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Clicker Pilot Report

Summer 2007-
Spring 2008

The Center for Teaching, Learning, and Technology

Pilot Findings, Best Practice, and Future Directions in Classroom Assessment Using TurningPoint® Clickers

Prepared by The Center for Teaching, Learning, and Technology
Bowling Green State University (May 2008)

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EXECUTIVE SUMMARY

Background
Often called *audience* or *classroom* response systems, "clickers" are interactive feedback devices that have been used in organizations for several decades, beginning primarily with businesses for training purposes. Today, they are used in many organizations and learning institutions to assess learning, obtain opinions and viewpoints, or make decisions. Traditionally, clickers have been used most often in the sciences, perhaps due in part to Eric Mazur's (1997) Peer Instruction model. But with more effective and affordable technologies now available, clickers are found in classrooms from a variety of academic disciplines.

At Bowling Green State University (BGSU), the use of clickers began several years ago. Since then, a number of clicker systems have been used in a non-uniform fashion, most often purchased by individual departments or instructors. Although these few, pioneering faculty saw value in using clickers during instruction, concerns arose regarding technological support, the use of multiple systems (students purchasing several clickers), or the lack of a reasonably-priced, durable, cross-platform solution.

The Pilot & Feedback
After initial planning during Spring of 2007, the BGSU Clicker Pilot officially began in May of 2007 (Summer I) with four faculty and over 120 student participants. Due to the overwhelmingly positive feedback from both faculty and students, the pilot continued into Fall 2007 with six faculty participants representing over 300 students.

Based on feedback from both semesters, a commonly cited reason for liking (and even disliking) the use of clickers in the classroom is that they make students pay attention, which is a "problem" most teachers would love to claim. In sum, during Fall 2007, 75-80% of students stated that the use of clickers made the class more engaging, fun, or enhanced/improved their learning.

> ***"I don't like clickers because I have to pay attention!"***
>
> ***~ BGSU Student***

The pilot continued into the Spring 2008 semester and another follow-up survey was used to solicit feedback from students and faculty. Similar results from the student and faculty surveys were shared—over 80% of students claiming that clickers made the class more engaging and enhanced their learning. In all, 94% of the 168 pilot students surveyed gave clickers either "Good" or "Excellent" (the highest two) overall rating. Upon completion of the pilot in May 2008, campus-wide integration and support will begin in Fall 2008.

Results and Conclusion
The use of clickers in classrooms has evolved to a point where faculty can easily integrate questions into existing PowerPoint slideshows and both students and the instructor quickly receive feedback. Students no longer have to guess whether they really know an answer or if they already know something, nor are students afraid to raise their hand during an opinion poll or amongst peers, afraid to be wrong.

Learning is socially constructed through a communication process involving dialoging, questioning, synthesizing, and questioning some more. Using clickers in the classroom allows faculty and students to instantly assess the teaching and learning process, and use that data to improve both ends of this dynamic, evolving process.

Although the initial steps of integrating clicker technology is somewhat time-consuming, similar to preparing a new course, the benefits faculty experienced in their classroom in terms of student engagement and learning far outweighed the costs (see Appendix - Survey Results). Overall, the integration of clickers is just one way faculty can move from a teacher-centered classroom to a learner-centered classroom—where *learning* is the focus rather than the content, and the teacher is the facilitator rather than the solitary orator.

Fall 2008 Implementation and Future Direction

The primary goal of the pilot was to determine if the TurningPoint student response system, or clickers, could become the standardized system used in classrooms at BGSU's main campus. The benefits of one standardized system, such as lower cost for students and unified support, training, and shared experiences (Twetten, et al., 2007), are balanced with the benefits in student learning and engagement (Beatty, 2004; Holland & Lide, 2006; Mazur, 1997; Trees & Jackson, 2007).

Based on the positive responses from faculty interviews and survey feedback from faculty and students who participated in the pilot, support of TurningPoint clicker use on the BGSU main campus will begin in Fall 2008. Instructional Media Services (IMS) and Information Technology Services (ITS) will work together to provide on-site hardware and software support, while the Center for Teaching, Learning, and Technology (CTLT) will focus on workshops and consultations on effective learner-centered pedagogical strategies.

