. They will be an asset to the class environment.

Group D

- It's a neat idea. I haven't used it yet but at this point I look forward to trying.
- I am not sure if the clicker will enhance my learning because I am not familiar with its uses.
- I'm more of a verbal learner. I don't really understand how exactly they work, but I'll just have to see. I do prefer to be more verbal though than use technology.
- I think that clickers keep a person interested and awake and make class more exciting than everyone raised your hand.
- I think clickers are a great way to ask personal questions and using the clickers will help answer them anonymous.
- I have not yet used a "clicker" but I am excited to use that technology. I hope that it will help me learn.
- I don't know because I don't know how we're going to be using them.
- My only problem with the clickers is the cost. I feel that I have enough expenses to worry about.
- Clickers will help you learn by keeping an individual's answer to particular questions in the class anonymous.
- Clickers probably have their benefits although I am not too sure how this concept is going to work. I will more definitely increase class participation.
- I am not exactly familiar with the use of a clicker but from what I hear they are an effective way of learning.

Appendix D
Student Post-Survey Results

NOTE: Group D1 and Group D2 are the same student population. Not all columns total 100 due to rounding error.

1. Age

Group	20 and under %	21-25 %	26-30 %	31-35 %	Over 35 %
Group A *n=31*	45	45		3	7
Group B *n=25*	16	44	12	8	20
Group C *n=23*	74	22	4		
Group D1 *n=36*	97	3			
Group D2 *n=26*	89	4	8		

2. Gender

Group	Female %	Male %
Group A *n= 31*	65	35
Group B *n= 25*	68	32
Group C *n= 23*	83	17
Group D1 *n= 36*	69	31
Group D2 *n= 26*	73	27

3. Had you used clickers in the classroom before this semester?

Group	Yes %	No %
Group A *n= 31*	35	65
Group B *n= 25*	88	12
Group C *n= 23*		100
Group D1 *n= 34*	12	88
Group D2 *n= 26*	12	89

4. I am comfortable using instructional technology (e.g., online learning systems, FanshaweOnline, CD-ROMs, interactive computer games, clickers).

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	58	42			
Group B *n= 25*	68	32			
Group C *n= 23*	39	52	9		
Group D1 *n= 36*	36	39	8	11	6
Group D2 *n= 25*	4	42	35	8	12

5. My sense is that instructional technology (e.g., online learning systems, FanshaweOnline, CD-ROMs, interactive computer games, clickers) enhances learning.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	45	29	26		
Group B *n= 25*	44	40	12		4
Group C *n= 23*	17	61	22		
Group D1 *n= 36*	6	53	25	8	8
Group D2 *n= 26*	8	39	31	15	8

6. Clickers helped me learn the material better than if they had not been used.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	39	39	10	13	
Group B *n= 25*	4	48	40	8	
Group C *n= 23*	30	52	17		
Group D1 *n= 36*	8	17	28	30	17
Group D2 *n= 26*	4	31	27	30	8

7. Clickers increased my participation in class.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	39	49	10	3	
Group B *n= 25*	40	36	4	20	
Group C *n= 23*	57	30	9	4	
Group D1 *n= 36*	17	42	11	17	14
Group D2 *n= 25*	28	32	12	24	4

8. My sense is that clickers increased student-teacher interaction in my class compared to similar classes.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	39	36	23	3	
Group B *n= 25*	20	60	16	4	
Group C *n= 23*	17	61	22		
Group D1 *n= 36*	11	39	22	17	11
Group D2 *n= 29*	15	23	27	27	8

9. My sense is that clickers increased interaction among students compared to similar classes.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	42	32	13	13	
Group B *n= 25*	24	48	20	8	
Group C *n= 23*	9	48	35	9	
Group D1 *n= 36*	6	36	22	25	11
Group D2 *n= 25*	12	32	20	24	12

10. Clickers increased my level of engagement in the classroom compared to similar classes.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	39	39	16	7	
Group B *n= 25*	16	52	20	12	
Group C *n= 23*	30	65	4		
Group D1 *n= 36*	6	44	22	11	17
Group D2 *n= 26*	8	46	12	35	

11. Clickers increased my level of engagement with the course material.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	29	45	16	10	
Group B *n= 25*	16	60	8	12	4
Group C *n= 23*	30	52	17		
Group D1 *n= 36*	3	33	28	19	17
Group D2 *n= 26*		50	35	15	

12. I would recommend a class that uses a clicker to other students.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	39	36	23	3	
Group B *n= 25*	20	60	16	4	
Group C *n= 23*	48	44	4	4	
Group D1 *n= 36*	8	19	28	25	19
Group D2 *n= 26*	4	39	27	19	12

13. Everything else being equal, I am more likely to take classes if I know clickers will be used.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 31*	23	13	42	23	
Group B *n= 25*	12	32	32	16	8
Group C *n= 23*	9	52	26	13	
Group D1 *n= 36*	3	11	17	33	36
Group D2 *n= 26*		4	19	54	23

14. What aspects of clickers did you like best? (Choose ONE.)

Group	My response is anonymous. %	I can provide immediate feedback. %	I see immediate results. %	My teacher can respond immediately to student feedback. %	Clickers make me feel more involved in the class. %
Group A *n= 31*	48	19	26	3	3
Group B *n= 25*	32		48	16	4
Group C *n= 23*	39	4	35	13	9
Group D1 *n= 36*	39	14	20	22	6
Group D2 *n= 26*	42	12	8	27	12

15. When presented with the opportunity to use the clickers, how often did you respond?

Group	Always %	Most of the Time %	Sometimes %	Never %
Group A *n= 31*	71	19	7	3
Group B *n= 25*	80	12	8	
Group C *n= 23*	78	17		4
Group D1 *n= 36*	50	31	11	8
Group D2 *n= 26*	54	35	12	

16. I changed the way I used clickers over the semester.

Group	Strongly Agree %	Agree %	Unsure %	Disagree %	Strongly Disagree %
Group A *n= 29*	14	17	31	24	14
Group B *n= 25*	4	8	52	28	8
Group C *n= 21*		19	52	29	
Group D1 *n= 36*	3	22	28	22	25
Group D2 *n= 24*	4	50	25	17	4

Post-Survey Student Comments

Group A

- It just gives me something to do.
- They're neat.
- They promote learning! I like them a lot!

Group B

- Overall, I think clickers are a good asset to a class as they can keep the student and teacher on the same page without having to be centred out. It would be nice to see them used more often but I would not base my class selection on clicker alone.
- Clickers are great but should NOT be the only tool in practicing what we have learned in class.
- I think clickers are useful when doing review for tests, but shouldn't be used to grade the students.
- They promote learning! I like them a lot!

Group C

- They were interesting to use.
- I really felt that the clickers along with the slideshows was very effective when trying to remember attractions with their locations. The hardware itself gave me problems, having to rotate batteries to continue use was not convenient.
- Having interesting slides helps to keep you interested. Use pictures maybe and interesting fonts.
- I found the clicker very helpful esp. For those who learn visually. I saw myself do a lot better using the clicker than in classes I didn't. Thanks !! ☺

Group D1

- Too expensive.
- I'm really not a fan, sometimes they are alright but I mainly feel that they were not worth the amount of money we spent on them. I would rather not use them and do more hands-on stuff in the class which [Professor D1] never does.
- The clickers were not used that well in this class. It wasn't for review ever it was just everyone's thoughts. I did not feel the clickers in [this] class were useful.
- I think for how expensive the clickers were, we didn't use them enough. Some of the clickers surveys done in [this] class were entirely pointless, and I gained nothing from them.
- The clickers are too small and can be easily lost between bringing them home and to class.
- I don't think clickers should be mandatory.
- They are useful at times, not so much in some classes compared to others. But they are not $100 of my money useful. This was required on my booklist – sweet cause spending $500 wasn't enough already. Let's throw in another quick $100 to use it once a week.
- We should use the clickers more, they aren't used enough.
- They didn't work well in the class that we used them in. Technical problems. Also a waste of money!!
- Too much money. Not used enough.
- Only helpful when we saw class results from experiences.
- Didn't use them often. I found they weren't that useful.
- The clickers were used to see how many people feel a certain way about certain exercises. It was used well to see what other people's opinion are compared to yours.
- I don't have to feel embarrassed by answering a question.
- The only time we use clickers in this class is to get the class's feedback from a previous workout session. We do not use them very often.
- Clicker was used to emphasize key concepts when it worked results were still skewed due the feedback given incorrectly or to throw off results. Clicker use would be more effective if used for quizzes or tests vs. teaching.
- Great way of getting feedback without singling out students. Worked well as long as the computers were up to speed.
- With [this] class we used it quite a few times.

Group D2

- Clicker being experimental and all were total waste of money. We used them maximum 1X a week if…I wish I could sell mine back.
- We only used these clickers for pre-test little quiz things so it really didn't help us in this program at all.
- We only use the clickers to do review right before tests in this class. It is a good way for review, but we are not getting much use out of them.

- Too expensive!
- They are a huge waste of money!!!
- I like the clickers because I am able to answer questions anonymously and interact within the class.
- The clickers would be a great tool if they worked properly. I recommend the school on getting a new type.
- I like the clickers, but they aren't used enough in this class. They helped before quizzes and helped you see that you aren't the only person who's wrong/right. They really get everyone involved in the class.
- We didn't use the clickers very much in [this] class.
- I found the clickers useful especially when used for test review, however not to the degree that they were worth $150.

Appendix E
Faculty Pre-Survey Results

	Professor A	Professor B	Professor C	Professor D1	Professor D2
Age	50-59	40-49	40-49	50-59	50-59
Gender	Female	Male	Female	Male	Male
Teaching experience	21-25	6-10 yrs.	21-25 yrs.	Over 25 yrs.	21-25 yrs.
Previous CRS use	Yes	Yes	No	No	No
Training received	Yes	Yes	Yes	Yes	Yes
Comfortable with instructional technology	Agree	Strongly Agree	Disagree	Strongly Agree	Agree
Comfortable with PowerPoint	Strongly Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree
Feel prepared	Strongly Agree	Agree	Disagree	Strongly Agree	Not sure
Instructional technology enhances learning	Strongly Agree	Agree	Agree	Strongly Agree	Agree
CRS will enhance learning	Agree	Agree	Agree	Agree	Not sure

Appendix F
Faculty Post-Survey Results

	Professor A	Professor B	Professor C	Professor D1	Professor D2
Instructional technology enhances learning	Survey not complete.	Strongly Agree	Strongly Agree	Agree	Agree
Comfortable with instructional technology		Strongly Agree	Disagree	Strongly Agree	Agree
Comfortable with PowerPoint		Strongly Agree	Agree	Strongly Agree	Strongly Agree
Adequate training received		Agree	Not sure	Strongly Agree	Agree
Comfortable with CRS		Strongly Agree	Not sure	Strongly Agree	Agree
CRS enhanced learning		Strongly Agree	Agree	Not sure	Agree
CRS increased participation		Strongly Agree	Agree	Not sure	Strongly Agree
CRS increased student-teacher interaction		Strongly Agree	Agree	Not sure	Disagree
Clickers increased student-student interaction		Strongly Agree	Agree	Disagree	Disagree
CRS improved student engagement		Strongly Agree	Agree	Not sure	Strongly Agree
Choose to use CRS again		Strongly Agree	Agree	Agree	Agree
Change the way I use CRS		Agree	Not sure	Not sure	Agree

Appendix G
Faculty Interview Transcripts

Professor A (Interview Date: January 25, 2008)

1. **Researcher: If you could think back to last August, your thinking about using your classroom response system, which is the CPS system here. How did you feel about using the CPS system, and I know you've used it before, so it's okay to say, well, I didn't give it any thought. What were you thinking, if you thought anything about it?** Professor A: Number one, that I would use it, but make sure that I would use the bag system, meaning that I didn't want the students to have to go through a registration process where they'd have to pay money to use. Then that would provide me with some flexibility, so I didn't feel like I had to use it every single week. Since I'm coordinator, developing and working in the classrooms, you have to balance so much, so if I didn't have to use it every single week, then I was much more comfortable if they didn't have to pay for it. **You have done that. In the past, there's been a different model?** Yes, in the past what we did was, for instance, if I were teaching a course, students would have to register online for the course, pay $15 USD, and then they got a special number that they fed in. Then they purchased the remotes here for, I think, $5. It was a different approach because if students felt that all the teachers weren't using it, they were quite upset. You know, "Here I've paid my $20, $25, and not all of the teachers are using it." And the other issue of course is – I'm getting a little off – **That's okay.** – is that we have an incredible number of part-time teachers here that we're asking people to go above and beyond to use those clickers, so it was much easier if we purchased the bag system where students walk in, they pick up a clicker, and then they put it back just before they leave. **So, when you say the bag, or the bag system, the College owns them, and it's a tool, like giving them a tool to borrow during the class.** That's right. And they hand it back in. **So, you went into the semester saying that's my approach I'm going to use.** That's right. **So, that was a logistics question. The actual technology itself as a learning tool: Were you thinking, "Oh, it's worked before," "It hasn't worked before," and "I'm looking forward to it?" Did you have any feelings about the tool itself?** Number one, I wanted to use it with the class I'd used it before so that I could use a database that had already been set up because I didn't want to have to spend a lot of time typing and keying in all kinds of questions. That's the only issue that I think I have probably with the remote system. It's all the prep. We did have a system in place where [NAME] suggested that we designate a certain clerk and that clerk could input that information but it was a matter of – **You mean setting up the slides?** No, setting up the actual questions in the database. Like in the CPS system – **So, it's different from the one I'm more familiar with.** Oh, is that right? [Description of TurningPoint used at London campus] For me it's a data base, but I can use slides. And then, all I have to do is click and I've got the question up. It's the same thing. I have my PowerPoint slide and then in the middle of my PowerPoint slide, I can just bring in a question at that point. But the database – and they'd be faced with the same thing – you see I could have all my PowerPoint slides from the publisher, but I still have to key in all of the questions that I want to use. They use slides, and I use the database. So, it's exactly the same thing. So, it's taking the time to put that in. Now, once you have that built and if you can use the publisher's, where the

publisher can just dump it in for you, or you can just import it, then it's not a problem, but we don't always use that technology. **So, you were thinking, "Great, I'm going to be using the clickers again, I've got a better model with the bag system – no hassle there – and I'm going to be using it in a class where I've used them before, so prep is minimal if I can use the same slides from last year."** The only other thing that I would keep in mind at the beginning is that with that technology it takes time in the classroom, extra time, and so I have to make sure that I'm still able cover to the material that I need to, even using this technology. **Okay, so despite that feeling, knowing that it would take extra time, despite that you were positive about using the clickers.** Yeah. Oh yeah, for sure. Students love it. **And you'd been through the experience to know, okay, we're not doing this, and I am doing that. So overall, no negative feelings about using the clickers?** No. No, other than I don't have the time to spend on a lot of prep. That would be the only negative, but otherwise – **So, you didn't go in thinking, I've used it for the last two years, and now I'm going to try something new. It was just I'm going to use it pretty much in the same way that I've been using it before.** Yes. Now if my role was just a professor, I would try all kinds of other things with the system. I would – there are so many things, and I love doing that kind of thing. I would be one of the first people to bring in clips and various other things, but the workload just doesn't allow it. **There's no time. That's too bad.** It is, so if there was an opportunity where I was just teaching, I would definitely go that route. No question. I like it.

2. **How did you use the classroom response system in your class? If you can isolate it to that class, that would be good.** Yes. **If not – it was [COURSE] that I was watching, right?** Yes. **So, if you can think about that class. If you want to go broader, that's fine, but try to keep it maybe to the recent past. So, I'd be looking for how – meaning how often, frequency, was it for review, reinforcement, were you teaching, were you pre-testing, post-testing. Did you – I don't think you did any grades attached –** No. **It wasn't used for testing because of the classroom approach.** No. **So, what worked and what didn't? So a broad kind of – how'd you use it, what worked?** People used the game approach where they were in the teams, I think. I'm trying to remember that class. **I did see that class.** Oh, okay. **I observed kind of a Jeopardy team approach.** So I've used that, and that's just a review. So, with that class I used primarily review. So it would be, you'd take in a concept, and maybe we would use CPS just to review, just to make sure they've got the concepts, and if they don't then what we need to do is go over them again. So, I didn't use it for testing or surveying. **So, it was content. So, I saw in [COURSE NAME] it was used to reinforce grammar, punctuation, rules. And would you use it the day you taught the lesson or the week after, or did it change?** Oh, the day of and then sometimes a week later just as a review to get going again. **And how about before a test? Did you ever do it – this would be the day before a test.** No, I don't think so. No, not with that group. I can't remember. **Did you ever use it as a pre-test, just to see – before you even got into punctuation – just to kind of gauge their knowledge.** No, not that group. **Frequency with [COURSE]? Five times a semester?** Max. **10?** Probably five times max. **Okay, did it work? How did the student –** My perception of the students was that they just found it as another tool. It's not something that they said, "We want to use it every week." It was like, it was nice to have a change, and it's nice to use this, but I didn't get the impression

that they wanted me to do it more or less. It was just another – variety. **So we might do group work, we might do this, we might use clickers.** Exactly. **Just another tool in the toolbox.** Right. So about five times. **Did anything you tried this semester with that group work – as opposed to something that didn't work? Did you try something and say that didn't really work?** No. **Because you'd already done the test drive.** Yeah, I'd already done it previously. **You'd already done the not work stuff.** Yes, we had, and it was primarily with the registration issues. With the bag system, it's much easier.