During the summer of 2008, IMS and ITS will install TurningPoint software and receivers on each of the approximately 200 technology-equipped classrooms across main campus and CTLT will begin offering a series of three clicker workshops. Faculty who are interested in using clickers during Fall 2008 are encouraged to attend these workshops and contact IMS and the bookstore with their ordering request, if needed.

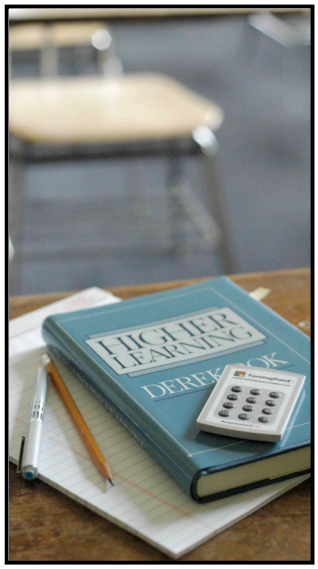
Throughout the 2008-2009 academic year and beyond, the use of clickers at BGSU is expected to increase, therefore, the type of use and teaching strategies employed are central to the overall success in terms of student learning. Just as with other technology tools used in the classroom, effective teaching and assessment strategies must be put into practice in order for learning to improve – the mere use of a technology does not in itself guarantee such improvements. Therefore, CTLT will provide multiple resources and collaborative opportunities for faculty to discover and employ effective research-based learner-centered approaches to using clickers in the classroom.

CTLT will provide multiple resources and collaborative opportunities for faculty on effective research-based learner-centered approaches to using clickers in the classroom.

As effective and meaningful integration of clickers in campus classrooms increases, future uses might include classroom research (scholarship of teaching and learning – SoTL) or institutional uses, such as for decision making and assessment purposes for events or programs such as orientation, First-Year Experience (Boyle, 2006), strategic planning, or on-campus conferences (audience participation).

INTRODUCTION

From large lecture classes to more personalized, smaller classes, uncovering what students know is most often determined from an exam, formal presentation, or written paper. In these cases, if the student does not perform well, it may be too late to catch up. But today, with the use of clickers (also known as student or classroom response systems), learning can be assessed at anytime during or throughout the semester and the results can be used to redirect the students' learning experiences (Beatty, 2004).



Clickers are handheld, feedback devices or remotes that students use to answer questions during class. The entire system consists of a remote (usually one per student), a USB receiver for the computer, software to either help create the question slides or just analyze student responses, and a projector to display the created slides. Questions used to assess student learning include: multiple choice, true/false, ranking, Likert items, conditional branching (where the next question given is based on how many got the previous one correct), and sometimes short answer. Best practice suggests that the instructor design the questions to require a variety of thinking processes—from memorization to higher-order, critical thinking (Holland & Lide, 2006). Moreover, the responses can be anonymous or not, and the data for each response can be collected and used for follow-up analysis or research (Mazur, 1997; Boyle, 2006).

The main benefits to using clickers in a classroom setting include:

- Allowing faculty and students to instantly assess the teaching and learning process;
- Data collected from student responses can be used to instantly redirect instruction (with on screen graphs) or for future analysis of long-term trends in student learning (with printed reports);
- Assessing publicly, but anonymously, students can see where they stand among classmates, allowing for additional learning opportunities;
- Students no longer have to guess whether they really know an answer or if they already know something, nor are students afraid to raise their hand during an opinion poll, even for sensitive or personal questions;
- Feedback received from students can be used to modify or redirect instruction, prompt a discussion, or review previous content or experiences—even "on the fly" (adding questions to a pre-made instructional set); and
- Clickers can be used for formative (ongoing, usually anonymous) or summative (ending, graded) assessments, or both.

> ***"Many instructors have pointed out the benefits of teaching by questioning over the traditional approach of teaching by telling."***
>
> ***~Mazur (1997)***

Theory suggests that learning is socially constructed (Vygotsky, 1978). Using carefully planned questions and instructional design to facilitate critical thinking, student responses can be used to promote discussion, dialogue, and spur additional questions, creating an atmosphere for socially constructed learning to take place. Students can learn from their responses, reflect on what is known, thought, or still to be examined, and subsequently become aware of what learning still needs to occur. These "metacognitions" can be shared with the instructor, assisting students in the process of "learning how to learn." Furthermore, the data collected during the instructional process can continually inform future instructional practice, becoming a source for continual reflection and improvement for students and faculty.

FORMATIVE ASSESSMENT & LEARNING
: ongoing, planned adjustments

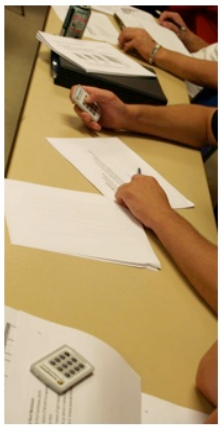
The primary reason for using clickers in the classroom is to gather information (feedback) from the students to inform the teaching process. Although clickers can be used for both formative (ongoing) or summative (final, graded) assessment, they are most valuable when used throughout the course in a formative fashion—making students "active participants in the learning process" (Beatty, 2004, p. 5).

According to Popham (2008), "formative assessment is a planned process in which assessment-elicited evidence of students' status is used by teachers to adjust their ongoing instructional procedures or by students to adjust their current learning tactics" (p. 6). In this fashion, students and instructors can use the data presented on the display slides or in printed reports to redirect their learning or instructional practice just as a sail boat captain uses information about wind, weather, and waves to direct the boat toward its desired location.

Formative assessment is a planned process where evidence is used to adjust instructional procedures and learning tactics.

More specifically, embedded formative assessment—that is built into the teaching/learning process—will help bring students to Vygotsky's "zone of proximal development," where a blended mix of support and challenge provide for optimal learning (York-Barr, et al., 2006). In addition to providing an ideal "zone" for learning, formative feedback offered from using clickers also provides an opportunity for students and instructors to reflect on the learning or teaching process through the presented data, most often in the form of a graph after student responses are received.

Furthermore, the use of formative instruction has been shown in one meta-analysis study by Black and William (1998) to have an effect size of 0.4 to 0.7 over other types of non-formative instructional method and be the "primary engine of school and student improvement" (York-Barr, et al., 2006, regarding the Black and William study). Consequently, if school and student achievement are improving, so are the instructional practices of teachers. In other words, instructors can use the data to inform their teaching and students can use the data to inform their learning. According to York-Barr, et al. (2006), formative and summative assessment data are essential components in the overall practice of instructors to use a Reflective Planning Framework for Differentiating Instruction. As educational research continues to advance, the use of ongoing, easily obtained and accessible data (for instructors, students, and administrators) will be an indispensable tool for improving learning for all students.


PILOT BACKGROUND & PURPOSE
: clickers of the past, present, and pilot

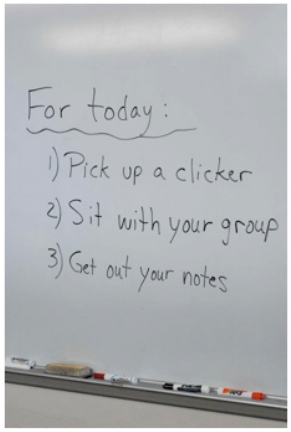
A variety of clicker systems have been used at BGSU since 2000, including iClicker, eInstruction, Quizdom, and TurningPoint. One of the primary reasons for beginning the pilot project in Summer 2007 was to find one system that met most of or all faculty and student needs. The main criteria of an appropriate system for BGSU included that it be cross-platform (Windows and Mac OS), cost-effective, durable, and provide access to resources on effective integration into classroom practice.