3. **Did your use of the CPS change over the semester?** No. **And again, because you'd done it before, used kind of tried and true** – and workload. I would try different things and do different things if I had more time. **Which suggests to me, as you said before, that you think it's a valuable tool.** Oh, I do, absolutely. **And you'd like to explore more.** Absolutely. **But time.**

4. **Did the students change – even the five times you used it – did their use change over time? These were Level 1 students, first semester.** Yes. **Were they kind of keen at the beginning and not so much later on? Or did you find no real change because you only used it the five times?** I didn't find any real change. It's always a novelty when you first have the clickers and they're trying all these different things, but it wasn't – No, I didn't really find that much of a change other than the first novelty. **Because you didn't have the problems that come with different implementation models where they're losing them, forgetting them, the batteries are dead.** Exactly. **So, no change.**

5. **Did you have training? Now, this would be a while ago for you likely.** Yes. **Unless you've done updates in training. I don't know. Do you remember your training? Do you remember about how long ago it was? And can you describe anything to do with that training?** Sure. **And it could be training that was formal, could be – I know there's some, CPS, perhaps they do webinars – maybe there's training that you actually – "I self trained." So comment on that.** Sure. Absolutely. It's four or five years ago now when we first, because we were the pilot. And so the salesperson was an older gentleman, maybe 55 or so – **Was he tied to a publisher?** No. Well, not at the time, but they soon jumped on board. And he came down to sell us this system, to promote the system. So, of course, we all got excited about it. We got some money for it. And so he was trying to teach us a little bit, but unfortunately he was a salesperson, definitely not the demo person, and so [NAME], who is one of our computer people here, she's a teacher, but she just picks it up so fast, she just sat down and played with it, and then we all sat down with her and she showed us some things. All of us are fairly savvy on the computer with new software. So other than a few glitches, we were able to work it all out. So, then when we got the upgrade – I think it was the infrared, then you knew the system, so it's just like a new version of – **Some of the features were different, but it wasn't a problem.** No, it wasn't a big deal. **So you had minimal, if any, training from the supplier. So, it was the sales guy. He must have done something to convince you to buy it.** He gave a demo, but it was a terrible demo. Honest to God. We could see how it would work. No, the demo was horrible. And he didn't know – I mean, it took [NAME] everything not to just go up and say, "Here, let me try it." And so, no, it's just that we could see the potential of it. **And you weren't looking at a huge, full-scale**

implementation. You were looking at a small pilot. The investment would be reasonable. Another issue that we had certainly with the core group that started out with this was all very energetic and enthusiastic about new approaches for the classroom, so we're not afraid to try these things. **A good attitude.** Right. And [NAME], being sort of a resource person, that we knew that we could rely on, gave us that support and a comfort level, so it was like, yeah, like bring it on. **Tell me her role again. Is she a teacher?** She's faculty. **She's faculty. She just has a facility with technology, but that's not assigned to her. So, she kind of took on a kind of informal champion.** Yes. And I don't think she uses it much, but she likes to help anybody who wants to. **So, you all saw the potential. So, she learned it, and then informal training. And since then, anything? From the manufacturer?** No. No, we don't call. [NAME], once in a while, if there's an issue, we'll call the manufacturer. We help each other. That's it. **You said you have new ones, so five years ago you had a slightly different model.** Yes. **So this is your second model.** Yes. **And any plans for the future for changing, upgrading, different manufacturer?** Not at this point. That's not to say that if something else comes down, there'll be a bunch of us get together and go, "Oh, let's try this out." But at this time, I would say no.

6. **We talked a little bit about this, but just so I can get it in the sequence of the questions, how did your previous experience with classroom response systems affect your use of the system? We talked a little bit about previous experience. You wanted to avoid having the students purchase and register and go through all that. You wanted to avoid that sort of implementation, and you did. Well, the campus as a whole changed its approach.** That's right. **And then your previous experience. Now we can talk back a little bit. Now you can tell me maybe about your first – if you can think back to the first few years and your experience – and how that has impacted how you used it, how use it now with your class last semester, or just in general.** It's interesting because I was very excited to use this approach. **Five years ago?** Exactly. And I mean we do have a philosophy here that we're not just standing, talking heads. We really try to incorporate all kinds of different styles because of different learners and so on, and so this was very exciting to use and fun. And of course, they're the generation that are always at the videos and so on. I can remember going into the classroom and you had to always download the list remotely and so when the students purchased it, it would be downloaded and all the students would be on, and, as you mentioned, the batteries or the remote wasn't working or I forgot it at home, and all of those issues came up which was just an incredible nuisance, and the fact that if they had to buy it, we had to use it, and with the number of part-time, it's hard to implement that. And the expectation on part-time is pretty high. But the issue with all of that, once you have a comfort level, then all those little issues become – **manageable.** Exactly. You didn't worry about them quite so much. You didn't have to run down the hall to get the technician to come and give you a hand, but what I learned was that to become more comfortable with that kind of technology, regardless of what it was. So, it was really good in that you just had an attitude of just whatever comes up, you can work through it, and it's pretty exciting to do so. Something I learned, I guess would be to, if there was an issue with the technology, always have a back-up plan. So, what I usually did was have the questions available on Word, so that if the system wasn't working for whatever reason then I just had it. I don't

seem to worry so much about that with the bag system because I don't have to worry about the registration and that sort of thing. And everybody can participate right at the beginning. It's not a process, so I like that. **Any other changes? Did you use it differently when you started five years ago than you do now? Have you tried some things that – obviously, you've tried some things and kept them. Did you try anything and you went, "Oh, that didn't work?" So, now you've done other classes, other [COURSE] classes. Other uses than the game approach and the teams, which is the only thing I observed. Have they used it individually? Did you use it to start discussion?** I'm trying to think. I've used quizzes in preparation for tests. I've done it in groups with students, not necessarily the game, in other groups, formations. **The quizzes – was that the team use?** Because I use collaborative learning in the classroom. Let me think. I think the quizzes were primarily for review, not for actually grading. But I would incorporate into grading. I'm still not that comfortable with the system to be able to do that. **You've never used it for a graded quiz.** No. Actually, that's not entirely true. With [COURSE], I did do that because with them I gave them a weekly quiz, and we would count that and, actually, now that I think back, because we'd use them in cooperative learning, is that sometimes we would do it independently and sometimes we would do it in groups. **And was that when you were having the clickers registered?** No. Still the bag system. **You just kept track of who had 17.** Yup, yup. **Anything else in your experience that** – I can't think of anything right now.

7. **What do you think – so this is your perception, we don't know the students' yet – what do you think was – well, you do know because I know Woodstock has done their own surveys and has studied this – but what do you think the impact of the CPS, the classroom response system, was on student engagement? And we're not talking about learning at this point, just engagement as distinct.** Just as something interesting to do and to involve them, I think they liked it. I don't know if my group would want to do it weekly. Isn't that interesting. I think that – and I could be wrong entirely – but I think that if you're going to use it weekly, you're going to have to vary how you use it because it just becomes the same thing, like PowerPoint and somebody lecturing constantly. If you don't have some variation, it's not going to work. So, what was the question again? **The impact on engagement, student engagement as distinct from learning.** It definitely engaged them. **So a positive impact.** Oh yeah**. But you suspect that overuse, however you define that, could have a negative impact on engagement. They might start to disengage, "Oh not this again..."** Exactly.

8. **Then what about impact on learning as distinct from engagement?** I definitely – actually, well, it's not tough for me, because I really feel it has – and maybe students will think differently – this is my perception and the reaction that I could see. So, when students – when we – if I taught a concept and then we have a question and many of them get it wrong, then it's a surprise to them, because they obviously thought they had it, and so they get instant feedback, which I think is really, really important, rather than a week later they realize, "Whoa, I didn't get that after all." It's nice to be able to get that right away. So, the student will go, "Whoa. Gee. I didn't realize I didn't have that." So , I think if you're looking at the learning in that respect, the recognition that I didn't get it or did get it, or perhaps even reassuring them that they are picking up the material, I think that's

great. As far as an actual learning tool, it obviously gets them learning because then what will happen is they'll go over that concept again. **Or you will in class.** That's what I mean. And then, we don't lose them. So, I see it as a student success strategy really, because they might not realize that until a couple of weeks down the road, or I may not. This way, we get the information much more quickly, which means that they are going to get that information again, hopefully get it this time, which will then help reinforce – because so much material is built on one concept after another which puts them I think in better stead. **So they will find out that they do not understand the concept in grammar, and if you have time and if there are a lot of students you will choose to reinforce it right there**. Absolutely. **If you don't have time or there are only two students, you probably** – Follow up. **You may not choose to go over it in class or have the opportunity, but the student then says, "Oh man, I got that one wrong."** Yes. **Or, "I advocated for my group to say that, and they're all mad at me, and I got that wrong." I better – so there's some responsibility for them too.** That's right. **And they can take it or not**. Exactly. And quite often I see, "Well, what happened there?" And so, that's right. **Positive impact on engagement and you feel, therefore, a positive impact on learning.** Yes, for sure.

9. **Problems that you encountered with the CPS this time through? You think you probably eliminated them.** Various problems. There were students who would, you know, press the button so many times, the red X was coming up and everything, but it just means – **They've already entered it.** – that they pressed it over and over and over and over again. **Because they're not sure – they can't see?** No, they're just playing. They're just getting bored, you know, some people are taking too long to answer. Or they'll point it at me trying to keep me shut. But as far as problems, the only problem is that it is a little bit time consuming when you have a large class. **So it takes – the extra getting the clickers, setting them up, they'll goof around with them for a second. I observed them being very quiet and attentive and really wanting to play the game, and cheering when they got it right, and consulting very quietly amongst themselves. They looked engaged to me.** Well, they might have been behaving because there was someone new in the class. They seldom do that quietly.

10. **If you were talking to – try to imagine yourself talking to a new faculty member who was telling you about his or her class or course. What would prompt you to say, "Oh that course, that class, that group of students, that situation, that context – would be perfect for clickers?" What would be the ideal learning environment for clickers?** What an interesting question. I find that an extraordinary question because I would say to myself, why would I think there's an ideal situation? Why would I think that it couldn't be used in every classroom and, depending on the person and their excitement and how engaged they are with the system, is going to promote that. If you walk in saying, I can't use this or I have to use this or whatever, you probably won't have the same kind of success. But I think it can be used in any classroom. I do. I can't imagine a class that couldn't use it, because you could use it in math, you could use it in health. It's just how much time and effort you want to – putting together your visuals and everything else, so if you can bring in the information and plunk it in. **What about a class like a philosophy class.** Oh, good grief. That would be a great one because you could just throw it up there

and have a question and they'd have the clickers, and you'd just have so much discussion afterward when you saw the results, it would be – **anonymous?** Yes, absolutely. **They may be anonymous, maybe not the way you're doing it.** Well, it can be – **if you don't pay attention to the numbers. So, in your opinion** – I'm just trying to think. **How about the types of learners? What if you had all adult learners? Or all very young 18-year-olds? I know your class is quite diverse.** They are. And they all love it. **So you don't see any distinction.** I don't. **Male-female? Observe any differences there?** Either I'm not very observant **– I have no idea. I'm just putting it out there to see if you feel that there's any limitations or situations, where, "Oh, that wouldn't work."** Gosh, I honestly don't, but I have to preface that with it's the approach, too, that the teacher would take. I mean, you could have to very similar classes, and two different facilitators, and have very different results I feel, I believe. And of course, how it's all put together and everything. So, it depends on your level of expertise with it, how willing you are to try new things. **So, more dependent on the professor than anything else.** Well, it's sort of like the computer and the operator. The computer is only as good as the operator. Well, it's sort of the same thing with this, and think there are just so many opportunities in the classroom. I don't think it should be overused, as I mentioned before, but I think there are lots of opportunities that it can be successful. **What about class size?** That one to me, just trying to manage class in general. So if you've got a class of 250 students, if you can make sure that everything is done in a timely manner, like if you put a time limit when they can answer, like 20 seconds or whatever, then you could probably manage it a little more easily and keep it moving. You just have to keep it moving. Oh yeah. **I know that's not your experience here having large classes.** No. **But with your experience using clickers, can you see potential for larger classes?** Absolutely. **A greater potential because of the difficulty, obviously, in engaging, all 250 students in asking questions and raising hands.** I can see it easily be used with very large classes. I would just use a different approach. Just make sure that they were very aware of the time limits and put a few more structures in place to make it work. But it's same thing. I'm not sure that it's going to work any better for engagement than any other system because if you use the same system all the time, eventually your engagement – you will have it but how much people are buying into it and really participating the way they need to. I don't know. I guess you would get more information than...can't ask everybody questions. **The thinking is that there are far fewer opportunities for engagement in large classrooms.** Absolutely. **So a lot of people say, well, that's the best use of it – is because there are so few options. You can't get raising hands, people don't feel comfortable. They won't participate because there are 200, 500 – and in some universities 1000 – students in a class, and this way everybody can, if they choose to, anonymously and safely answer a question to see, "Wow, 40 percent of you have shoplifted." And you're not going to get shows of hands, not that you'd maybe get that in a small class either with that type of question. But there are so few other options in large classrooms, so some people have said that's an ideal environment. Not exclusive.** Right. Absolutely. I know Western's using them, and it would be interesting to find out what their results are.

11. **If given the choice – now, I guess you have made the choice to some extent, but the Woodstock campus has made a choice to have these available – it was you making**

the decision for next year, would you have them here or not? If you could pull them away and it was your call for renewal. In some situation, try to imagine yourself – they could come or go next year. Stay? Keep them or – ? Can I qualify my answer? **Sure. Do whatever you want.** I would say that I would have to take a look at the budget because, you know, what the issues are. And if I had an opportunity – **So, at this point, you have site licensing? No, you've bought them.** We've purchased them, so it's not an issue. You have to take a look at the decision. Well, if it's a budget-related, then I'd have to take a look at that, but with that, get the group together – **faculty group?** – faculty group, part-time, anybody who felt they could use it, because we use it for other than in the classroom, I should tell you that, and ask them how much they plan to use it, if they felt it was effective in the classroom, and I personally believe it is, and so I would be a bit of a champion for it. I would say, what do we need, what needs to be put in place as far as strategy is concerned to make sure these are used on a regular basis, because I'm not going to spend the money if they're not going to be used. We'd come up with ways of, well, I need some help inputting information. Okay, we'll establish this person who will do that. Then we would we would decide together if we need to put on teacher workshops. Anything to help them use it in the classroom, because I do think it's a good thing to use in the classroom, but you do have to consider lots of things to implement that. Now the other thing is, because we have the bag system, I have taken that bag out in the community to promote Fanshawe College and actually I used it for when I was, and I am, a board member for Children's Aid, putting on workshops and so on because it engages the group. Because right off the bat, you can throw up some statistics and see if they know anything. And then they go, "Oh, my God." So then when you bring in your information they go, "Ooooh", so it's a great use for that too. So we don't use exclusively for the classroom. **Interesting. So, you're a good administrator. You would consult, check the budget, and if the support was there, and you'd identify any training needs. We didn't explore that. Do you want to comment on that? You get, I imagine each semester, likely more in September, a few new part-time faculty. How do they learn how to use it?** Well, the only part-time people who use it are the part-time people who are really interested in it, who have been here for some time, who love to try new things and that sort of thing, so we have – And, you may not have thought of this, and it just came to mind which I think has bearing on this, is that business programs generally are involved in computers and all that sort of thing, so those teachers are willing to try new things and use computers because they are quite comfortable with that. Then we have the people who are part-time who come in from the field in the child and youth worker program. So we have people from the children's unit in the London Psychiatric Hospital, KidsLink, various other places, and they don't have the same kinds of background. They aren't so willing. I'm looking at generally speaking, just a general observation. They may not be as willing to jump into this. They won't be as convinced because they, themselves, just love that interaction with students and everything, but if they saw the results, they'd probably be more interested in it, but it would not be one of their first inclinations to learn this new technology to put in the classroom than it might be another group. So you might find a little difference between the disciplines. I know I have. Sorry, I got off – **No, that's all interesting.**

12. **We've probably covered this: What was the CPS well suited for? What was it not well suited for?** You know, that's such an interesting question, because I really don't see where it's not suited. I can't come up in my mind with a situation that it couldn't be used in some way, shape, or form in each class. **So, obviously for a writing class, it can't be used to teach writing, but it could be used to reinforce rules.** No. Take this for example. You could give three examples of writing. Select which one you think is the best, and then you have a discussion after why. Yeah. So, even with writing, it's interesting. It just varies. I think it's just so good to have something that's different in the classroom for students. **Do you see any issues around using it for testing?** My age. I like the – **You want a piece of paper that's got the student's name on it.** Well, not exactly. I guess what my concern is, is that – and I guess when we have such large classrooms we have to do this – an entire multiple choice test. I have real issues with that because our learners – not all learners are good at multiple choice. Sometimes it's just memorizing and that worries me, so I encourage all of the teachers we work with that you have a combination, so if it is used for testing, that is a portion of the test, not necessarily the whole test. You have a mix, short answer questions, multiple choice, and fill-in-the-blanks – or whatever it is that you want – but you need to have a test that facilitates all types of learners. **So, that's your philosophy of evaluation. Let's just go to that multiple choice part. Do you see any issues around using it for the 20 percent of your test for multiple choice.** No. **Issues around cheating?** I suppose if they were to switch remotes somehow, it might be an issue, you know, somebody else does somebody's test or does two tests and that sort of thing. **That's the sorts of thing that's happening.** Is that right? Yeah. **Especially in large classes. Students show up with several clickers.** Interesting. **So they are registered to students and they just click all three of them.** That's really creative. **And the other thing is, if you're doing it on a screen, everybody's seeing the same question at the same time, correct?** Yes. Oh, but you know – No, in our system – how does this work now? In our system, yeah, they'll all see the same question – we have a system where students would have a hard copy. However, the questions have all been randomized so that the person sitting here has the test questions, but the numbers will be different. So when they click, their answers will be different than the person next to them. **So, you're not displaying the questions. You're putting them on paper –** Well, you can. You could do it either way, but I know that some people have used it where you have the sheet here, and it really eliminates the cheating because the answers are all – it's random in the computer system how it's recorded, so if we're sitting next to one other, you wouldn't have the same questions to plug into the remote. **That's not being done in some places, but being done in others. Some of the issues, obvious ones, with having displayed questions is that everybody's doing the same question at the same time. So you could easily go –** And watch. **No, there's tapping, there's been numbers.** Oh! **Because everybody's looking at the same question, so – because you're all doing them at the same time, so this means B, or tapping. Because everybody's simultaneously doing them, so that's a problem with the display.** Yes. **But the paper would eliminate that. But the paper's a little extra work, so some people are trying the display one and –** That's very interesting to compare that. If they're using testing in the business area – to compare – **They are not doing them yet.** Oh, they're not**. Not at Fanshawe main campus. In broad uses across North America primarily of these, there's –** I'm sure they've been

writing some articles about it. **Oh, there's reams of stuff. There's all kinds of concerns about using it for testing.** Yes. **And plus the whole – can we really be sure that it's working? And what if no record of it and something crashes.** Exactly. **Nothing. We have nothing.** And you don't want to have students to have to – **And some students worry that pressing – they are thinking, is this really working and they have some anxiety around that even though they use telephones and all kinds of technology. When it comes to testing, they've come through a system where it's a piece of paper with my name on it, here you go, and they hand it in, and they're a little worried about – is this really catching, does this know what I did?** Yes. **And what if I want to change my answer, which is possible, but not easy, and can cause problems. The last thing we want to do is make them more anxious in a test situation.** Absolutely. It's true, it's true, especially for mature students who are already going –

13. **Anything in your product, so your hardware, the CPS system – any features that it has that you'd like to use in future classes that you haven't used already and then, I'll ask you this one as well, last question, which is, are there any new features that you would like – if you were designing a new clicker or you knew of different products out there, is there anything you'd say, "Oh, yeah, I'd like to have this feature in my clickers?"** Can I do it the other way around? **Sure.** You know the whole clicker system? I'd like to have it connected to FOL, so that we'd have a system – and I actually wanted to talk to [NAME] about it a couple of years ago, and I just have never done this. Can you talk with Desire to Learn and could something be developed where we could do that testing, and that works so that it automatically go into the gradebook for FanshaweOnline. **Like with FOL?** That's right. So that we all have the same system across the College. It's all the same. It's like when we were using WebCT and Blackboard and different kinds of formats, and now we're all on Desire to Learn. So, that to me would be great. I guess for me just more time to be able to play with it and use it. I would bring in more video, graphics, and that sort of thing, try to incorporate more things. **So, the software** – Just use the software more effectively. Yeah. **You use, I think infrared – they have to be pointing.** Not anymore. That's the new system. That's the old one, so that must have been infrared. Now it's radio frequency. **Generally, that's considered a better system.** Yes. **So, you're using that. There are clickers that – some of the new models and different ones I've seen that show, well, there's an LED read-out so you can see. There's ones that indicate battery power. There's ones where you can actually type.** Oh yeah. **There's talk about having your phone become your clicker.** Interesting. Interesting. How would they control that? **Just everybody's phone would be their clickers. So, anyways. Any comments about any of those?** Well, ours has the screen, and ours has the numbers, so they can actually do the math, calculate the math. And I fully anticipate that every year there will be something new, and it's great to be part of that. **There's also some remote testing, where a test can actually be sent to the clicker and the questions come up, so as opposed to paper or the screen, you're answering the questions –** eventually becoming paperless **– so, you're just getting your questions on a little screen. I'm not sure about that. They are very used to – students I mean – things on very little, tiny screens.** Which would drive me nuts and they won't be able to see by the time they're my age. **I don't know.**

Anything else you want to comment on? I think the system is a really good system. I really feel this is another option for the classroom, and I think it's great. I think the students enjoy it. My only thing is is that the College really needs to give faculty time and help in getting everything up and running because we have FanshaweOnline and everything up on the courses there, and so any new technology just needs to be supported, and other than that, I think it's great.