Based on initial research by ITS and CTLT, TurningPoint was the clicker system selected for the pilot for several reasons:

- Windows and Macintosh compatible software that integrated with Microsoft Office applications; more specifically, PowerPoint for slide/question presentation, Word for text/question importing, and Excel to analyze and report the collected data;
- no semester-based fees for students or the University are required after the original purchase of the remote;
- easy-to-use data analysis tools for analyzing and displaying student responses; and
- on-site or online training, email, and phone support.

In total, from Summer 2007 to Spring 2008, over 500 students and 8 faculty participated in the pilot.

The pilot began in Summer I (May) of 2007, when four faculty and over 100 students participated; in Fall 2007, six faculty participated with over 300 students; and in Spring 2008, the same six faculty and over 250 students participated. Before each semester, training was offered by ITS and CTLT staff and a 'clicker primer' document was distributed to encourage research-based best practices and pedagogies. During both semesters, participating faculty agreed to provide feedback during a mid-semester meeting and in an end-of-semester survey or interview. For the Fall 2007 survey, responses were collected from students (N=179) and faculty (N=6) and are included in Appendix A. Survey results from Summer 2007 are not included due to low participation (N=10), but these results are available upon request. Faculty (N=3) and students (N=168) completed surveys in Spring 2008 and the results are shown in Appendix B. Also included in Appendix B are the survey results from students (N=173) of two other faculty members who were not officially part of the pilot and therefore did not participate in the meetings and discussions on troubleshooting and pedagogical strategies. The extent of support for these two instructors was minor technological assistance in setting up the system and some troubleshooting during the semester.



Class sizes for participating faculty ranged from 10 to 55 in the summer and from 20 to 70 for the fall and spring semesters. Most were undergraduate courses, but one was a master's level course and one was a summer grant project with over 50 high school students. Although most research cites the use of clickers in large lecture courses, the effectiveness and positive reactions from the smaller courses (both students and faculty) demonstrate that feedback on learning is important in all classes. In fact, two students responded to a survey (N=10) after using clickers in a smaller summer course, suggesting the uncertainty with the use of clickers in large lecture classes—"not sure how they would work in a larger lecture setting" and

> ***"They made class a lot more interesting, but there just might be a problem integrating them into larger classes. By doing this, class will only drag on longer and be a lot more boring because of the time waiting for everyone to answer."***

As they say… from the mouths of babes… Their concerns need to be considered when planning for effective use of clickers in any size course. The following section addresses a variety of uses for clickers in the classroom—large and small classes, new and experienced instructors, and undergraduate and graduate students.

EFFECTIVE EXAMPLES OF CLICKER USE
: interactive learning, engaged participation, and decision making

During the pilot, faculty were encouraged to use questions from all levels of Bloom's (1956) Cognitive Taxonomy (knowledge, comprehension, application, analysis, synthesis, evaluation), thereby encouraging not only memorization, but higher levels of critical thinking and analysis. (See Appendix C for a link to Bloom's Taxonomy.) The primer document included a list of effective uses or "best practices" from a variety of research (see References) and TurningPoint web resources. Some of those examples are listed here as well as those suggested by pilot faculty.

Examples of Classroom Clicker Uses

- Immediately after quiz or exam, go over all/some answers with clickers so students get immediate feedback.
- Use for anonymous feedback on anything from prior experiences or review questions to personal behaviors or attitudes and beliefs.
- Use different question tracks based on student responses and levels of understanding (conditional branching). If all understand Topic A, move directly to Topic B, or if few understand Topic C, additional questions, discussion, or activities can be added.
- Keep track of and follow-up with low-performing students for additional discussion or practice during office hours.
- Take attendance (students are assigned a specific remote and sign in to pick up/return it) – (NOTE: Using clickers for attendance purposes is suggested ONLY as an added benefit, not a sole reason or purpose.)

Beyond the Classroom Uses: Campus Wide Implementation Options

- Department or campus-wide decision making – strategic planning, new programs or curricular decisions, or program evaluation
- Summer Orientation, President's Day Open House, Campus Visitors, PSEOP (post-secondary options for high school students) – gather feedback about experience, expectations, or attitudes
- Conferences (on or off campus) – interactive keynotes or break-out sessions; solicit opinions, gauge prior experience, test knowledge, evaluate session instantly

From a BGSU faculty member who used clickers during an on-campus conference:

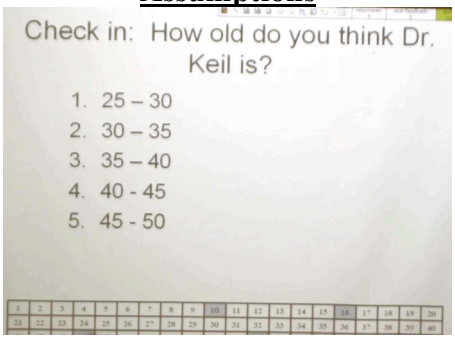
"We had lots of teachers with comments about the clickers. They felt "engaged" in the lecture style format, and enjoyed seeing the immediate feedback on the screen.

"…On a less scientific note, I had several students helping as volunteers at the conference. These students will be teaching personal finance in high schools. They were particularly animated when asked about the use of clickers. One said they are being used in a class he is taking - and he appreciates them because he is able to participate in a very large lecture type class. The others could see various ways they could be used both in high school and college classes for student engagement, teaching/learning group feedback for teachers as well as the ability to target specific students for follow-up re-teaching."

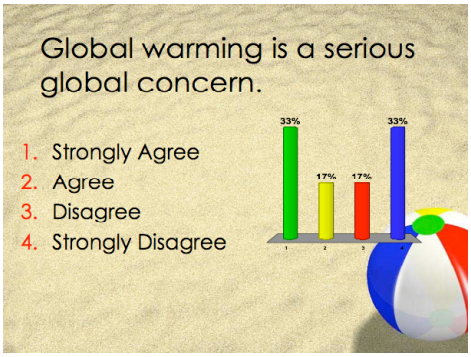
"They felt 'engaged' in the lecture style format and enjoyed seeing the immediate feedback on the screen."

SAMPLE QUESTION TYPES & USES

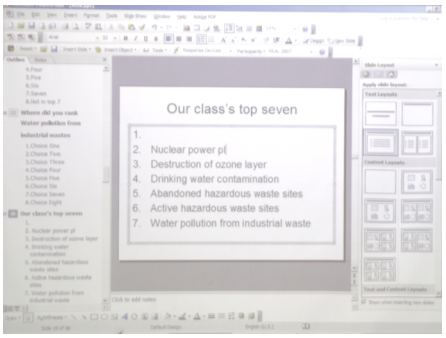
Introduction / Prior Knowledge or Assumptions