Professor B (Interview Date: January 25, 2008)

1. **Researcher: You got hired probably in July, August to teach that course and you were probably aware, because Woodstock's been using the CPSs, that you would have the option to use them. What was your state of mind as far as your thinking about using the CPS again? Because you've used it before, correct?** Professor B: Yes. **So, what were you thinking?** From the perspective of a part-time instructor, whether it be partial load or not, my thing is that this is something else I have to learn or learn more thoroughly, to be honest with you, whether it was worth it or not. **So, that was your thinking –** One of them. **I should probably** – brush up on it. So, I mean, that was an issue because that's something we have to do on our own outside of remuneration. Secondly, how was I going to use it? Because I know that some instructors like using it for testing. Some like using it for just review at the end. Some like using it throughout the class, which is what I'm more tempted to do. **So you were thinking, okay, I'm going you use – you don't have to use it?** No, no. Not at all. **But you chose to use them, correct? So, obviously, that would imply some sort of positive.** I find that I used it for a number of reasons, some of it for me, some of it for them. I find that as you teach three hours, even with a break, sometimes students will doze off and do this and find things boring. So, I find that from that perspective, it's good to get them – it keeps them jumping to different things. I throw a question up, ask them an idea. It jolts them back into reality. So, it's a way of – an attention grabber for me. It's also great to see how they understand the concepts that I'm presenting. And another thing is, I like to run my classes very wide open. I don't like just to lecture. I like students to bring in their own experiences and that. So I could just be walking and, boom, I think of a question where I could draw a really good discussion or heated debate. I find that by asking students certain provocative questions, they'll see the results and it will get them to sort of jump in and say agree or disagree and debate things – and debate things in a meaningful way. **So, this is an on-the-fly sort of thing –** It's both. Sometimes I'll prepare. I use both. There's a verbal option and there's where I can input data which is really extensive if the textbook doesn't have the proper – if it's not set up to format using CPS. **So, what this question is trying to get at is your attitude toward clickers going into this course. Sounds positive. You had some experience. I mean, you chose to use them. It wasn't mandated for you. So obviously, you wanted to use them.** There was another clicker system that came with my [COURSE] textbook. Now, that was different clickers that came with the – I didn't use it at all. I didn't have the training for it. They were supposed to contact me back in the summer. They didn't. If I'd known, I would have made sure they didn't come with the textbook because that was a negative experience and the students got turned off because they paid for something they didn't use. **Ah, so that was the [COURSE], which was set by my division.** Yeah, and we didn't get the training for it in Woodstock. On October, I found out that there was supposed to be training for it from the publisher. Never happened. We did some online stuff. It wasn't – the way they taught us online wasn't good. **The webinar?** I'm sorry – for me. **That's not you.** No. Everything I teach is online. All my courses are hybrid or online. But the way they taught me wasn't good. No, it was just too much. **That was the – not Pearson.** Was it McGraw? **It wasn't McGraw. Nelson. It was Nelson.** So, our students didn't get on board with that and I honestly didn't use it at all. I used the CPS system instead. **So, that**

was the TurningPoint system. Exactly. Yeah. **So, that was a different course, but that's good to know.**

2. **How did you use the CPS in your class – in that class, [COURSE], last semester. Frequency? I don't think you used if for testing from what you said. And what worked and what didn't work? And this might have been something you observed this last time or you can draw on –** No, I'll do it on this course. So, in that course I did both on-the-fly questions with verbal analysis and pre-set questions which was the data – for instance. I don't like testing, and I think it's – the integrity of testing, you lose it with that because a student can look over and see what you're punching in. It's a cheatable system for testing unless you have some barrier or something between them, okay. **Randomized test questions and all that.** I don't know how to do randomized with it yet. In my case, I used it on-the-fly, I used it with questions, and I also used games where I set up a Jeopardy-type of game where I put people into groups. I found that in the most part, when it's used with students, and I use the anonymous option only, and I let them know that, I think – **You don't track in the background?** – I do not track it. I tell them. **A lot of set up, too.** The set up is pretty easy actually, but I don't assign clickers to them, because I can't always guarantee that I'm going to get the clicker system because [NAME] uses it and so does somebody else from the tech class. But I use it anonymous. I mainly use it in that case for the benefit of the students. I want them to see how they're doing so they can say, "My God, I better pull up my socks. I'm not doing well." Or, you know, with self-evaluation, I found that the group work really got students to work together, especially in an environment where you're teaching HR, you're working with people, so I found that worked, really, really well. And as well, even though it took a little bit extra time to input the questions because you can't copy and paste the way you could unless you knew DOS functions for it, you can't unless you knew the control keys for it. That's one negative thing about it. If they could make it more user-friendly so that you could draw questions directly out of Word, copy and paste, instead of knowing – luckily, I know the Control C and Control V. So, that's one drawback. **That's different from the system that you didn't use because you didn't have any training or warning or anything, in that TurningPoint is just an overlay on PowerPoint.** Exactly. **They don't think of it as a database of questions. Oh, I just created a – their language indicates they think it's quite easy. "Oh, I just created a slide." That's what they're doing. Just adding A, B, C, D. So they create a slide: What is the standing heart rate of a 50 year-old man? And they have four ranges, and they say this is the right answer, and it takes about a minute to create the question.** We have the new CPS as well, and I find that it's more flexible. I can shift either way. I can do what I've got structured in the databank or just go outside of it, sort of bang, right off the top. So, that's what I like about it. Testing, I do not use. I use it with structured questions, on-the-fly, and I also do group stuff with it, too. **So, some of it is straight – there's true/false, multiple choice – there's a right answer – or sometimes it's to prompt discussion. Those are your two**. Exactly. For opinion or for right or wrong answers, whether it's yes/no, true/false, or multiple choice. **And which of those – they both worked well?** They all worked well. I mean, they're all fine. With verbal it's a little bit more challenging to use multiple choice. Just like students can't remember if I give them three options, A, B, and C. But I use it fine. It seemed to work well with me. I'd go over

it twice. Or sometimes if I'm really fast, really cut for time, I'll print questions on a sheet and then I'll run it off that sheet and use the verbals, but – **and then they answer the questions. They can still do it**. Then I give them four of five options that are right there instead of on the board. So, no, I find there's no limitation. **And then they have a record of the questions which is also useful to them.** Yes.

3. **Did your use this last semester – if you want to answer this question just thinking about last semester, or because you've used it before, you can think about your use of the CPS over time – did your use of the CPS change either over the last semester or since you were first introduced to them?** I'll break it down. So, comparing to what I did last semester as compared to what I did the semester before, I actually used it more last semester. Through the actual semester, last semester, I used it as well, the frequency increased. This semester, I know that's not part of it, but I'm using is more, and I'm using it in every single class. **So, you were able to get the system?** Yeah. It's available. And you know what? I know how to do most of it. And you know what? I find that I learned the discussion portion or the games portion online. They had really good video. That's how I taught myself, too, those extra options. I'm using it more, and I'm going to continue. But through last semester, it increased. It was more than last semester. **So incrementally, you're adding.** The students like it, that's why. They like it themselves because it gets them more class involvement. I mean, I'm finding we're having really good, heated discussions and that, but it's also another way that they find, so – **It's another tool.** It's another tool. **So, your use changed. You commented that it changed with regard to frequency. Did it also change with the type or – the way you're using it? Mostly, you used the same ways as before but you're just using it more frequently?** Well, no, last semester, actually I'd never used the game option. That was the very first time I'd used it, and I found that it was very easy to set up. **So, that was a new thing.** That was brand new. **That's what I saw. And I saw someone else use that as well, so it must be popular.**

4. **Did your students' use change over the semester? Did you observe any change in the way they used them, responded to them, in any way?** Last semester? **Yeah. Over the semester. Did they change from the first day you brought them out to the last day? Can you think about anything that changed? In the way they used them? Or their attitude toward them or their enthusiasm?** No, I think from the very first time they used them – like the first time I used them, at the end I got comments like, "I really like this," "Let's do this again," "Can we do this again?" So, I mean, they like that. **I observed that they liked it, too.** Yeah.

5. **You talked a little bit about this, but I'll capture your comments on training in one question. So, the impact of training, such as it was, way at the beginning or any reinforcement, or whether it was self-training, which we've just mentioned, your own online training, any comment about training and its value to you related to your use.** I mean, the training was really good when it happened. **Which was, like, five years ago?** No, well, a couple of years ago. I find that – **Who gave you the training?** Well, I think [NAME] was the one who first started, as well, [NAME] and [NAME] are the ones that have actually gone to conferences about this, what I found out. So they're

really the – I call them in-house experts because they're using day-to-day. But I find, like I teach in [COURSE], if I've learned and applied, then no problem, but things I've learned but didn't apply right away, so I lost it. **Oh, so you had training a couple of years ago, but you didn't – other things came up, you weren't able, you didn't choose to use it.** So, last semester, I got a lot of help from [NAME] because she'd come in and help me set it up. So, that's what got me into it and then I would start doing things and started learning by the videos online, like the new things – the stuff [NAME] taught me was good. The new ones such as games application, I learned that myself and diddled with it. I still have some problems. Sometimes I save the database and I'm having trouble somehow retrieving it, so I'm not – there's still glitches from my perspective. **So, what prompted you then to, from two years ago, when you had some training, what prompted you to last semester use it more? Was it me asking you if you wanted to be in a study?** One was out of selfishness and one was for the students. **So you want to learn a new tool – make yourself more –** I want to be, in Woodstock, basically the online person, FanshaweOnline and everything. Okay, so another tool, another skill to have for myself – so, if jobs come up. But also, the students, too. I mean, again, it's very important to get the student involved, and I want them to enjoy coming to my classes, and I want them to believe that they learned something. My motto: if they don't succeed, I don't succeed. So, it's another tool I can wrap them with. You know, I mean, I have more class discussion than other classes do. I give them a lot of rope to move around with. And this just perfectly adds on to it, complements what I do.

6. **How has your previous experience with CPSs affected your use of the system? I think that we've already addressed this. So, you've used it before – but minimally.** Very. **But based on that , you must have had enough confidence – I'm putting words in your mouth – I mean, you'd used clickers before, and you didn't say, there's no way I'm using it again, so there must have been something positive about it when you decided to go forward.** Well, you know what? If there wasn't the support here, I couldn't call [NAME], and say, "[NAME], what am I doing wrong when I set it up," then I wouldn't use it half the time. **Not worth the effort and the hassle.** She'd come over any time, and the support was one of the major drives that made me use it more and more. **Oh, interesting. That's important.** Because every time I set it up, I knew I had a problem. **Some little glitch.** Just detecting the receiver, whether making sure it's on teacher mode versus student mode. **All the little things you have to remember**. And that's what – and that's what screws things up. It's learning over time, but [NAME] taught me everything. If I have a glitch – [NAME] – and that's it, boom. I get help right away. **So, you had previous experience, it was positive, but there were problems, but knowing that – your confidence in moving forward, in deciding to use it more** – that there was support there if I got stuck or anything. Yup. And then, you know, practice makes perfect. **Yeah.** Every time she came, I'd learn what she was doing. Now I just grab it and flick it in. I know what to do. I still had issues until this semester. I'm learning, she's learning.

7. **Impact on – I'm asking these two – try to separate these two concepts. My first question is, what do you think the impact of the CPS system is on student engagement as distinct from learning, which I'm going to ask you separately if you**

are able to separate them in your head, because they are obviously linked. Impact on student engagement. You've answered that a few times already, but specifically for that question, you would say – ? You know, it's always hard to get the students involved, right? And it's hard, actually to – They have their own little cocoons, and by asking them you put them more in corner again, right? So, I find that I'm able to draw every single student. I have 25 clickers out there. I don't go to the next question until all 25 responded. Okay, so I find that this makes everybody becomes engaged, regardless. And then I find that over time, if you work it properly, that those students who don't like to talk, who sort of look away from you when you say can somebody tell me – they now, because they're being forced to answer a question, sort of draw in a little more closer too, and you can sort of say, well, okay, what do you think? You can sort of get them more – I find that it's a really good tool to engage everybody, even those that are really, really shy. I had a student last semester in this course, or even in this course, that are terrified of answering questions. I found this was a great way to open the door **– like a baby step? And so if they see they answered it right in a safe environment.** Exactly. Anonymous. **So, if they start seeing they get them right and go, "Well, maybe I can actually put up my hand one time."** Even though the culture of the class is, answer the question, if you're wrong, you're wrong, but you learned something. This gets the next step and gives them confidence. **Okay. So, engagement – so, the impact on engagement is a positive one.** Thoroughly, very strong. Very strong.

8. **Okay, and then learning?** With learning, it's kind of the next step up from engaging them, like we talked about. Now that I get them involved, and I make them, and I don't move on until everybody's used their clicker, but I don't know who's using which clicker, though. Again, they as well as myself, are both able to see, have I explained the concept right, is there something wrong I'm doing, or is it something wrong that they're interpreting? So, it allows them, again, to learn the material itself, the factual material, and allows them to build that confidence to create an environment where they can learn as well. It's a transition step from the engagement portion of it. **If you asked a question, and most of the class got the question wrong, what do you do?** I would ask them. I'd say, maybe I'm wrong, and I ask them why do you have that point of view. You explain to me why you answered it as such. And then, maybe my question wasn't clear enough, and so I know to go back and clear it, or maybe there's a misconception. So, I mean, it's just not okay just to say yes or no, and say you're wrong, you're right. Ask them why they chose that question. And then sometimes, you know what, it makes sense. I gave the same class an essay last semester, and said, listen, I don't care how you answer it, you justify how you answered it, we see your thought process, and that's how I'm going to mark you. I'm not marking you mathematically, if it's right or wrong. So I find this, number one, I can see how they're thinking, change what they're thinking, I'm transmitting information wrong, And I also use it before exams or mid-terms too. I give them a dose of reality, see if they're doing well or not. **These are the questions.** Exactly. **They might be the same ones.** And I use some of them. At times when they didn't know, I used a whole test once. I didn't let them know, then afterwards when they found out, they said, "My God, we did this in class." It was an experiment to see how many were paying attention. But, yeah, it's a great tool for them to see what's going on in the class, and if you're wrong, or if you're misinterpreted, or if they've done it. **Do you think**

the students – what's their reaction if they – in groups or individually, if they get a question right? If they get a question wrong? How do they react, as a group or individuals? Can you give me anecdotes of what they do? Oh yeah. Last semester, they get things right, they go, "Okay, I'm getting it right. I'm impressed." They know their material. Other students, I hear them say, "Wow. I better go back and look at my material." You know, so whether it be in a group environment or not – if it's in a group environment, it allows people. It creates that bond and that support. A lot you do in group environments, even in the class lecture, was, "I hate doing group work." **Great, good thing you're going to be in HR.** Exactly. That's why we build it in. This is what HR is about. Start living it now. So, in that aspect, it sort of gets them into the framework that this is all teamwork: "There's No I in We." And as I said, for individuals, it shows them where they are. Exactly. Do they know the stuff? Do they not? And it says, you know what? I've gotta go back and crack the book open. Or you know what? I'm doing well. Let's see how better I can do at the real thing. **You probably haven't done this, and few teachers have and there's a lot of variables to this, but do you have a feeling whether they do better overall? Their marks are better?** After doing the CPS system? **Yeah. Do you feel there's an impact? I mean, we think it's positive on learning. "Oh, well, there's last year – I didn't use CPS, this year I did, and there's a 10 percent increase in their marks overall?"** I'd have to compare over last year, though. **Yeah. No, I'm not going there, but is it something that's occurred to you to look back?** What I did is I actually – I didn't do it last semester – but I'm doing it this semester where I'm sort of, I'm, with different quizzes or different sections, I'm doing, and it's nothing scientific, but basically, I'm doing some units using CPS heavily, other ones I'm not doing it to see if it's worthwhile. **So as a professor, you're interested in seeing, I wonder if the CPS is having an effect on –** Only to the extent of how much should I use it, regardless of whether it's a negative, neutral, or positive correlation, I'm going to use it because I found that the engagement portion itself is enough. But to use it more, how heavy should I use it, I want to see if there's any kind of direct impact on learning. **So your guts are telling you, engagement is up, learning must be – I mean, it can't be having a negative impact.** Oh no, no, no. I don't think so at all. **So, either neutral or positive.** I think it's above zero, in the positive from what I've seen so far. **So, positive on engagement and positive on learning.**

9. **Are there any problems that you've encountered with the CPS system? And they can be technical and I'm not going into that, but that does speak to some issues that I'm looking at, so they can be technical, they can be problems that the students had, or that you had, and it can be last term, or if you want to go back.** Well, we had a problem this semester with – the receiver was supposed to say TMA, it was saying SMA which was student – **Student mode?** Exactly. Student mode something, and teacher mode something. We didn't know what was going on. We thought one of the CPS units obviously we had was not working. Eventually, we found out that's what it was. [Description of technical problem] So, I think they should make it so there's two defaults where you just press one button or the other, where you don't have to go click, click, click, click, click. A teacher default [undecipherable] to avoid things like this because we didn't know what was going on, and we tested every single computer and we found out later. **Was that a new software upgrade, they'd changed something?** It's been used

before but maybe I clicked something off accidentally. I don't know what it was. We still don't know, but we've remedied it now. **You've fixed it now.** Yeah. **So, some interface issues.** Yes. **What about clickers dying or batteries or – ?** No. **Frequency, it's radio frequency now.** I mean we say, don't just press 1, press 1, send. Or I don't know how it's keyed in. As long as I give them little guides like that, they're fine. Teaching about the different colours, what they get on the panel, green, orange, yellow, red, I believe. But on the student side? No. Once the technical stuff gets out of the way, it's very, very user friendly. **Well, you don't have the issue of different models of implementation. They're not forgetting them, they're not leaving them at home.** No. Here, because we use them – I drag them class to class. Now I guess in London I've heard that because students have them it sometimes might interfere if somebody's using it from room to room, they have to set up – **different channels.** I, fortunately, don't have that issue. And I don't have to set up class rosters and stuff like that. **Which don't have to be done, but they do have to register them the first class. Okay, so fewer – because of the way, because of your model, you have fewer of those –** [Discussion of Aplia software]