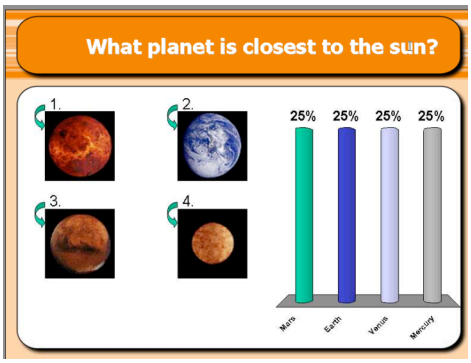
Opinion / Experiential / Likert



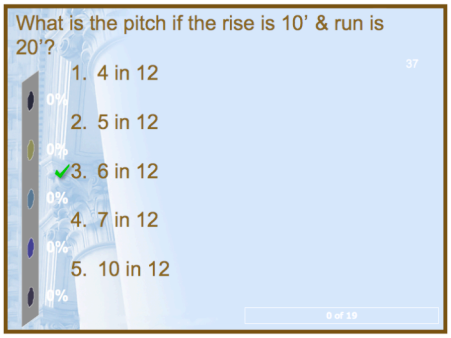
On The Fly Questions/Results

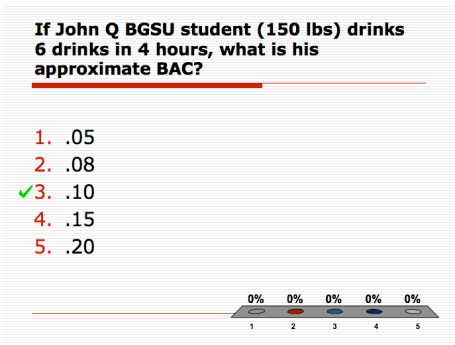


Images

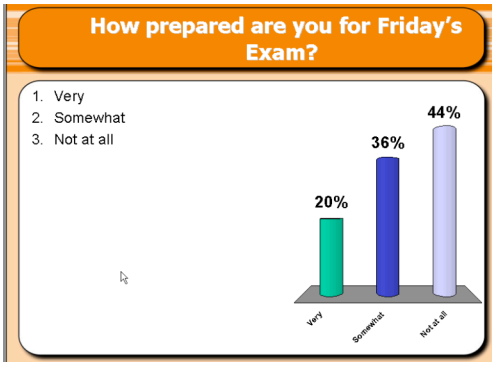


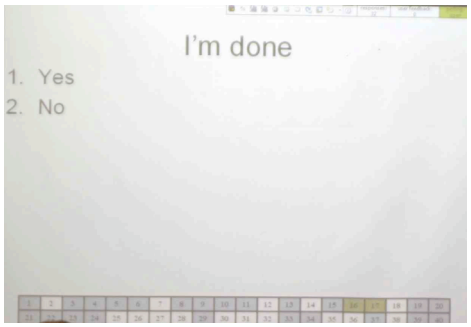
Problem Solving / Application



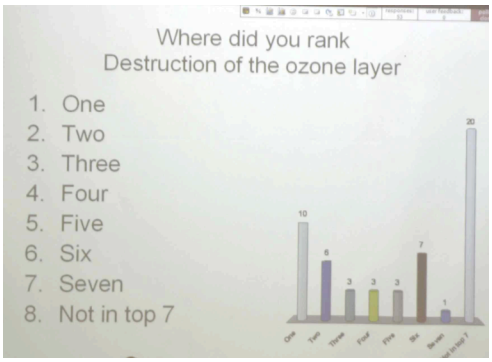


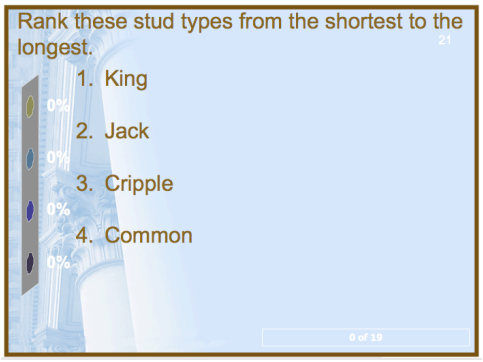
Student Reflection on Learning/Prep



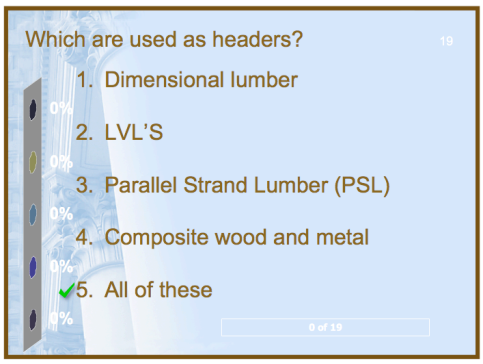


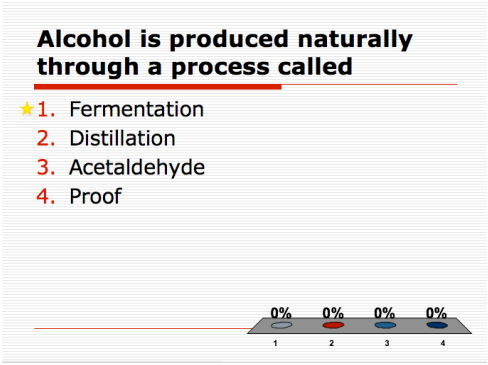
Ranking





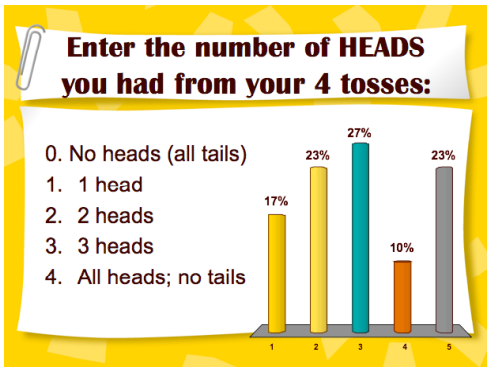
Recall / Fact / Memorization





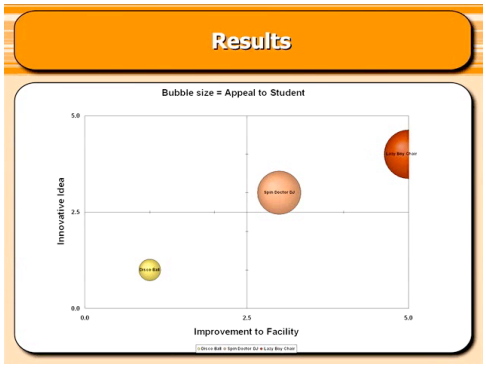
Real-Time Demonstrations

(Duncan, 2005)

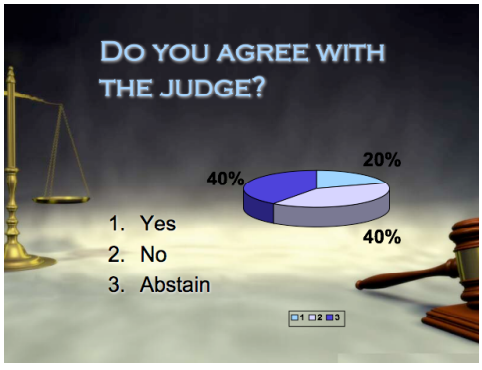


Competition Slides (options – usually used with Recall/Fact or Problem slides)

Decision-Making



Discussion Starters



CONCERNS / ISSUES
… and suggested resolutions

Based on discussions with pilot faculty and their survey responses, the most common concerns or issues are listed below with a suggested resolution.

Concern/Issue	*Resolution*
Setting them up at the beginning of semester	Because of glitches or time constraints at beginning of class, do an actual run through in the classroom you'll be teaching before your class starts; preferable with ITS support, if available.
A "quick start guide" or something similar would be helpful	These are available in the kits, but a more targeted list can be developed or created by each user (keep a log/notes of what works/doesn't) and share these with department faculty and CTLT. Also, check the CTLT clicker resource webpage for more tips, especially Eline Teixeira's Reference Guide.
With new updates, compatibility issues arise (doesn't work)	ITS will need to check all possible combinations of software and hardware available to faculty on campus with the new version and troubleshoot accordingly; communicate this information to faculty (possibly through TP/clicker website or campus updates).
Forgetting to load participant data	On first PPT slide, write a note to yourself that says, "Load participant data" (NOTE: this is only needed if recording individuals' answers for points). 
Lots of time to prep	Primarily front loaded, just like a new course. Once you prepare the slides, only slight adjustments are needed for future use (unless focus or outcomes change, of course).
Ran out of students in participant list (students added to course)	Be sure each class list has a few extra participants than needed for additional students as well as backups for those who lost or have a malfunctioning remote.
Students not sure if their answer is received (since there's no screen); particularly for graded responses	Remind them early and often about the LED on their remote – it will shine green when an answer has been accepted; their last entry will be the one recorded. In addition, a screen showing what was depressed can be used, which makes students more confident in the technology if responses are graded. When using TP clickers with no read-out (LCD) screen, use sparingly or with caution for graded work, as students feel a loss of control – having them write down answers in ink and submit them may help with challenges later.
Students get bored, even with the interaction	Use a variety of question types from all levels of Bloom's Taxonomy (Cognitive Domain), not just Knowledge and Comprehension (or memorization) – include application, analysis, synthesis, and evaluation questions too, along with allowing students to discuss the possible answers in pairs or groups before responding.
Tech support if something doesn't work	Since it is used "live" during class sessions and oftentimes the clicker use may be an integral part, there may be times where support (ITS, TP, CTLT) is not available. Like all lessons, especially those using technology, it is important to have a back-up plan. Moreover, practicing beforehand with the same equipment and classroom will help iron out some glitches.