10. **Try to imagine yourself talking to a new professor, or someone you've never met before, another teacher at the College, and he or she were talking about his course and the content, what would prompt you to say to that professor, "Oh, that course would be perfect for clickers."?** Just the course itself. Is it – **Does it matter?** It does. Look at it from these two perspectives. One, is it a course that involves a lot of discussion? Where on the fly you can ask questions. Or is it like a mathematical course, that's very, very structured, where we know what the elements of the table are, and that's it. [Examples of factual and scientific data]. For those areas, it would take more work, I believe, to use this. You could still use questions. It would still allow you to engage students, but engage and go one step further where you would have open-ended discussions would be more constraining in those types of course, whereas in courses such as, I would say the majority of HR courses are very open-ended, [COURSES], all the courses that I've taught. However, you could still use it for every single course, but I find that it would be easier for courses that are more open-ended where you want discussions. That's my biased mindset, that's how I teach. Every class has to be wide open discussion, say what you want. It would be a lot easier, certain courses I guess or certain textbooks, they have CPS modules built in, it's just one click and you transfer all the questions. If I saw a textbook like that, I'd say, you know what, they put it in the format for you, use it. To be honest, it will make you look better. It will help your students. And at the end of the day, it will be a better course for everybody. **So, your preference for teaching is to have discussion and use the clicker, and you see potential for the clickers to prompt that discussion. So, to have kind of a "Who's shoplifted?" kind of question. They answer anonymously, and you go, "Wow, 40 percent of you. Let's talk about that." Or 60 or 80. That's a springboard to a controversial –** How many courses have you been in that are really awesome and how many are dry to the point of putting you to sleep? The greatest impact in most types of courses. In [COURSE], certain chapters are just lethal. Or there's another course I taught, where it's just, "This is as fun as I can make it, guys." But with the CPS, it changes the total dynamic. **But you could ask the questions and they could raise their hands. So what's different?** People are more hesitant to speak for the purpose of – you know what, they don't want to sound stupid,

they don't want to say, Oh, I'm wrong, they don't want to sound dumb. **So you ask the question and they say, "Wow. The class is split on this." Or, "I'm in the majority" or in the minority. They feel more safe because it was anonymous. They would be comfortable seeing the results and then speaking?** That is why at the same time – over the semester those ones that are in their cocoons will come out eventually because of the way we teach, but I find using this advances the process a lot faster. If your instructor is worth half your salt in weight, then you know what, then eventually you'll get them to come out, but this makes the process much, much faster. **What about classroom? What if you had a class of all men? A class of all adult learners – over 50? Gender? Age? Anything like that?** Doesn't make a difference. No way. **So everybody, not just the kids – clickers are often presented as something, well, for the digital natives and all that sort of stuff. You're saying, no, you've got your adult learners – they're just as adept at pressing buttons?** The more mature adults are just as good at FanshaweOnline if they want to be. It doesn't matter. If you shut yourself down, you're not going to learn, regardless of what age group you are. **Nothing there.** I find it awesome, though, when there is a gender difference and I can really spark a good debate. **In the question – but not the use of the clicker.** Exactly.

11. **I think I know the answer to this one: If given the choice, would you use the CPS again? You've said, obviously, you've demonstrated it's a yes, because you're using it again now. And why or why not? So, why are you using it? Because the same reasons that you started to adopt it. You thought it was good for you as a teacher to be using it. And you think it's good for the students.** More skills. Good for students. And it's become easier for me to use. Instead of taking me 10 minutes, it takes me 60 seconds now to set up. **I think we've covered that.**

12. **And I think we've covered this as well: What was the system best suited for? What was is not suited for? So, you've said you like it for discussion. Did you do pre-tests, for example, in any situation, where you hadn't taught the material yet?** Yes, in advance. Yes, all the time. Before we started class, I might, before we even get to objectives, PowerPoint, I'll ask them – talk to [undecipherable], then I'll talk to the material. Did you read your material? Or, what do you know about it? Oh no, it's really good to see where all the students, are. **You like that.** For sure. **Did you ever use it as a post-test/review? I think you said yes.** Yes, I use it all the time before exams, test, mid-terms. And sometimes at the end of class if we have time to see how they caught on to the material as well. **In those situation, they might be more factual, those questions? So, as opposed to your prompt a discussion questions.** No, I mean, when I'm using it in that context, I'm picking – **Testing their knowledge?** Exactly. And again, some of the knowledge has to be discussion-based, so it's good for that, but some of them are just A, B, C, yes or no, true-false. **You've not used it for tests. You're worried about that. You've mentioned that already. Anxiety around that.** Look, I'm a freak with respect to the integrity of the diploma. [Discussion of FanshaweOnline testing] And I believe that the CPS doesn't really lend itself to that. That's my personal perspective. I could be wrong. **And I understand that tests here – the questions are not actually displayed on the screen. They're actually given on a piece of paper?** They might be in [NAME]'s class. I don't know. For testing itself, I wouldn't know, but I think that's how

it might be done. **Some people have done the screen thing which has all kinds of issues.** You know what guys, no doodling on your paper, but then – I just think it leads to opportunity. **Worse than multiple choice where they can look around as well – you can see people clicking?** If you're in my class, each row is going to get a different test, two tests, pink and white, and even that, if I have to do testing in class, I can't help – cheating is going to happen. I don't care. **And then there's the issues in large classes where people show up with three clickers. Would you – you've never used it for attendance? You don't need to. You have small classes.** No, I use paper. I know someone who uses it for attendance. I know for a fact.

13. **Can you think about features? Well, I think you've mentioned one already – existing features you'd like to use in future classes? Well, you started using the test one last semester. So, that was something that you used that was new. Is there anything else you're looking at for this term? Some new feature – way of using the clicker, software-based or hardware, for all I know – I'm not that familiar with your clickers.** No. **Something new you want to use – or is something that you think, "Oh, wouldn't it be great if the clicker could do this?" – whatever it is.** From what I know, the clicker only has those three options. Even doing their audio or video stuff online, it doesn't show anything else, but, I mean, it's an awesome way for attendance. I don't use it. I'd just like to see it where I could transfer stuff from a Word document into it. I don't know if that's really the question you're asking or not. **Exactly. It's things you go, I wish I could do this. This is harder –** It's easy to copy and paste in Word than having to use DOS keys, number one. It would be better if we're going to use this if schools would approach publishers and say, you know, you're putting them in PowerPoint, you're doing this, you're doing WebCT or Blackboard – can you make a pack for the CPS? Another option would be for a simplistic interface, teacher-run or student-run and have it automatically set instead of having to go – when we open it up, we have to plug it in, plug in the receiver, right? We have to open the program. We have to ask it to find the that port the receiver's on. We have to create a default class and give it a name. So if we could simplify all that with one click, instead of me going step one, step two, step three – plug in the receiver, hit a button and it would do all those things for you, that would make it so much – it's user friendly and more people would use it. Eliminate the technical stuff for the non-technical teacher, which – you know what? – isn't hard to do, isn't hard to do at all. **Have you seen any other clickers being used? Any other types? Any demonstrations?** Well, there's the one for the [COURSE] last year. But you mean have – **Have you seen one used?** Yes, I have. I'm just trying to think right now. **Western uses Interwrite, a different product altogether.** Yeah. Yes I've heard about it being used at Western. I've seen the game shows. **Yeah, right. Same thing, that's the genesis of the thing.** [Discussion of clicker-type products and the features of CPS versus TurningPoint] I guess because my tech person's right here. That's the biggest difference right there.

Professor C (Interview Date: January 2, 2008)

1. **Researcher: How did you feel about using your clickers or the classroom response system before the semester started? Think back to July and August.** Professor C: Definitely nervous. I would define myself as a non-technical person, but I was hopeful that the benefit would outweigh the risk, but absolutely very, very nervous about it. I'm no pioneer when it comes to technology. **And that was July-August?** Yes. **But you still made the decision?** Yes. **Hoping that, as you said, the benefits would be there?** Yes.

2. **Describe how you used your clickers in your class. So, just in general terms, how often it was used per class? And I know that some of these questions are repeating some of the things that were in the survey I gave you, but I can get more information this way. So, how often it was used per class and did you attach any grades to it. I don't think you did. And just comments about when you're thinking about how you used it, and you might have used it a certain way at the beginning and changed it. What worked and what didn't?** I used it in every class except in the two classes that I tested in. So, other than that, I did use the clicker in every class. **In every class?** Yes. **I didn't know that you used it that much.** But I used it faithfully, and I used it at the beginning of every class. So, I used it in two ways. Typically, it would either be a "preview" is how I labelled it, where I would pose questions about the unit we were about to begin. **And that is what I saw. Almost like a pre-test to test their knowledge.** So it would be a little bit of probing to see what information base they came in with and what was really new information for them. And I also used it as a review. So I might, in a case where, let's say, I was timetabled Mondays and Fridays for geography – so if I knew we were beginning California and Arizona on Monday morning, I would build preview questions and use those to preface the lesson on a Monday, and sometimes I would use the identical questions as part of the review on Friday because the balance of the Monday two-hour lesson following the preview would be that new information. And that was really enlightening for me because the scores would shoot up. **And so the students as well, they'd go, "Whoa, I actually learned something from school".** "I remembered that. I remembered that." **So, that was how you used it. You said you used in almost every class, or every class except for testing, you made a point of using it.** Yes. Yes. **No grades were attached ever?** No. **You did not use it for testing?** No. **And so you used it consistently like that over the semester?** Yes. **Did you change in any way? Or did you always pre-test and post-test? Preview and review.** I didn't really change the format too much.

3. **That's my next question, which is how did your use of the classroom response system, clickers, change over the semester?** Not really. I think it changed in the sense that initially I was always planning to use it as a preview to get them engaged and to test what information they arrived with regarding that part of Canada or the U.S., and I don't think it was really my original intention to repeat some of those questions. **To show them –** Yes. Yes. **And you tried that once.** And it was so illuminating and they looked really pleased and I, to be honest, I was also pressed for time because I was teaching a brand-new course in addition to adopting the clickers this semester, so I had two really time-consuming, new, new – **I didn't know that. So, this was a new prep for you?** Not this class. Another class that was a second-year course that was an entirely new prep. And so

from a time perspective, I was busy. **And you're saying that if you'd had more time, you might have looked at other ways to use it.** Yes. Yes. And I think that there were times as well where when I was pushed with my new prep for my second-year course that it was inviting to know I can use my preview questions as a review because we finished that whole unit on Monday so it's not cheating really to think, well, I'll re-use these questions. So it was desperation that caused me to do that initially, and it was one of the very, very effective – **And were those questions – so you did preview questions, then review questions – were those also similar or identical to test questions?** Similar. **I think I remember hearing you say "these won't be exactly the same."** Right. And the reason that I said that is that I would have some students that would rather than using their clicker would start madly writing down all of questions, and I thought I want to move them away from that because they thought their time was better served writing down questions, and I knew many of these will not be identical to questions that are on the test. **Did they have access to those questions? You didn't post those PowerPoints?** No. **Okay, so they were not available because some teachers have them as part of their weekly PowerPoint slides that they post online, but you kept them separate, so that's why they felt they "Oh, I have to write them down" because they're not there.** Yes, yes. **Okay.**

4. **How did your students' use of the clickers change over the semester, if it did? So, how did it change? Did you notice any changes, either positive or negative?** I had a couple purchase clickers who didn't buy them initially. **Because they bought used textbooks?** Exactly. **They found the clickers?** They bought them in the Bookstore. I know two people. And they are quite expensive to purchase separately, $106 including the tax. So, I think that in one case someone was given the textbook, so that was fine. It was still a little bit less expensive for them to go that route. So, I was pleased about that. I had two who purchased them who weren't using them at all initially. "**That looks kind of fun."** Exactly. **"I'm out of the loop."** Exactly. I think that if they hadn't thought there was value in spending $100, they wouldn't have, because in both cases it wasn't just after the first couple of times they went out and made the purchase. In both cases, it was probably after a few weeks. I would also say the reverse happened. Just again, being a little bit young, I heard one of the students say one day – I said, "Okay, everybody grab your clickers," and one of them say, "Ah, how are we supposed to remember to bring these things?" And I'm thinking – **Well, you remember your cell phone every day.** Exactly. Exactly. And you know how small these are. And I think again it was just that maturity level. It was an easy out to say because – and I did use them faithfully and that was one of the reasons why I wanted to use them faithfully to make sure they knew it was worth their while to have them with them Monday and Friday mornings. **With your rate of response, do you feel that of the students who were there, did they mostly remember and bring them, did they participate?** Yes. Yes. **Did you see students there with the clickers who didn't bother pressing them?** I never noticed that. I would get a show of hands quickly to see how many of them had theirs with them so I'd know when to close down, so I'd do a quick count. So if I had 28 students in class, I might have 24 hands up, and then if I saw that we were at 23 and there was a gap, then I'd say, "I'm going to close down the polling," and then I would check to see if there were any – **if there was one that wasn't working. I noticed when I was there that someone went to the washroom.** Right. Yeah. Yeah. **So, overall, in your opinion, most of the students**

had them? Yes. **And used them if they were present in class?** Yes. **And that didn't change? They didn't get bored. They didn't stop using them. You didn't notice a noticeable drop off?** I didn't find that personally.

5. **Here's a question more about you. Think back to the training that you received, such as it was, before and a little bit throughout. I'm not sure if I attended everything you took advantage of. What was the impact of your training on your use of the clickers?** The training per se probably made me more fearful than positive about it because just the fact that the clickers weren't in. **Oh, right this was August, the last week or so.** This was the first week of classes. Remember? It was like September 4 or something. The clickers – [NAME] did not have clickers available for us to use, which is fine. My textbooks were not in because they were waiting for the clickers in order to bundle them. **So, you found that out at the training? When we got together for that training? That's when you found out?** I think I knew the week prior. August 18 was the date I was given that the clickers would be into the warehouse. I had checked pretty faithfully without trying to be too obnoxious to see just become I'm anal about things like that, and I wanted to be able to tell the students that the texts are not in yet, don't worry. I didn't want them to stand in a long line up only to find that the textbooks were not in yet. So, the training probably set me back emotionally in the sense that I had gone out on this self-perceived limb and now my textbooks that would have been in were not available to the students because I had made this decision. **So, that was an operations problem. What about the part of the training that was actually about learning to press the buttons and register the students? Did that help you?** I didn't find that training particularly effective for my learning style. I really need a slower pace. I found that because I was so new to the technology and other people had used it, and other people had used a different type of clicker that they were more comfortable with the whole concept, so I felt very archaic as people were moving ahead and, truth be told, it was you and one of the other teachers who said to me, "It's going to be fine. You're going to catch on to it really quickly. Don't worry." That was probably the most helpful. I thought you wouldn't say that to me unless you truly believed that once I got going I was going to be OK. And I could self-teach myself but the training was not as effective for me. **And it was last-minute.** Yeah, all the things I'm not. **Not the way you would have liked to approach training. You'd have liked to have something in June or July...all summer and that sort of thing?** Yeah. **And did you then participate in any ongoing sessions throughout the semester?** No. But what was very helpful for me was [NAME], who was our rep at the time but he's not any longer, but he said to me, "Would it make you feel better if I came in on your first class and helped them set up?" That would be so huge. That was like a giant weight off my shoulders. **I've heard other profs say that too.** Because I felt very responsible that by making that decision I had indirectly delayed the arrival of the textbooks. You know I really felt that if I hadn't made that decision, it would be all systems go because the texts were not a new edition. It would have been for sure. So, it was [NAME] offering to come in and run that whole first class and get the clickers set up and "I can help you trouble shoot." It was a huge turning point. **And did he come to just the first class?** He did. **And he circulated among the students?** Yes. So he created a PowerPoint step-by-step that he also let me have, so he put it on the desktop and he also had e-mailed it to me so that if I wanted to do an adaptation of that – earlier in December he e-mailed me to say do you need me to come in in January to do a

similar start-up, which was very kind. **So, you're not thinking so much training as support.** Yes. Yes. And it was support from the people who had assured me that this would be a good thing for me, so it was wonderful. I think if Nelson had said, "Trust me, [NAME]. It will be a great thing" and then had withdrawn, you know, "It's a busy time of year...blah, blah, blah." And one of the other teachers, let's say, in your division, had said I can help you out in your first class, even that wouldn't have been quite as effective as them saying we will help you make sure that you don't feel goofy on that first class. And he would've come back in for sure. He e-mailed me about a month down the road, and certainly had left that if you need me at any time, just let me know. I will come in. I will help you. **Would you recommend that we have either a Thomson Nelson, or whoever supplied our clickers now or in the future, person be present in the first class.** If a teacher would like that, that's huge. **And what about another – what if [NAME] had said I'll come.** Yes. **So it wouldn't really matter to you. Someone who was experienced.** I think also the backup of saying, and here's my introductory PowerPoint that I used, so that there's something there in writing. **And that was [NAME] who gave you that?** It was. So he created it and customized it, "Welcome to [COURSE NAME]," so it wasn't just a commercial for their company. He tailored it to my course. I think that would be vital for someone like me who didn't have a lot of training. **So, if you didn't get the technical training in the right way or at the right time, how did you learn to do it?** [NAME] sent me an attachment that had a printable step-by step guide to creating the TurningPoint shows as well as showing a TurningPoint show. And that just became my bible. **So, you used the Thomson-Nelson supplied.** Yes, the step-by-step process. **You followed that.** Yes. That's the way I learn. **On your own.** I can't just have somebody say you do A, B, C, D, E, and bingo, you're golden. I don't retain that kind of information. I really need to have that step-by step. Exactly. **I hear you.** And then I think it's my security blanket too. I always had it in my book bag with me so that if anything happened I always had some piece of mind that I had that with me. **So, that helped you with managing the students' use of clicker as well as creating your PowerPoints? And that's it?** Yes. **That's what you needed.** Yes. **And then your confidence over time improved?** Yes.

6. **You have not used clickers before.** No. **So that question does not apply.**

7. **Now back to the students. What do you think the impact of the classroom response system, the clickers, was on student engagement in your class?** My gut feeling is that it was very positive for student engagement. **Positive impact?** Yes. **Based on what?** Based on two things. Number one, the majority of them did, when I said how many of you have your clickers, the majority of them had their clickers with them. So they did bring them and then it would follow that the number of people chiming in up on the number of responses bar would be very close, within usually one or two, of the number of people who had indicated they had them with them. Thirdly, the one time that my show didn't work and it was not interactive, I could bring it up and read the question, that was a horrendous nightmare. That's like my worst nightmare to have created this thing. I guess that wasn't my worst nightmare. My worst nightmare – at least I had proof. I could show them I had created the questions and they could see that the show was in place. It just wasn't interactive. That fell apart horribly because I said to the class, well, why don't we do this: Because I can show you the questions, why don't we just pretend it's an old-

fashioned thing? I've created the questions and when you have an idea, you just put your hand up. Well, some people would; other people started talking, other people started writing. So it was very vividly clear to me that if they weren't interactive with it, there were a number of them who were disengaging even from the identical questions. **Interesting. Would you have seen that same response last year if you'd done a show of hands?** I probably wouldn't have been as aware. I don't know that I would have been as aware because if we're having a normal class, it's not unusual for me to break up a little pocket of conversation, or for me to notice, "Oh, that's interesting, she looks like she's writing out notes for another class." So, I don't know that I could compare it to – I guess I would have thought that given the visual nature that at least the questions were up on a screen that there would be slightly more engagement than to me just pitching questions out there. **So, overall positive, based on their purchase, and bringing them, and using them?** Yes. Yes. **You've taught this course before. Can you say that overall that the students learned more or better? Or their marks were higher?** My gut feeling is yes, just even gauging by the final grades. I can't quantify that for you. That's not based on any data whatsoever, but I had definitely – I was very pleased with their final grades, so I should probably pull out last year's or the last time I taught two years ago that course. Would be interesting for me to compare. **Was it with the same book?** Yes. **That would be interesting. I'm not going there because it's fraught with all kinds of – you were a different person then slightly and you taught differently and –** It was the same books and the same tests. **Oh, they were the same tests? That's good data to have. Your feeling right now is that the engagement through the pre-test and post-tests maybe built their confidence and they did better?** We could see very vividly that if 30 percent chose the correct answer to a Washington, D.C., question on the Monday, that in some cases was up to 80, 90 percent on the Friday. Mind you, that's skewed a little bit too because the Friday morning class was 8:00 a.m. and that was often my hard core [student base]. So, my true blue, I'm going to be there through thick and think, probably the majority of people who ended up with a strong mark in the course, were very faithful at being there as often as possible. **And they would have probably done well with or without a clicker.** Right. **They're just strong.** So, my comparing it often to the Friday, but I think it was nice. Sometimes there would be almost a gasp from them. And I would say, "Oh my gosh, that's 80 percent of you chose the right answer compared – " **with Monday. "Oh, look you've learned something**." And I think in fact that – I may be getting ahead of myself here – but I even got an e-mail from someone saying just before their grades were even released that last few days, when they could figure out what they finished up at, and one of the students e-mailed me and said, "I'm amazed at how much I learned in your course." I don't know whether to be pleased or – I know she meant it in a positive way. **But I thought I'd learn nothing.** That's almost how – That's hilarious, that you would sign up for something in first year and be surprised at what you learn. **She thought she knew a lot about Canada and travel.** I don't know. Or she was not a high-achieving student, so whether she didn't think she'd be that successful in College geography, I'm not sure. **Would've been nice if she'd said something about the clickers. It's all because of the clickers.** Yes!

8. **So engagement, positive impact on engagement, and the next question, I think we've already touched on the next question: What do you think the impact of the**

clickers was on student learning? Engagement doesn't always translate into learning. Right. Right. **But that would be positive as well.** I would. I definitely would.

9. **Here's a good one: What problems did you encounter with the classroom response system? You've told me some of them.** Yes. On two occasions my show worked on my home computer, and I had two clickers, so I would have the two clickers purposefully answer by me different answers so I could make sure the bar graph was coming up 50 percent on two answers. And I spoke to [NAME] about it after and he – **About the one that worked at home and didn't work in the class?** Right. And that happened on two occasions, and what [NAME] thinks I did, and what I was very, very cautious about after speaking to him, he thinks what I might have done is built the show, saved it, been interrupted – I know on one occasion I ran up to make dinner on a Sunday, and then I went back down to save it to my thumb drive – and he thinks what might have happened is that I didn't open TurningPoint first. So, there was a lag, for sure on the one show that wasn't interactive, there was a lag absolutely between my saving it to my hard drive at home and my saving it to my thumb drive which was sort of a last-minute Sunday night, "Oh, I'd better make sure I've got that on my thumb drive." So, I absolutely might have closed down TurningPoint, and he said that if that was the case, it would not have saved in an interactive fashion. So, I might have done that on the second time as well because I think it was after the second time – I thought the first time might have been just a fluke – was it "Oh, this must be Thomson-Nelson's fault." You know, I knew that it was something I had done. But after the second time it happened, I was talking to [NAME] on e-mail, and that's when he said make sure that TurningPoint is open on your home computer before you save it to your thumb drive. **So that was a problem at your end. So, twice you created the slides at home, you thought you tested them at home as you always had done, and they did not, in fact, work.** And in both cases, the show would open up, but the red bar never turned green. So I could open the show. I could go through all of the questions, but the students could not participate. **So, from your end those are the only problems you had?** Yes. **What about the students? Observable problems for the students?** And I know that Nelson has identified this: Problems with clickers not working. The quick fix was take the batteries out, pop them back in. **Sometimes that would work?** And most times it would. I'm going to say 90 percent of the time. **The same batteries back in?** Yes. **So it's that they got jiggled.** It just seemed to freeze in some way and removing the batteries and putting them back in seemed to restart it. **And for 10% of those problems?** Well, I had one student where it would fix it temporarily but two weeks later – and I have her clicker with me right now. **Oh, she got a dud, a lemon.** Yes. **And they've replaced it, have they?** Well, actually I need to – They had said to me originally that if putting the batteries back in wouldn't fix hers, they would go with me to the Bookstore, if the Bookstore gave me any problems. I need to contact them. **So, some malfunctioning clickers. Battery problems likely. One lemon. And what about students registering themselves or the first day**? [NAME] was there. Any issues that came up, he knew the answer immediately and was able to fix it immediately, so that was huge for me. **And once they did it once, they were good?** Exactly. And then we found a clicker. A clicker was found in one of the classrooms. It wasn't while I was there. [NAME], my colleague, was there. And she said to one of the students, "I wonder who this belongs to." They took it. They were able to go into it and check to see whose name, and it wasn't even anyone in our program. So [colleague] left it

for me. I didn't have a clue how to work this but one of the students said it belongs to, and said his name and found out it was someone in the business division. And I was able to get it back. So the students understood how to. And apparently, I don't even have a cell phone, I have a Blackberry, but I don't use the cell phone capacity on it. Apparently to the students, they found the clicker to be very similar to a cell phone in some ways. That's how they figured out whose name was encoded in it. **The newest of the clicker technology is looking at using cell phones.** Oh, really? Wow. Wow. **That's not here yet. Did you ever have any problems in the classroom with the console not working? Anything there?** No. Because that's been a problem in some classes. **So you had no problems there?** No. Oh, actually, sorry. I should say there was one time. There were two occasions where my show wouldn't open. Then I shut down everything that I had open, that had been opened and minimized kind of thing, and it was only after I had closed all of those out that I could open up my TurningPoint show. **And you learned that by – figuring it out!** Exactly. Exactly.

10. **Now that you've used the clickers once, in one class, one type of class, based on that, I know that's not a lot of experience, but could you describe the ideal environment for using clickers, either content, class, students, types of teacher. If you were talking to another colleague, listening to him or her talk about the content or the course, and you go, "That would be perfect for clickers." What would that class be like?** To be honest, I can't think of a situation where it would not be effective. I really can't because when I think of any of the different types of information that I give to students, I can't think of a time when they wouldn't like it unless the usage was so slight that it didn't warrant the cost. For instance, in the new second-year course I had, we were out in the field quite often, visiting sites. I can see where they would say, this is fun. There was no textbook for their course, so if they had had to pay $100 for that, they would have strongly disapproved with the benefit to them because we would have used it less often than we would have been out in the field. But I think for my geography course the net charge to them was a difference of $35. **Bundled with their text?** Yes. And we used it in every class except for two times that I tested. **So, your only reservation is to ensure that the teacher would actually use it enough to warrant –** Exactly. – **the cost. So they aren't going, "This is a waste of my money."** Exactly. Let's say, projecting into the future, if ever there was a time when students could use their cell phones at no charge to access the questions. I think if you only used it twice in the semester it would be great for them. **Just like when you try some other new tool: "OK, today we're doing – we've never done this – we're going to try group work in this way."** Exactly. On one occasion, in that second year course, on one occasion only I brought flip chart paper and markers, so they would put that in the same context. **If you could use it at no cost, if they were sitting there in the classroom – and Woodstock campus does that, they just bring them in –** Yes. **So if they're sitting there, why wouldn't you?** I honestly cannot think of a situation where if there was no cost involved, the cost certainly justified the usage. It's like when I came in with flipchart paper, they didn't think, "Why would she use paper when we have a screen and a computer set up?" And they participated really well, so I think that just in terms of the variety it would offer, if the cost was not prohibitive, I cannot honestly think of a time when the students wouldn't think it was sort of cool. **What about older learners?** I think they would especially love it because it was anonymous because what I found with mine, and I think one of the

reasons some of them disengaged, when it wasn't interactive – **They didn't want to put up their hand.** That's right. And even if they weren't sure, that sense that you can anonymously send your answers through. And if you show up on the bar graph – **No one knows it was you.** That's right. **So the older students like the anonymity. There's teachers looking at this even for writing courses for the grammar, grammatical questions. They spend most of the class writing, but they're thinking that even for the grammar class they would have for 10 minutes each week using them, thinking it might be worth it. Anything, right, for grammar? Economics uses it.** Honestly, short of being in one of the practical, cooking courses, short of that, if there are no lecture hours, and you're strictly in a practical environment, I cannot think that of a situation that it would not be deemed a kind of cool, fun, neat thing by students. Because it's really safe and I really saw that with mine. On Friday, when occasionally I'd have a couple people who typically were not there, so they'd missed the Monday class sometimes, I think they were my 10 percent who got it wrong. But it was safe for them and it also sent a further message: Wow, if most of the people in the class missed this on Monday, and now I know privately I'm one of maybe two people who missed it today, but the rest of you got it, maybe that was a good thing...**to go to school on Monday.** Yes. Yes. **That's an endorsement.** Yeah.

11. **I think I can guess the answer to this question: If given the choice, would you use clickers or a classroom response system of some sort again?** I would. **For this course again? You teach it again next fall?** I would. **Now your first-year students will have them. Are you thinking now ahead?** Yes. **They'll have them, hold on to them.** Yes, even if it's just my courses that they're using them in, there'll be that perception that the value redemption is there. **So next fall, you're looking at that. I didn't ask you this: did the textbook come with clicker questions?** No. I don't know. No. Because I know [NAME] said that that was something they were looking at down the road to have them created. **They would have to have enough teachers and colleges.** Yes. **OK, so they didn't come with yours. So, you're using it again, and why or why not? Well, obviously, back to your answers to the other questions, you said it had a positive impact.** Yes.

12. **I think we've covered this: What was the system, what were the clickers well suited for, and what were they not well suited for? You said you did review. You did pre and post.** There's an application that I would use now that I've got the first run under my belt. My initial intention was to create photograph questions, to show a photograph of the CN Tower, right, and then have them indicate what it was. But again, because my learning curve was so steep that when I got comfortable with creating text questions, I thought, well, I'm testing them in a text fashion as opposed to visual. My tests are paper tests. So, my test is not, "look at this photograph on a screen" because a client wouldn't bring in a photograph and say, "I want to go here but I have no idea where it is or how much it would cost. Take me to this picture." But I think that would be a wonderful enhancement. And it was a time issue for me. I was racing always to have the shows created for Mondays and Fridays in addition to working on my brand new course, so that was more a function of time, so next year I do have all of those shows created, so what I would like to add that would be really nice for them is something like – Mount Rushmore is a perfect thing – most of them would recognize having seen that image but not know

even that it's called Mount Rushmore and not have a clue where it is. **So still the pre and post, adding pictures.** Yes. **What about other things, like to prompt discussion? These are being used not just in multiple choice situations, but also in philosophy classes: "Who has ever shop-lifted?"** Yes. [Description of alternative application] Great. **Could you see anything beyond your pre- and post-test of factual information?** Definitely, because one of the courses I'm teaching this semester is [COURSE]. There's a lot of abstraction in there. There's a lot of – we were just talking about buyers' remorse. There's a lot of issues that – I don't test that course in the same way that I would test geography because so many of the things are conceptual in terms of service, and our perception of service. [Description of course concepts] We have a lot of really great discussions. So those questions that I would use the clickers for would be of a different nature. **So, it wouldn't be fact-based. Some profs found that if they ask that question, a show of hands is not going to work. [Description of sample questions] Students feel safe to engage in discussion if they see, "Oh, actually 30 percent of us feel that way I do. Now I feel comfortable." Whereas you don't get the hands, so they found it a stepping off point for discussion.** What a good point. I was thinking that even if I were reluctant to voice my opinion prior to the poll, if I see, "Oh, 40 percent of us feel that way I do," then that would give me the courage to voice...**Or even, who's had a bad experience with customer service.** Yes. Yes. **OK, so you haven't done that, but you see the potential for that?** Absolutely. And oftentimes with something like [COURSE], the quieter ones tend to let the more verbal ones take the floor, so this would also be helpful for me, if I could say, "Thank you, [NAME], that's fantastic. Now, I know that 40 percent of you felt the same way, so who else has something that...? Yeah, yeah. And then I know there's other people out there that have some examples. **You know it's not just [NAME] although he's loud and the one who always talks.** Yeah. **What about testing?** I'm nervous about the testing, to be quite honest. **And why?** I'm nervous about the exchange of information. I found even when I was – and I was really shocked by this – even when we were using it as a bit of preview, there was cheating during the preview. So even though – I can hear somebody say "South Dakota" when I had stressed, "Now remember, this is not for marks. And when you sit down and write the test for me, that feeling on your own without your friend, without watching what button your friend is pressing." So I found, even having said that, there was cheating in the preview. **So, consultation. They were chatting amongst themselves?** Or, at one point, when I said really, I know how much some of you are anxious to show what you know. There was – but this is one case with one of the guys. **He couldn't keep it in? He'd say the answer?** Well, no, what he started doing, I looked over one day and what caught me, and they'd laugh when I'd say, "Oh that's fantastic, 90 percent of you [got it right] and then there'd be this riotous laughter from that section of the room. And I thought, that's a funny response. **A guilty response.** It was weird, and so I looked up the next time and let's say the answer was the second choice, and he was going like this. [Gestures with fingers] And so I said, "[NAME], are you telling people the answers?" "Oh, No, No!" This is just like a fun little thing. And so I though that's exactly what he was doing because he wanted to show "I know a lot about geography" and so back to the maturity level. So it's absolutely possible to cheat, even in a non-verbal form. **So cheating that way, seeing each other's buttons, sharing clickers.** Yes, so I thought if I can't control them in a little [test] by giving them really valid reasons: Remember, it's anonymous. I don't look

at [responses]. I told them there is a capacity for me to check to see who answered what if we were using this for testing, and I said I might do that for second semester, but right now I'm never looking at that. I quite frankly don't even know how to do that. So, even knowing it was absolutely risk-free, there were still [cheaters] It was impossible for some of them not to show "I know the answer to this." And I don't know, short of having blinders on them how – **Their own little cubicles.** Exactly. If there's a communal screen. **And they're tapping pencils.** Exactly. So as soon as I saw that – I would never have predicted that somebody would be – and they would vary where it was. [Description of cheating] So, how would I even prove that? **So, testing?** At this point in time, I'm not comfortable with it. **So you didn't use it – you've never linked it up to the students' names, you didn't do attendance.** No. **You didn't ever do any of those things. And you're happy with – the way you used it was great?** Yes.

13. **What existing features in the clickers would you like to use in the future classes that you didn't use in this class? So, now we're talking about technology.** I think the attendance would be an interesting application because in the winter courses I give in-class exercises. [Description of in-class, experiential activities and grading policies]. So if they registered, that would give me some concrete way of showing these are the people who were there that day. Now, it's not a huge problem for me, because as I said, they typically hand something in that I mark, but – **If they knew, they could be sending in clickers with their friends.** Exactly. And that's what would happen if they knew that I was doing it on the clicker, and they knew attendance was being taken that way. **And you have a small enough class that you can really count.** Exactly. **And you know most of the students.** Exactly. Yeah. **So it may not be a big benefit. So, the testing, you're not looking at that**. I would dabble a little more with the countdown. I tried it a few occasions, but I found that the benefit didn't really outweigh the time that it was taking me to do that. It was just easier. Some of them would chime in really quickly and then we'd be waiting for the countdown. **What about – they can actually answer words?** Yeah. **Did you think about that?** Yes, I'm glad you mentioned it because one of the initial things I do in the [COURSE] course is have them write down what they think when I say the word salesman. And so that might be kind of fun. [Description of activity and clicker application] That would be interesting for them to see how many people chose some of the same negative words. Yeah, I'd like to try that. Thank you. I wouldn't have thought of that. **There's some things where you give them a test and they submit it at home. That doesn't sound like something –** That could be sort of an interesting, but I wouldn't attach marks to it.

14. **So, those were existing features. Anything you'd like, that you just thought, I wish we could – is there anything on those clickers that you wish you could have?** Well, from a timetabling perspective, this is not a clicker per se, but just from a teaching perspective, which I know is part of your interest, if I changed rooms between – so if I was teaching to Section A and I had set everything up and then I had to change rooms and I would repeat the same one for Section B that, again this is just a timetabling thing, it would have been a beautiful thing to have the second group come into the same [classroom] and just be able to. **Because you found the set-up time-consuming?** Exactly. **And a little bit stressful to make sure everything –** Exactly. [Description of set-up process prior to class and limitations of high-tech podiums] **Did you ever have a**

problem with the receiver? That you thought was a problem with the receiver? I didn't, no. It was always the clicker. The reason I'm hesitating is there were several times they [clickers] would say "Receiver not found" on some of theirs, but others would say, "Oh no, mine's fine." So, it was their clickers. [Description of receiver channels] **And this group will use them again this term? Are these the students that will be taking your [COURSE]?** Yes. **So you're not worrying about a Thomson-Nelson textbook. You're saying, I don't need that. I just need to create questions.** Perfect, because I think that even if they thought it was mildly fun, this will, as we said, will just be like flipchart paper. Just another teaching tool. But I'd like to use them often enough that they do have them with them all the time. [Reference to earlier student comment about forgetting the clickers] They are really portable. I can't see the purpose of taking it out of your backpack, to be quite honest, if you had it in your pencil case. **Or purse.** Yes. I **know that the teachers were not using them with any regularity. Of the group, I'm positive that you were using them the most, which usually has a positive impact on students.** Mine was purposeful for that reason. I just know how they are because we've had texts we've used sporadically in other courses, and I'd say to them in advance, I'd put right on the board, "Bring your textbook on Friday!" Because I know – especially a big textbook. I don't blame them for that. But if I can just make it worth their while to bring it every time. I don't know if I'll be in the same position. I'll have to look at that. I think I definitely could use it in every course, in every class except for testing in my winter courses with them. **And is that your intention?** I don't know that it will be in every, but I think I would tell them, "We'll use them every week in either of my courses. It would be a great thing to have with you." **And so have you thought about your first week? Have you got any ideas yet?** No.

Professor D1 (Interview Date: January 9, 2008)

1. **Researcher: Think back to last spring and last summer. How did you feel about using the clickers, the classroom response system, before the semester started, and that can run from when you first saw them used or however you were introduced to them through the summer.** Professor D1: Well, when I first saw them demonstrated it was very appealing. I thought it was a great participation opportunity that I was really anxious to try. I'm always an early adopter to try and get things into the classroom. I'm always trying to make the classroom something more participatory. And in a way I'm always sensitive to student sensitivity about being put on the spot: "How did you think?" "What did you think of this?" And singling someone out. So, what I used to do a lot of was a show of hands, and say, "How many of you think this?" And then I'd stand there and count heads. You can assume the others think the other way, and sometimes I'd say "How many yes?" and that doesn't include everybody, so "I guess we have some abstainers" and the clicker is just a wonderful way of making that visible to everybody rather than the hands don't stay up. Is that hand up or down? Half-way up because you're not committed or not certain or even awake? I looked for forward to using it. I thought it'd be great way to keep them involved in class, and have them give me an answer, and them see the diversity of response. The opportunity for people to speak about the yes and the no answers, and not the requirement to speak. **So, this is all positive. You anticipated a lot of the benefits that you thought would happen early on. Where did you first hear of or see them. How did you learn about them?** I think we had a PD presentation. I'm not sure if it was here or Ridgetown, a great teachers' thing where they have people come and talk about advances in technology and ideas to try. **I think it was Ridgetown.** So, I saw them down there and it was an interesting thing. I was wondering how sophisticated the hardware was and how expensive it was and whether Fanshawe would be doing it. And it's one of those things that you don't hear of locally and then when you come back up here, and they say, oh, they've been doing that for a long time. They're at Woodstock. As soon as we had the demo, I turn around and find out that someone else, like [NAME] has been investigating things herself, and says, we're going to use that in Pre-Health Science. So I said great, there's a start-up. Then I heard that there's a pilot project through [NAME]. Well, can we tie into the pilot project if we're going to have clickers? At least I'll know the system would be consistent with what the College is supporting. It just seemed to come up at a time when the interest was building and I could get on the bandwagon. **So, no anxiety, just eagerness. And some questions around technology, but it looked like this was going to work.** Yeah. The presentation didn't really make a deal about the software side of it, the TurningPoint. It was more about the technology and the classroom response system. This is a neat tool to use and gets your classes participating and certainly had very clear appeal. I felt it was worth pursuing it if wasn't a big impediment to the students financially. It turned out to be a really good thing for my students. One of the companies that provides them, Thomson-Nelson, is a company I've had a long relationship with for my computers course, using some of their software products, and they said they could package the clicker with the software at a really good price. That way, I know every student had to have a clicker. [Discussion of clicker bundle]

2. **Can you describe how you used the clickers in your class with regard to frequency and also just how you used it. I don't think you had any grades attached to it. So just general comments on how you used it.** The course I used it in was my [COURSE] course in first semester. In that course the students have a weekly work-out assignment where they go to the gym and physically try out something. These are work- out sessions that are done with four or five classmates so the numbers in the gym are small enough to get on the equipment, and we use second-year FHP students as, we call them lab instructors. They know how to work the equipment so they help these guys get it up and running right. And the challenge of that is there's about 50 first-semester students divided into groups of about six, so that's eight groups, and they will all have a slightly different experience at the end of the week. And this is my chance to survey them on strengths and weaknesses of the experience. Was it taught well or not? How many of you found your instructor good? Now, it's not just about the instructor. There are elements of the experience that I ask them to analyze. We might do two different types of cardio types of work-outs. And I'll ask them how many preferred Work-out A? How many preferred Work-out B? This is a great way to get that head count up on a screen and then we can go into why. What were the things about this? Now, does this make one better than the other or not? It was a launching point for an analysis discussion. And a great deal of what I look for them to recognize in first year is that your favourite isn't necessarily the majority favourite and you need to open to the fact that most people seemed to prefer this, and these are the things that make it easier for the people who didn't like it and such and such. Then we follow up and find out what made it more challenging about the steppers. Ten people said the stepper was their favourite exercise, but 30 people said it's their least favourite. So, the ones who said it's your least favourite, what don't you like about it? So, those who did like it can remember a lot of people don't like it because of this, this, and this. [Description of trainer/client discussion] **I observed that in the class I was in.** Yeah, pick up the majority opinion and have some answers for the experiences that aren't necessarily the same as your own. Every experience is valid, but it's good to know where your personal tastes lie in the scope of the whole population. **And you felt the clicker helped get that information so that people felt comfortable – so they didn't find I'm the only person who liked the stepper. They don't know. They just press the clicker. So there's no intimidation. I don't want to be the goof that loves the stepper and nobody else did. I was the only one who liked this.** And it's very visual too because people can really stop and see with the graphs, how strong something was or whether it was 47 to 53 – it's almost – it's a toss-up. If it's a show of hands, it's really hard. I used to say, keep your hands up and those who are in the front, turn around and look back. Look how many hands are up. This is a very strong opinion. Of course, it's hard when you're sitting in a chair looking through a sea of arms to see how many arms are up. But the graphs were wonderful in terms of making that very visual and quick. When the technology worked well, it's a quick way to get the numbers done without having to stand and count hands too. **How often would you do it? Once a week? Once a month?** Once a week. **A scheduled follow-up to the activity.** Exactly. For me, it was a scheduled activity through the week. And it only made sense to do the critique and analysis when everyone's done it. Let's compare notes kind of thing. Another example is the push-up work-out with three different processes. We'd basically say, who found Process A the hardest? Who found B the hardest? Who found Process C the hardest? There are three

different ways and each way someone found harder than the other two. Most people found this one the hardest. So, those of you who didn't, it's important you realize that most people find that the hardest even if you didn't. Maybe you're the exception to the rule. So, we're trying to teach people to anticipate average response rather than exceptional. **And respect the client.** Yeah. **Did you use it in any other way that you can think of? Did you do a pre-test to get awareness, or a post?** No, this was the one thing I wanted it for. **Oh, so this was the intended use.** That's what I wanted it for, to get rid of my show-of-hands analysis, and I was always scribbling 15 on the board and 13, and saying that's 28 and there's 40 people in here – we're not getting all the answers. I wanted to get to a more thorough analysis. Now, some of them wouldn't participate, and by having the clicker numbers – **You think more did?** I think so. I think so. The downside was the reality of student unreliability. People didn't have a clicker: "Oh, don't bring mine today." I got to the point of reminding them a day or two before, "Make sure you've got your clicker with you tomorrow in class. We're gonna do that thing." And they'd still come some without it. Some would say, "I lost mine." Some would say, "I forgot mine." A couple of people were telling me theirs wasn't working right, "I'm sure that mine – I'm pushing the button, and I don't see the number up there changing when I'm pushing." And I'd say, "Well, try again right now." Now, whether theirs was already registered – you couldn't tell. But there was suspicion with some of them, and we never ended where – **You just isolated for that person, and say you just answer.** No, I didn't try it that way. Maybe I should have. There's a couple of classes, I said how many clickers we got. Hold them up first, and I counted. I said, now we're waiting for that many responses, we'd wait and wait, but we could never get that many. So, somebody's didn't work. **Did you ever get to the point of bringing a screwdriver, or telling the students to check their batteries or re-insert them?** No, I was too anxious to carry on. **Oh yeah, no, it takes time. You don't want to take time for that.** I don't want to disrupt the flow of the activity and yet it's important. I think some of the people were feeling excluded from it because of that. **Because their clicker didn't work? Or because they forgot it?** The ones with the clickers that didn't work were frustrated. "I don't think mine's going in there," so instead of saying, oh well, that's technology, at least I can see the way they normally work and the what the numbers look like – the ones that didn't have clickers, I'd say to them, well, you just have to see the normal pattern. **I wish you could participate, but** – I think for some of them, I think they would probably say I don't care if my two cents isn't in there. I'm not going to go buy another clicker. It's no big deal. I can have one with 28 people. So, because it didn't have an evaluation attached to it to participate, I think the caring about having one or being involved wasn't what I wanted it to be. [NAME] said we should have used it now and then for testing, but it wasn't used for testing. We didn't count it for a review test. So again, if you didn't have that, you didn't lose out, you just watched the review and mentally take it, but you didn't know if you were getting it right or wrong – A neat tool.

3. **Question 3 says how did your use change over the semester? So for you, it probably didn't change. Did you add more questions? Post activity follow-up. Did you add any changes? Or make any changes to the types of questions you asked? Or were you fairly consistent over the semester?** I think it was fairly consistent. It was a matter of still trying to come up with about six questions to kick-start a discussion. Given the

nature of what we did each week, certain questions made sense. There were weeks when it was comparative. We'd say do you prefer A, B, or C. It got to be a bit of a challenge to try and phrase questions for follow up, multiple choice for clicker response. Once your follow-up points become discussion oriented. There were days that I was able to take up most of the class just based on four or five questions because of the follow-up part of it. I wanted to be analytical for the discussion after.

4. **Did your students – you talked about some of the problems you saw the students having or their perceptions – but more specifically, did their use change over the semester? Did you notice the frustration of those few grow or decrease? Did you notice a change in any way, in the way the students used the clickers? Whether bringing them, forgetting them?** I think once they got used to bringing them, the ones that had them regularly, and I think there was a reliable bunch. I think I could see that they settled in, and it seemed to be a very sensible, good way to get their – **They just came into class, bring them out.** It was click, click, click. And again, I kept saying, think of it like your backpack, your cell phone. You've got it with you. And those that said that's not a problem, did it. It was just a routine part of class. There were a few there that I think it took a while for them to treat it like a class item, and once they did, and they could see how it was being used, I think kind of they sensed that it made sense – the way I was using it, what I wanted it for, and why I wanted them to have it. I know there were some who would say it doesn't really matter if you don't have mine. You have enough data up there to do what you want. Again, I can still imagine people who are going to sit back and say, you know, it's not that big a deal. It should be optional if you buy one. You can still get your survey done. But I really want it to be universal.

5. **Training such as it was, and I don't know what training you had or didn't have – I have some idea now – but what was the impact of any training that you did participate in? And it could be – I'll expand the definition of training to things you did on your own – in preparation for September. What was the impact of that training, any kind of training, on your experience, your use of the clicker? Describe what, if anything, you took part in – and it was all on your own –** [NAME] and I did an online, remote training session. **A webinar?** Yeah, so [NAME], I think she was in New Brunswick at the time, and she was doing something. She was showing us the slide creation steps, and it's so straightforward. It was just a matter of learning PowerPoint for the first time. You just create new slides, you pick your form of graph, and you type in your answers, and you've got a slide show. **So, you observed this online?** Yes, observed it online. It was fine. It started off, it was working, meeting our needs. And then [NAME] and I both tried to tinker with the correct answer indicator, where you're doing a study test, he couldn't get it figured out, I couldn't get it figured out. [Describes problem with correct answer indicator and consultation with publisher] Turned out – we finally figured out, we went to a meeting with [NAME] and her technical staff over in K, and they were trying to deal with the Pre-Health Science people who were using them at this so-called training session. We thought it was a user feedback and discussion but they were a training and troubleshooting. **You were beyond what they –** Yeah, we were beyond what they were doing. It was [NAME] and I sat there for an hour and a half and we actually go this figured out. **So there was a benefit.** We got our problem solved. We

finally learned you had to do two things to get the correct answer indicator on. [Describes solution to problem] So we had one glitch. It was really hard to communicate to somebody what it was. There was nobody nearby. [NAME] couldn't figure it out. She'd e-mail back the steps, and I'd say I'm doing the steps. Honestly, I think the directions they provided were missing one statement. You must A *and* B **– to get the checkmark to show up. It's too bad there wasn't more communication because [NAME] has been using it for two years, and the College is not that great at connecting people. He could have** – Back when we had the New Directions group going on, that's exactly what we had, people who were doing these new things – **would mentor –** new directions, and someone else would say I want to try it. If you get to a problem, you'd know so-and-so was doing it down the hall. [Description of New Directions group and PowerPoint] The same would have been true here. It's like, who's doing what. That would have been good to know. I've often said to the people who've got that staff page on FOL, you know, it's a staff development page. **The Curriculum?** – Yeah, that group. They should have more stuff down in the content of that that is technology. Who's doing what. Just a list of who's doing what in the College. You know, it can list ideas under content subheadings, and if you're curious about clickers and classroom response systems, here's readings pages, here's link pages, and here's local contact people. Saying that it would be nice to be there, I don't even know if it isn't because I don't look at that page. **I don't think it is. It's very much focused on FanshaweOnline.** How do you do FanshaweOnline? How do you use Fanshawe Online? There's so much more than that to use. **We could be using that tool to be talking about some of these other things.** Exactly. **Interesting.**

6. **You have no previous experience with FanshaweOnline?** No. **And you hadn't used them in any other way? You were never in the audience for *Who Wants to Be Millionaire*?** No. **– which is where these come from, from audience response systems.**

7. **Two questions – sound similar, but they are slightly different. First question has to do with student engagement and your perception of the impact of the clickers on engagement. And the second one has to do with the impact of engagement on student learning. And they're slightly different, so I'll let you interpret them the way you want. The first one is one engagement, student engagement. We've already addressed this question a bit, but directly – positive, negative – and what do you base that on?** I'm not sure if it made better student engagement than previous years. You can always do a show of hands survey, and figure it out, and say, "Come on, Come on. Hands up. How many people this or that," but the issue was you could never be sure if someone didn't answer at all, the number count – I'd end up – I could be sure because the number of no's didn't add up to the number of people in the class. **But you knew you were one or two off .** Yeah. And the same thing is true for the clickers. So it was in the same realm of participation. I'm not sure that having a clicker in your hand and having to turn it on made you more involved than asking you to raise your hand, or stand up if you're this or sit down if you don't. So, I think it's a modern way to do things. I think students enjoy this kind of technology thing that's participatory. I mean that's what I got it from, the presenter at Ridgetown saying your students are into Facebook, this, that and the other thing. They've got their computer open, having a chat while they're listening to you teach, and trying to write notes, and it wouldn't bother them to be text messaging at

the same time, so you put another little toy in their hands, and you start thinking that's supposedly what this generation likes and can relate to. I'm one of the people who always says there's people in every class who hate their cell phone, don't know how to use a calculator, and just resent having to do e-mails. I said they're still there. They are 19, 20 years old, and they're not on Facebook, and this assumption that everyone can do this and everyone likes it, leads me to people that I know get frustrated and feel alienated. So, I don't know if this is, as I said, between the cost factor, the forgotten clicker fact – I don't have mine, I lost mine, it didn't seem to matter if I didn't – if that ends having people conclude it's a toy, it's nice to have, but it really isn't that big a deal. I'd like it to be seen more essential, more like you really should be doing this. But again, to me, that's just the ideal, saying every student should want to participate in the learning and everyone should say I want my two cents. They don't care about everything we do, and that's never going to change.

8. As far as the learning goes, I don't think it changed the learning approach, because whether it's a show of hands of who prefers A and B and C, and the analysis afterwards that goes with it, the clickers are over and done with. It's just a launch pad for me. I've been trying to think of whether it would be beneficial to do either study tests or tests that count using the clickers, just to try and bring them out more and more, and validate them, but in some ways I think that forcing myself to use them doesn't necessarily make them a better tool. It makes it more of an impediment to the student who has a problem with it, and if you're success oriented you start saying, if you're going to be doing multiple choice tests, putting the questions on screen, and students answers are recorded, and they don't have their clicker, all you're going to do is give someone a sheet of paper and say, well, you put yours down on here because I'm not going to exclude you – you're sitting right here – and therefore they still end up being able to say mine counted without the clicker. I don't know if that helps learning or anything else. I just don't know – **You're not sure if you can go that far.** Yeah, to go to the point of saying if you don't have your clicker, your grade doesn't count. You've got their body in the room, which is a good thing. To say that because you didn't bring this technology thing, you can't answer this quiz, is – **Because it's easier for me to have to mark.** It's easier. It's not better. It's just a different method of evaluation. It's almost like saying to people, you've got a multiple choice sheet in front of you that has to be filled in in pencil and if you haven't brought a pencil, I'm not giving you one. So your grade, your exam won't count. That's not what we're here for. **There's issues around forgetting the clicker. There's also issues around cheating, where students in larger classrooms, perhaps not yours, show up with two clickers and click for themselves and their buddy. Now that's an issue in larger groups, as I say. And the other one is cheating. Everybody sees the same question at the same time, so it's very easy to go [TAPS] for B or [SIGNALS] for 3 because everyone is doing the same question at exactly the same time. And we've seen that signalling of questions because it's simultaneous, as opposed to multiple choice, where, you know, you're turning pages and you can watch them doing this and doing that.** Yeah, that's again – I'm not wanting to look at it as a testing tool and say I think it would be great to go that way because I'd see too many of these barriers and impediments and say it's not worth me doing it. I only really can relate personally to that survey aspect of it. **There is the pre-test or post-test, but not counting. At the**

beginning of a unit, you do that just to see what they know about something, and at the end, you do it again, same questions, and they all go, "Wow, we did so well." Or review for a test, and they say, "We actually learned something in the last two weeks" or one week or whatever. So that pre-survey and post-survey knowledge – It's good for that. I can see that. Again, you're back to – every one of these examples is illustrating people who care and appreciate it. When you get kids, "If it doesn't count, I'm not worried about it. I don't care that you can show me that the class learned. There's still a percentage of people who got question 8 wrong, whether it's me or somebody else in the room who still didn't know question 8." You know, some of us learned as we went along, yes, we're better off, that's assumed. I can still see the ones, "Who cares what tool you used. Give me a test tomorrow and the test will if I've learned the unit and whether the class has learned the unit." There's a security blanket, or pat on the back that says well, you're so much better than you were when we started this unit. Now let's do our official written test. To me that's just a second way of showing they learned the unit or not. A pre-test, to show that they did, you could do that on paper, multiple choice, 10 quick questions about this, to find out who knows what coming in. **So, you wouldn't find it easier to have it simply done in class?** What does it accomplish? It shows the class that they've all learned something, but so would the test that you're going to say the class average on the test was 72 or 52. **Sometimes the thinking is that if you do it the day before, or before the test, yeah I'm solid on this or confident, or man, I do not know this stuff and most people do or whatever.** If it's the day before and they're saying, "Oh, gosh, I didn't do well on this practice thing. I better cram tonight," that's obviously a bad message. I didn't learn much in the three, four week we've been on this unit. Now I've got to learn it all in a night. So I think that could increase the stress on the people who are not well prepared. They might have gone in falsely confident into tomorrow's test and done badly, but that happens now. Getting a pre-warning that they're not ready gives them a chance to rescue themselves. That's good I guess in a student success mindset. It helps people who aren't ready. I just worry about adding to the last-second stress of the bad student. And then one of my problems is the people who are not in class regularly enough and then realize they are losing out because of it, and come to you two days before the day before and say, "What can I do about this? **"Can you teach me everything I –** "missed in three weeks?" **Okay.**

9. **Problems you encountered with the system, yours and students'? So, anything you observed among the students, and then your own. I know you can talk a little bit about observed – I observed some of them.** Well, we eventually found out the computer in my room – I'd been using the same room every week in the same time slot, which was good in the sense that you could try and standardize, but it got to be scary. I would go in that class – **That H** – H-3030. I went in 10, 15 minutes early, and I would try to get it up running and set it up and check my own clicker to see it worked, and it was just fundamentally something wrong with the software, that they finally put a whole new image on the computer, and it started to respond. It would take longer than normal to just start up PowerPoint in that room and then longer than normal for TurningPoint. **The computer itself** – It was a bad unit. **It was a lemon.** It was a lemon. And then the students – it would take 10, 12 second from pushing a button on your clicker to seeing the number arrive on screen. The system was slow in reading the RF receiver. You know, it

sort of made the whole thing painfully slow, to the point where I wasn't sure it was registered. I'd move forward and the numbers would change. So, I'd say, "I don't know if I went too soon or if it's waiting to enter." And that happened early which made you sort of – it looked bad to the students, and I think couldn't tell it was hardware and not me or my use of the equipment. **But then you had another class as well, didn't you?** No, not I. [NAME] used it in another class? **No, another classroom? Were you always in 3030?** I was always using it this way in 3030. I think I tried it once maybe in B, and didn't have that problem, but I don't think I really did make a significant use of if anywhere else. And the students' point of view, like I said, I could see there were some who felt fairly certain that their clicker was not performing right. And I can't remember what the colour code is – one, when you push your button and either a red light is supposed to flash, or a green, or something like that. It was clearly orange flashing on some of these. And it seemed like it was flashing, like four flashes in row and then stop. So it wasn't just a normal, "signal has been sent" confirmation. **So problems sending the – confirming, and students' confidence that the system was working. Some felt they weren't**. And I think it's another one of those things where it would be ideal to have a test run day where you walk in, say stand here, push your clicker, see that it registers, document their ID code off their clicker, and say go away now. The next person comes in, and you do one after another. It's silly and trivial, but once you know they all got one, what their code is, and they all work, then you should start using them in your classes. **And did you keep that? You never went in and looked at the data from reports afterwards?** No I didn't. I think I got to the point of, again not having confidence that they gave me the correct numbers – **The new clickers have confirmation. You're using the older ones. And then there's new ones with a better print-out that actually confirms it was received and you can see and they tell you that, and they also tell you a bad thing, that the batteries are low and that sort of thing.** Well, yeah. **There's always something new.** It's a matter of if they could make it affordable, I'd use a better one. If all you're doing is clicking a button, you just don't want to spend $50 on one when a $35 one will do it. It still seems really costly. **And to buy them alone is quite expensive.**

10. **If you were talking to somebody, or me, or a colleague, and you were discussing classes or courses, what would make you say, "Oh, that would be a perfect for a clicker?" What kind of course, what kind of students? What would you say, "Oh that's an ideal environment for using these clickers"?** A couple things pop into my mind right away. I mean, anything that's analytical. You could do it in a film appreciation course. You could do it in a sociology course where you talk about opinions and values. You could do it in an English literature course when you talk about interpretations. "How many of you felt positively about this character's response? How many felt negatively about the response?" You list characteristics, and say which of these qualities do you think demonstrated in their speech. So you could try and teach the students to recognize messages within the context of the literature. This was expressing empathy or wasn't. Heck, you could even do it in terms of grammar, and saying "What's the right word for what should go into this blank"? Put four words up there. Even spelling. Just have the students try to figure out which spelling goes in. A lot of people have problems with the word empathy and sympathy, and deal with that when it's a problem. You know, sometimes your pre-post concept could be used in a course like that. "You know, we all

started out really struggling with when's the right time to use sympathy, when's the right time to use empathy." At the end of the unit where you talked about meanings and show the application, people now know the right way to use the words. **So, you see a lot opinion. All the examples you've given – not one of them was a factual-based, memorization of facts – standing heart rate or something.** Well, use of words, getting the right word, like sympathy, or – **That's right. That's right –** even spelling. Which of these is the right spelling for gastrocnemius? How do you spell it and you pop it up there. Can you recognize when it's spelled right? Because I told my students, multiple choice testing sometime gets you off the hook for learning to spell muscle names. There are ways for me to create multiple choice questions that do that. I say which of these is spelled correctly? Spell a muscle name the way students usually spell it, now one of which is right. Now the right one doesn't look at any more right. You just have to know it's right. So I could use the clicker. Again, whether or not that's evaluation use or learning. You just say did you know and most people do or don't know this. I would probably worry about the people saying well, most people don't know the difference. I don't need to worry about it. I'm normal. [Discussion of English and writing skills of college students] Illustrating to them that everybody is weak is not necessarily good thing. They should be better. **What about types of learners? Any kind of breakdown at all – older learners versus younger, male-female, their learning styles? Is there anybody you'd say this would be perfect for or this would not work for them? – In your observations from this semester.** I've only done one semester with the one group, so I can't really say, you know. It seemed to me it would have been ideal or I wouldn't have used it if the people were like that. I could see – again, they keep talking about testing and things like that and the big debate of honesty comes up. You talk about signalling. The research that you read and hear about adult learners is that they want to know that they know, they're learning because the want to learn, and they won't cheat because it won't do them any good. And then I've also heard people say that in studies on cheating in MBA programs, 80 percent of them do it because they say that's how you succeed in business. It's not cheating. It's business practices. If you want good grades which gets you hired into good jobs, you do what's necessary. Other than that, if you play the thing honest, you're just going to look like a chump. You're getting two bits of information about what's cheating and what isn't. Do learners care to learn or do they care to get good grades. And that's why I tried online testing on FanshaweOnline for a while and I've given up on it because the feedback from students was that it's just not being done honestly. I said, you're only cheating yourself if you don't know the stuff, but they don't care. So I had to bring them back for paper and pencil tests in front of me, and find out these kids are getting 80 online and 50 face-to-face. **Group testing is going on somewhere.** So, I can't think of a particular group where I'd say I can't imagine it working. Like the illustrations I gave, You could use it in English as a Second Language and put up sentence structure and ask people to try and pick because it doesn't ask them to speak, but gets them to participate and see what's being done. Probably even do it in auditory learning for second languages where you listen to a spoken phrase and say which of these things did the person just say and have people pick to see if they understand the spoken language well enough to function in it. **So, you see it as almost limitless. Different kinds of uses in different courses. It's just another tool, just like show of hands and the whiteboard and discussion. It's another tool in the bag.** I

honestly think it's better than a lot of others because you're getting the students to participate in class and you're moving along and they participate in more than one thing. If you wanted to get them to write comments and then share what they wrote, you'd only get a few people to participate. If you're asking people to speak out and analyze something, you get your keeners that's doing the talking. In this case, I could survey everyone, and then ask for follow up and I'll still get the keeners but at least everyone has a sense – **they participated** – you can ask the thought-provoking questions. If think about whether you're in this group, what does that tell you about the rest of the people over there. If you don't speak, but you're seeing where you fit in in a different way than – I don't know what some of the tools would do. I say to them over and over, I can stand up here and tell that most people will find this uncomfortable. And then you just have to accept so-and-so said so. But if I show you that amongst a group of 20-year-olds, most people found it uncomfortable, not everybody did and we talk about it, to me, this validates a point I've always taught. **So, you were already doing that, so this was another way to reinforce it – visually depict.** It's fun. It's modern. It gets you past a show of hands. Other than that, it's just from that perspective a gadget that does that, same thing a show of hands would do. If it's not expensive, I think it can be appreciated. If it's too expensive, forget it and do show of hands.

11. **If given the choice, and you do have the choice, would you use the clickers again? Will you use the clickers again, this term, next term? They already have them.** Yes, absolutely. The thought was to use them consistently term after term once we got them initially purchased. The down side is the lost and absent clickers. They have to go back and spend 50 bucks if their perception is that it's used in a very weighted way. I can't see us ever getting the absentees to care to replace the ones that are lost. I fear that it's just going to fizzle over the four semesters to the point where in the last semester we'll have 15 out of 35 people have one, and they will be our representative sample group. And you'll never be able to get someone to spend 50, 60 bucks to replace it because they'll say, what are you going to do if it don't? I'm disappointed in it that way. I'd love to have them be 10 bucks each and do something that fundamentally says that if your clicker response isn't in, you don't get your participation grade, the only form of participation that would count. Simply to say that it's do-able, it's manageable, a fair expectation – it's not a fair expectation because of cost. Then, you know, I can let go of it quite easily because if it's a 50-50 thing it's unfair to those who have it. **So, your intention at this point is to use them this year, this semester. This group has got them. Your intention is to proceed.** With this group all three years, yes. **And next fall, you're not sure yet or you are?** I'll actually get to the end of this term and talk to [NAME] about it, and I have the feeling that he enjoys it. The students – he's taken it into second year and passed them out and they said, "This is keen. I wish we had this." And so the perception is the students appreciate them. They're kind of fun to work with. That's an easy response when you haven't had to buy one. **Good point.** If you can hide and absorb the cost, like our guys didn't know because it was part of the packaging, and everyone had to buy that computer package, so as long as you can slip them out there. "Here, you've got a clicker. Let's use it," I think it'll be fine. It's the damaged, lost, replacement thing. They start saying, "It's not worth it to me for the way I see it being used." I just like to see them use it then take – it's part of class procedure, we do this. Like I said, it's a fun, modern way

of being involved. It helps – I certainly have to recognize they say, "It certainly doesn't hurt me not to have to mine today. So, I'm not going to worry about replacing it." I would just rather get over that hurdle and keep doing it. I would like to continue using it and have next year's group get it. I think probably, we'll tell more after next year. We'll follow through with the guys who bought it this year, and how we use it in second year and how many of them still have them. If we get to the point that this fizzles too much over two years. It works great over – **So maybe not have them next year? Let's see this as a pilot year?** No, I wouldn't wait that long. If I don't have students next fall buy them, students buy them, find out that it worked well for the second years, then we can't use them for the group who came next fall. I'd probably be more inclined to say let's buy them again once more. If we find by the end of next year that it's really fizzled out, we would never do it again. So, probably two years buying them, waiting for that first year group to finish up. By the time they've moved, we've lost interest or fizzled, then I'd say we'd never do it again. **Or if there's hasn't been another solution to cost or –** Yeah. **Recycling old ones.** Exactly. Selling back old ones to the Bookstore for a cheap rate. **Plus you'll have the results of the survey from the students.** Exactly. If the students are clearly saying to us, what a classic waste of time – I think it's going to be similar to the student feedback of course stuff. [Discussion of weaknesses of Instructional Feedback Surveys] You're going to get the same with clickers, where two thirds of the people thought they were either okay or really cool, and a third thought I didn't have mine, it was a waste of time, they're filling in a bubble sheet now, they don't even have a clicker, and say I can just live without out it. So, you end up with this wishy-washy positive feedback where a third to half of the students don't care for them. Well, they're the ones who lost theirs, those are the ones who half-heartedly got involved and don't want to feel left out, don't want to support something, don't see the good in anything, don't care about learning. So, it's really hard to interpret. How strong a student perception do we look for? **Typically, surveys get about 90 percent positive of all the research that I've looked at. Ninety percent of students find them – either approve of them –** Oh, you mean the clickers? So, if you found it less than that, it would be – **Well, I think 90 is crazy high, but** – generally speaking these are more interesting for students – and that's why I wanted to adopt them – than standing and listening to you talk. And even though it's only – again, by spacing it throughout a class, putting up a question, then analyzing it, talking about strengths and weaknesses, and then doing the next question. Like doing question, question, question, question, over done with and then back to the lecture, I don't think students would find it didn't make as much impact. I think the way I slid it into the class made the clicker involvement in that class change the nature of the class quite a bit from its traditional lecture. I think students would say I'd much rather do that and be involved throughout the class than five minutes at the beginning of the class and back to the old. So, I can see it being perceived as a nice change – "I really like it." Particularly those who are surveyed and haven't done it before. You like something new. If everyone and their dog's doing it, then they say, "I've got another clicker class," it's sort of like PowerPoint. [Discussion of PowerPoint misuse and overuse]

12. **I think you've maybe answered this: What was the system well suited for? I think you've answered that. What was it not well suited for. Review tests. Prompt**

discussion. To test comprehension. I think we've talked about that already in your other answers, so I don't need to go back.

13. **Are there any existing features in the clickers, and the technology, and the slides, that you haven't used that you would like to, and then the second question is are there any new features?** The better question is – **Can I get it working?** – No, the better question is do I have time to explore? I don't know what it can do that I didn't try it for, so that might lead me to use it in new ways. I did a quick exposure to it where you see, as you said, the audience survey concept: How many people think this is the funniest video – A, B, C, and I thought, I could use that and then do a follow up. But to see what other ways people use them and what else – I never looked for anything else in it other than – **You went in thinking this is great for –** I do this all the time. I could use technology to do this, but I don't know what else it could do. I haven't looked for anything, other features, like I haven't done anything in terms of statistically analyzing the responses, keeping track of a person's before and after. I've heard a little bit about them and thinking if I'm not using them for testing or knowledge-based assessment then I'm not sure that I even want to even get involved in tracking – **whether it's worth your time.** Yeah, and so, I think it would be worthwhile to either, again, have an FOL showcase, ways it's used differently. Here's one classic way just to survey, here's a classic way for an assessment that may or may not count, review tests, you know, or here's another way, and if there are ways out there that someone knows of, it may be better if they brought it to light for me rather than me sitting there in front of TurningPoint and saying, "Now let's see, what other features does it have? Under this menu – what's there? What does this one mean?" **So, would you actually go – could you really see yourself, if it were on FanshaweOnline, would you look? What if there were a larger, maybe training session, but professional development session around clickers and really bringing people who were using it longer and new** – That's the kind of thing that is usually easier to spearhead me. I would go to another presentation but if it's presented on – it has to be something where it's clearly not beginners – what is a clicker? I've gone to those things and said, geez, this is for people who've never touched them before and I've just wasted two hours just sitting here because it just wasn't marketed. Same thing with that one we went to in K building. They didn't say it was an introductory training session. They said it was a user feedback, or you know, we wanted to get the technicians together with the users. We thought it would be trouble shooting, problem solving. It wasn't. They're just labelled wrong, got us out to the wrong thing. So, if it doesn't sound right and we don't go, then we may miss it. So, we need to identify that and, like you said, we're probably at the stage that we need Level 2 or variations of clicker use in the classroom where you say there would be presentations by three or four teachers who use clickers showing different ways to use clickers, how they use it, and their experiences with them. Because other than that, saying [NAME] is going to show what a clicker is and how the software works. She came to our divisional meeting to do that, and it didn't work, not at all. She couldn't get the software running, even on her laptop. [Description of failed presentation] But, again, that was for people who had never heard of them, this is what it is, how simple it is, and what we're going to try and do with it. So, I think we're ready for Level 2 types of things, then we can begin – I don't know. I wouldn't certainly go to that FOL staff development page, open it and say, I wonder what they've

got here? They're not telling us that there are things here you may find beneficial. Go look. I think it's only set up to be how to use FOL, which is – I'm way down the road on that. I've been doing online tests and everything else. So, I don't think I'll look up how to use FOL. **So, if there training, you'd be interested.** Oh, absolutely. **The type of training would be preferably other faculty members here at Fanshawe.** It doesn't have to be that limited. We could end where we get someone from U of T who comes in and tells you something totally different, a fresh look on how to get more use out of them in a variety of ways, and then say great. I don't need to know that someone's tried that here at Fanshawe. If we then try it at Fanshawe and our system screws up, then we put the squeeze on our technical support people and say make it do this. This is what it's supposed to do. You know, if we've only used it in baby steps, we want to start rolling out the real thing. And maybe we've limited ourselves by the clicker system we've adopted, whether it's x or y brand name, maybe you need to spend a little more and get one that has versatility. Of course, Fanshawe guys will say we can't support everything. [Discussion of alternative institutional approaches and pricing models]

Professor D2 (Interview Date: January 3, 2008)

1. **Researcher: How did you – if you can remember back to the summer – I think I kind of know the answer to this question because we talked about it – How did you feel about using these clickers before the semester started? So as early as you were thinking about it, so maybe it was last spring and then through the summer, up until the semester started. Talk about how you felt about using them.** Professor D2: I was very keen on using them as a tool in the classroom but very stressed out about the technical aspect of it. I'm not a genius when it comes to, you know, computer technology and all that stuff. Luckily I have a co-worker who knows that stuff fairly well. But I wanted to use them, and knew it was a kind of a new technical thing, even though it's been around awhile, but I was really stressed out about all the whole technical stuff that comes with it. **What particularly about the technology?** Just getting it set up. At first I thought it was just something you just walk into the classroom with. I didn't know it ran off the computer, didn't know you had to have a receiver, a program you had to have downloaded to the computer, not all the college computers would have them – all that stuff that I've learned as we went through the process. I came from seeing this first used at a conference at Ridgetown, and I knew that someone else in the division was looking at using it as well. And even at the conference in Ridgetown, it just seemed so simple, so easy. All the background technical stuff wasn't really explained to us. **Okay, so you didn't think it would be that complicated, but as you started to realize that there were software and hardware requirements, that's when you started to get a little concerned.** Yes.

2. **Can you just describe—and I've just observed one class and talked to you a little bit – how you used the clickers in your class? You can think of how often. So, frequency. You can talk about whether you attached – I'm pretty sure you didn't – whether you did anything that attached a grade to it? And I don't think you did as far as testing. And what worked and what didn't work?** Sure. **So, how you used it.** I definitely used it with the first semester class mainly for review. I think I used it five times in general. The first time was just a review of a unit that I had taught, just to see how much content that they had picked up, and then I used if four times after that as a review prior to a major unit test the very same day. So, basically I had true or false questions using the clickers. We'd go through each one. In between the answers, I'd give them feedback, little hints that might help them with the upcoming quiz, and I did that four times in general. **So, that was a two-hour class?** No, it was a 50-minute class. I would do that for 20, 25 minutes. The unit tests were just quizzes, 50 multiple choice questions, and they'd do them after that. **So, in a 50-minute class, you'd do 20 minutes or so of review with the clickers. Would they be identical to the questions with the clickers?** Not at all. If they paid attention, used the clickers, and also paid attention to my comments in between the questions as we took up the answers, they may get little hints that might help them, but the actual quiz which resulted in marks, the questions weren't the same at all. **But they'd be along the same –** I also used them for second-year students for discussions. We didn't have enough clickers. They didn't have to purchase the clickers, so I would bring in I think – my program has about 10, 11 clickers that the faculty have now – so I would bring them in, put them in small groups, and I would ask them very opinionated questions, you know, attitude-type questions, and have like 90

seconds to respond. **As a group. How did your group feel? Reach some sort of consensus.** And they were mainly true and false questions as well, but they weren't supposed to – the counter would be counting down to 90 seconds. I would say I want you to discuss this in your group for the first 55 seconds and then answer. And they really enjoyed that. **What type of questions? Can you give me examples?** The course I used it in was called [COURSE]. So it would be a question like, "Do you think violence on sports on TV affects children positively or negatively?" **So, "Violence on TV affects children." True or false.** They have to come up with a consensus. If you disagree, you've got to go with the majority. **So then what happens ? They'd punch their answers in, they'd see the results on the bars. And then would that then be a springboard to more discussion?** More discussion. **You said that you felt that worked to prompt them to participate in a way that maybe they wouldn't have?** Sometimes when you put them in groups, they don't really discuss what you want them to discuss. They don't have a goal in mind. This gave them a goal, something to actually punch in so they see their results up on the screen compared to the other groups and so on. They did enjoy it. **And how often did you do that?** I think I did I think that three times, although one time, major technical problems in the classroom. I actually still did it, but not with the clickers. **Tried to do a show of hands.** I think two times I actually went to the classrooms and wasn't able to do what I was going to do. I didn't check with the second years, if all the computers – I just assumed sometimes that the classrooms would have TurningPoint 2008. And twice they didn't. In terms of learning what they got out of it, I think with the first years, if I hadn't used the clickers, the days that we had those 50 multiple choice quizzes in the past, I might do a brief review, but sometimes I'd almost still be teaching content, and then we'd just do multiple choice quiz at the last 20 minutes of the class. This semester, you know, I didn't teach any content on those days. It was all review using the clickers, and then the quiz. **So, if you found that 80 percent of them got it wrong, and it was something they should know for the quiz, or in that area, they should know something related to that question, you would address that immediately?** Oh, I addressed it every time, but I addressed it even more if the stats were saying that 80 percent got it wrong. I didn't do a comparison of grades this semester compared to a year ago, which would have been nice to do. Things don't look too much different. I mean, I still have people fail my course. Similar numbers, I guess.

3. **I'll ask you a little bit more about that in a sec – whether you're thinking about going back and looking at the stats. How did – or maybe it's just did – did your use of the clicker change over the semester in either of the classes you mentioned. So, either in your first-year course or your second-year, did you change it? Now, you didn't use it as frequently as every class or every week, but did you feel your use changed?** I think I pretty well used it the same way in both instances. Like I said, review. In the first-year class, I did use it the first time related to just reviewing some material I'd taught the previous week. **Without linking to the quiz.** Yeah, it wasn't anything to with a quiz. It was just review. And that was my very first experience with it, and I think that was the first time I had technical problems as well. I had to do it the next day or something like that. Then the rest of the time I used it in that format as a review right before the quiz. With the second years, I used it just for discussion, so, no, I guess the format of how I used it didn't really change. But now that I've used it the one semester,

you can start looking at more possibilities. It was just to get my feet wet this time. **So, you're saying your use didn't really change over the semester.**

4. **Did your students' use change over the semester? Meaning more, less. They brought them, they didn't. They were excited at the beginning and not so much later on? Did anything change for the student that you perceived watching them and checking numbers? Who brought them and that sort of thing. The things you could observe.** I think they understood after the first time I did the review prior to the test how I was going to use it and how it would help them. So I saw the next couple of times that more of them had the clickers with them, maybe a little bit more attentive during the discussions in between the questions because they understood how I was going to use it. **Did you see them bringing – I mean generally if you had 30 students, would most of them would have it?** I would say that maybe 90 percent of them would bring them. **So, the people who came were the ones who wanted to come and would bring the tools they needed to learn.** Sometimes I find that I spoon fed them too much. We do have clickers, as I said, and I'd bring a few too. Now there's a couple of students in there that weren't in the computer course where they had to purchase them with their package. So they didn't have them at all. They asked if they should purchase them somehow separately, because they were purchased in a package. And I said no, just come to class. I tried to get my clickers to them because I knew they didn't have them. **It wasn't forgetting. It's just they didn't have them. And then the second-year class, you just brought them so that wasn't an issue as far as – you just provided them to them. The students' use, was it pretty much what you expected? Did you expect more – less?** Going into it, I guess I thought they would use them and would enjoy the process. It's learning, but it's also a little bit of entertainment for them, you know, *Who Wants to be a Millionaire* when they survey the audience. **The suspense: Did I get it right? Was I with the majority?** I thought it would go over well. I was worried about things like would they bring them and have them with all the time. The other instructor in the program really forced them to have them with you because I think he used them a little more randomly than I did. They got to know when I was about to use them. **Because it was quiz day?** Exactly. **But if they were having them anyway. I mean they're pretty small – in their purse or backpack – they can just throw them in it.** It's not hard to walk around with because they're so small.

5. **Think back to the training, such as it was, for you, what training that you had. This could be formal or informal. This could be with your colleagues. This could be self-training that you provided yourself or training you received from the publisher, provider. Think back to your training. Describe it to me a little bit. Can you comment on the impact of training, in whatever form it took, on your use or your experience.** The training I had – like I said I first saw it in a workshop in Ridgetown last May, June – and there was an online training session set up through the publisher that I did. And I had to actually do it at home because my computer here was not set up to do it. So I stayed home that that day to do it which was fine. That was June-ish. But even then it wasn't running off the software they were going to have out in September. **So it was an older version of TurningPoint. But the concepts were similar enough.** So I really couldn't do a lot of advance preparation because we knew in September it would be

different software program, so in May and June I couldn't put shows together. **You were getting the newer clickers. Do you have the LCD?** We have the older ones. **No, I think you do have the older ones.** That training session went okay. Like it's kind of interesting because you're on the phone and on the Internet at the same time. I had a few technical problems, and there were 6 or 7 people online at the same time, one being my co-worker. And then you just starting playing with it on your own. The publisher was always available if we had problems. The problems we had were more kind of technical in nature, as I said, related to the hardware at Fanshawe College as opposed to actually using the program. I do have experience with setting up PowerPoint slides shows and if you can do that, then setting up these clicker programs in TurningPoint is very similar. Very, very easy. **So, the integration of TurningPoint, the way it overlays on top of PowerPoint, is a good thing because of the College's and faculty's familiarity with PowerPoint. So that wasn't the problem. So that was a quick learn.** Yup. By the end of the semester I felt very, very comfortable. You know, at first, to put a show together with 15 slides or 10 slides would take me an hour or more. By the end – but you could copy and paste too. You just take the first show, and save it as, and go in to change things and stuff like that. **You didn't have to recreate – I want a multiple choice question or I want a true/false question.** Exactly. **You just bring it over and modify.** You'd have to restructure it in terms of the correct answer. Sometimes the time factor might have changed. But everything's kind of set up for you, so I got so I could do them really, really quick, along that line. **So an hour down to 15 minutes?** Oh, definitely. **To do the same number of questions.** The training I thought I had was suffice because you really do have to just go and play with it on your own. I had myself and my co-worker – we kind of just worked on it, and discussed ideas, solved problems, or we contacted the publisher once or twice. I thought that part went really well. **After your Ridgetown first exposure to it, at which time you didn't know for sure you were going to be using it, did you?** No. **So it was your first exposure and then you kind of chatted, I'm going to try this, and then you had that webinar, that online training, no other training sessions?** No. That was it. **The rest was you on your own and working with [NAME].**

6. **You've never used these before?** No. This was the first time.

7. **Two related questions here. Now back to the students. The first one has to do with student engagement, distinct from learning. So, engagement is simply, did you find them more engaged? What impact did the clickers have on student engagement – positive or negative. Did you find student engagement was impacted in any way by having the clickers?** I think it was influenced positively. If you ask a class a question, you might have 35, 40 percent of them even thinking about the answer to the question and 10 percent put their hand up to respond. When you ask a question and they have to respond through individual clickers, you engage everybody that clicks in an answer basically. So, it definitely increases involvement and engagement in what's happening in the classroom. It is funny because you find out that there's 42 people after the first question or something – maybe not the first question, second or third question, okay, we've got 42 people in the room that have clickers. Sometimes you'd only get 39 responses. Sometimes you'd get 42, sometimes you'd get 41. So, I thought that was kind of interesting. Weren't doing it, didn't know the answer. **Got distracted or were**

checking their cell phone messages. But you've definitely got them engaged –They all – if you're after them, let's get 100 percent response rate here, guys. **You made an interesting choice of words there: you said when you've having them have to use the clickers. They don't have to. There's no marks attached it. So, what made them – you feel, though, that they feel they had to. They had the clicker. Why would they feel they have to with the clicker as opposed to "Can I just see a show of hands?" and "Who thinks this and who thinks that?"** I guess there's no reason why they had to. For some reason, maybe by my comments in the classroom. And like I said, I would get on them sometimes if I knew there were 42 people there and I was only getting 32 responses. I think they did it because they just think it's cool and neat. They want to see graphs afterwards, the bar graphs and stuff, but there was no grades attached. There's no reason they had to. **Was the anonymity a safer environment in which to answer?** Definitely, as opposed to putting up your hand and looking foolish and stuff like that. **So the anonymity provided a safer – I'm putting words in your mouth.** Talk about engagement, too. I mean, these classes – this class had 50 people. You could definitely engage a high percentage of students if you had a class of 100, 200 people and so on. I know it's used in some larger classes in university. **Where there's no possible way they would know students' names in those large classes.** You're engaging a large percentage of those students. **That is the genesis of – the introduction of these in post-secondary is to do something creative in those large classrooms, but colleges are also looking at them for different reasons. We have similar disengagement problems even in small class. So, you feel there was a positive impact on engagement based simply on the numbers. You have no reason to think they were just sitting there pressing numbers randomly?** No. They might have been, but the only time they would do that was if they really didn't know the answer. **They guess, but at least they're guessing something and they can see where they fit in. So that's engagement: positive engagement.**

8. **Do you also think it had a positive impact on learning? And this would be related back to your remark earlier: I wonder about those marks. Do you feel – a gut feeling – do you feel that they had a positive or negative or neutral or no effect on learning versus engagement?** I would definitely like to think that their learning was improved because of the use of the clickers. As I said, a review of that format right before the 50 multiple choice quiz, if you paid attention, should have helped them. I can't verify that for sure statistically. **Did you run the same quizzes last fall – were they similar or identical?** The quizzes would have been – I used the same format, but the questions would be different. But we had 50 multiple choice questions after four different units last year as well but, no, the content changes. I change some of the questions and so on. **If you run that data, I'd be interested to see it. It's not part of this study, because the big questions with clickers – there are a few, but one of them is, yeah, yeah, students like them and teachers like them, and they're fun, but do they really, at the end of the day, can we say engagement was up and learning – what are the implications on learning?** At the end of the course, I had two outright failures, and I had a few other people that their standing going into the next semester is based on doing a rewrite. That's pretty consistent with that course for other years, maybe a touch better. But I don't have statistics that say they actually learned better because of the clicker. I couldn't say that. I

sure don't think it hurt their learning. **So, it didn't have a negative impact, at worst, neutral, and you have a feeling that – how couldn't it have made it better?** Yeah. The one thing that I did have trouble with in that course this semester was I always seemed to be behind in my teaching, in my content. And like I said previously, prior to those 50 multiple choice quizzes, I might still be teaching content, whereas in this case, I wasn't. I was doing the review. But I think I got behind for other reasons as well. I had a class on Monday, and there are two Mondays that are holidays, and we did some other things. I think we missed a class for another reason or two, like the Canadian – the walk we did. Things like that. I don't want to blame that on the clickers. I really don't. That was interesting. **I know what you're saying, though. If you use that 20 minutes to cover, over four, that that could add up to 2 classes.** Exactly. **Two classes is critical when you have a 14-week semester. We need a semester with no Mondays.** And I've never had a problem like that before in that course as far as being behind. [Discussion of Monday classes]

9. **I think you've talked about some of these, but if you haven't – What problems did you encounter with the clickers? You've mentioned our hardware. Our consoles did not always have the software.** Right. **But in addition, when I observed, the software was there in the classroom, but still something didn't seem to be working.** In mine? **Wasn't it yours?** No, it was working. The time you came it was working fine. **The only problem was that?** The clickers seemed to work fine. **Any problems? Batteries?** Yeah, not really. At first, stupid little things, like there's a little piece of plastic that separates the battery. You have to pull that out and some didn't do that at first. I forgot to remind them of little things like that. The hardware not being in the computers, or the 2008 version not being in the computers – that was really it. I mean, if that stuff was there, I had no problems, you know. **What about students? I think we've discussed this already. Generally, the ones who came were coming to class, the 70 percent that come, brought their clickers and used them. Did you ever have to change batteries or check batteries?** No. Batteries never became an issue with my clickers or the student clickers, not that I'm aware of. **And the receiver? No issue with the channel?** No. **Nothing like that.** We never – apparently there might be a problem with the channel if someone in the room beside you might be using one. **When more people use them that might become a problem but there's enough channels to go around.** You mentioned attendance. In the format I used, they knew they had this multiple choice quiz that day, so I had very close to 100 percent attendance on those days, very close to 100 percent attendance. **Right, so they're there anyways.**

10. **Based on your experience now in two different classes – one was review and one for discussion – if you were to discuss with a colleague classes and clickers, what would prompt you to say, "Oh, that would be a perfect course or a perfect class for clickers?" What would be an ideal environment for clickers? Are there any that you would think –?** I think a clicker could be used in almost every environment. I think if you're teaching actual factual content, there's a way to use it for review. You can't really use it that well while teaching factual content unless you want to test them in advance to see what you think. Do they know the correct answer? **Pre-test. Yes, and that's a common use, a pre-test and post test.** If you're teaching stuff that's more subjective or

opinionated in nature, it can be used along that line. I think they could be used almost in every – I guess I need to think more about the differences in courses – but I don't see why they couldn't be adapted one way or another to all content. I really do. I only used them a couple different ways. **You used them in a factual review before a test and you also used them as a springboard to discussion.** They can be used more generally at the first of a course when you trying to get to know the students – a little bit about them, their background, and so on. Nothing to do with the course itself, but with first semester students, what their ages are and where they're from. **Get them to use the clickers.** Yeah, but also how much experience have they had with nutrition, did you take a course in the past, those kinds of things. **Oh, I see. That would be a quick way of getting that information, and the whole class would see it.** And I didn't use it that way but my colleague did quite often to find a little bit about their background. How many of you took a year off, haven't been in school in the last year a year and a half, which is a significant piece of information to have. If they're coming right from high school or a college program, or if they've been working for the past couple of years. Questions like that. Even the age questions: How many people are 25 years of age or older? And the students will be surprised to see that there are four or five people in the group who are that old, and they'll start looking around. **That raises a question: What about adult learners versus right out of high school? Did you see the clickers as having more or less use for older students?** I think everyone would enjoy them and learn. There's nothing too technical for – well, most 30-year-olds are more advanced technically than I am. There's nothing too technical at their end. It's just like working a remote control for your TV. Who doesn't know how to use that? So, I think that the benefits would be great for all. I think instead of age, you might want to look at how people learn. Some people probably really like that automatic feedback, the visual aspects associated with it. It might be nice to see the surveys from the students. Some might think that whole thing was stupid. It wasn't needed. It wasn't necessary. **You'll get all that.**

11. **If given the choice, would you use clickers again?** Most definitely. **Why?** I have plans to continue using them with the ones that had to purchase them going into second semester. I'd like to expand on how I use them. Like it does take time to use it in class, develop the slide shows and so on, so I just kind of got my feet wet this time. Different courses might mean I might use it differently. How I used them in nutrition for the reviews for the quiz, that might not happen in some of my other courses coming up and so on, although it definitely could. I've got a [COURSE] coming up. Well, you could ask all kinds of questions about their past experiences dealing with people and bosses, supervisors. Everyone has all stories of problems dealing with people. **And that's a way to engage students anonymously. And they can just participate and be surprised, "Oh, wow. Six other people or 20 other people in this room have been fired. Wow, I thought I was the only one." And from there they can talk.** I also want to use based on some of those things we've talked about. I think it does engage the students. I'd like to think they're learning because of it, hopefully more than if they hadn't. I don't know about that for sure. I also believe that with these young people, you do have to kind of entertain them a little bit. It's a visual thing related to watching TV, being on a computer, video games, whatever. It's kind of interactive that way. **The Game Show approach.** Yeah, I hate to say that, but you do have to entertain as well as educate. You can't just go

in there, lecture all the time and be too dry. It's the same as using PowerPoint. It's nice to use PowerPoint, but I don't use PowerPoint all the time either. I try to use a variety of methods. I find PowerPoint puts them in too much of a zone – a passive zone. They don't interact or ask as many questions. And the clickers have been the same way. No matter what I'm doing, I'm not going to be using them every class. I don't see me even using them with one class as much as once a week. I might just keep using them once every two, three or four weeks for the time being. **And they've got them now.** Yes, they've got them.

12. **I think we've discussed this: What were clickers most well-suited for? What was it not well-suited for? You felt it was well suited for reviews.** Right. **That made sense for you.** And for the second years for discussion. And I didn't use them any way in which I thought they weren't suited for. **You never tried something and said, "Oh, that didn't work"?** No. **So you used the two ways: to review before test and to prompt discussion. And test comprehension, that would have been your first use. You weren't reviewing for a test at that point. What about attendance and testing?** If someone could help me set it up – we didn't set it up so that we knew who was clicking each response. You can do that and so you could use it for attendance purposes. Formally – those 50 multiple choice questions that followed – we could have used the clickers again for the formal test basically and stuff, and it would probably speed up some of my marking processes and so on. **Do you see any potential problems with the use of clickers for either of those?** For me, there's problems as far as getting it technically designed and set up. As far as the students, I mean their biggest problem is potential to cheat. They may not trust it: they may not trust that my answer's getting recorded and the instructor's finding out that that's my answer, that's me, although I think they probably would because, like I said, kids nowadays, they trust this technical stuff more than we do. Potential for cheating – I mean if you sat at a desk and there's room and you sat a clicker there, you could see someone pressing number two, you could very well watch the person beside you pressing number two. **There's this sort of thing going on.** Signals. Yeah. [Description of cheating with clickers] I'm pretty traditional when it comes to testing. I haven't used online testing. We've been pushed to try online testing. I'm pretty traditional. I like them writing on a piece of paper. **There's a record, a physical record.**

13. **Any features that – I think we've talked about this a little bit – but existing features that you're aware of – you've mentioned the attendance list – existing features in the clicker and the software that the publisher, or I guess the distributor, the manufacturer, makes – any features that you think, "Oh, I'd like to use that" – that exist right now that you've noticed. You've mentioned one. Perhaps you'd like try attendance would.** [Discussion of role of attendance] **So there's that. Is there anything else you're aware of?** Not really. Like I said, I haven't explored the full potential. I may have been exposed to some things during that online training session, but I sometimes say, "Oh, that's too advanced for me. I'm not going to worry about that." I'm at step one.

14. **Is there anything – likely not then, but is there anything that you don't know if it exists or not, but it's a feature that would make you say, "Wouldn't it be great if clickers could be used in this way or that way?"** Just some things you mentioned

today. If we could stop the cheating with testing and stuff. Somehow or other you've got to be there to [participate], some things like that because the potential for cheating has been discussed. **Do you see yourself going back for more training? Finding more training or more informally calling the publisher? Do you see yourself getting more training?** Yeah. I see myself, I tend to do more of that in the May-June period, so I can see myself doing more if it was made available to me. I think you pretty much have to. The technology will change. It will become more advanced. Maybe it will start doing things, like you said, that it doesn't do right now. You've always got to keep upgrading yourself. **So you might be ready for some of those more advanced features.** Sure. But during that May, June period, there's always stuff to upgrade. I mention how I use PowerPoint. My PowerPoint shows are average. They're not super fancy. At the same time, I don't think that's necessary, you don't need too many bells and whistles. And you've always got to stay on top of it. And technology will change. It will start doing more things. Someone told me that you might be able to buy a cell phone and the clicker and the cell phone will be one. **Yeah, that would be interesting. That would be better for the students in that they wouldn't have to buy another –** But they'd have to have a cell phone, and most of them do. **That will likely change over the next 10 years.**