SUCCESSES & ACCOLADES
: a model for "best practices"

Based on research, including BGSU faculty and student feedback, the following table summarizes the most common uses of clickers in the classroom—pedagogically sound "H.O.T.S." and misdirected, well-intentioned "NOT.S."

H.O.T.S. ***(Higher Order Thinking Skills)***	**NOT.S.** ***(NO Thinking Skills)***
Breaking Out: Mix up questions with lecture, activities, and discussion for reinforcement and to keep the mind engaged. Using clickers ALSO for attendance is fine, especially if it saves more time to ask more questions!	**Attendance Ally**: "I'm only using clickers to take attendance." Clicker benefits are in formative feedback (and there are much less expensive ways to take attendance).
Movin' On Up: Focus on a variety of questions, especially application, analysis, synthesis, and evaluation (e.g. ask for an opinion).	**Factoid-Folly**: Questions focus only on memorization skills (Bloom's: knowledge and comprehension levels) rather than higher, critical thinking levels.
On the Fly: Create questions based on student responses or a new thought; have students work in pairs/groups to come up with questions during or out of class time and present it themselves.	**On A Whim**: Using clickers randomly or only for certain kinds of questions or topics – this doesn't allow for the full range of educational benefits from this feedback system for students or the instructor.
Reflection Beyond Mirrors: Encourage students to analyze their own learning and understandings – in relation to the "correct" answers as well as to other student responses**.** Providing opportunities for them to "learn how to learn" is one of the most valuable outcomes of any course.	**Analysis-Free**: Repeatedly using clickers without examining student data and response patterns doesn't lead to instructor reflection for improvement– questions that come from data could be: Should I review that section/concept? Why does Jimmy always answer "A" to every question, etc.
Think-Pair-Vote-Share: First ask a question, students should write down their thoughts, then pair with another student (or group). Then as a pair (with one clicker) or as a whole class, students respond then share reasons for each choice before the answer is given.	**Captured Soloists**: Students respond alone rather than discussing with a peer or several others. Allow them opportunities to discuss and challenge their thinking.
Off-Balance Learning: Keep students away from redundancy and repetition; vary the types of questions, response times, activities, and response options (show answer or percents, or not) to keep them engaged in your message. Be sure to do so with a specific purpose, such as, "I am not going to show the answer because I want you to discuss this in groups to determine what it is."	**Answers-Only Learning**: Some students may not prepare for class or try to think of the right answer – they are just waiting for the "smart" people (or "wisdom of crowds") to provide the answer. Vary questions so that some do not have *one* right answer, provide time for pairs/groups to discuss answers before responding, and vary the use of showing the correct answer or student counts.
Ask-Discuss-Ask Again: Using any type of question, especially those with few correct responses, after their responses, re-teach the concept (with activities, lecture, readings, etc.) then ask the same question again. This can be done in the same class session or next.	**Ask-Discuss-Ad-Nauseum**: To use this strategy often is to remove the motivation to answer as accurately as possible the first time. Students will soon discover that they can quickly divert the flow of class with tawdry responses and drawn-out discussions.

MANAGEMENT: FACULTY/DEPARTMENT-SUPPLIED CLICKERS
(Students pick up and return the clickers each class - Ideas from pilot faculty)

- For large lecture classes, use a numbered remote assigned to each student. They pick it up and return it for each class (either with a paper sign in/out sheet or colored/labeled bins containing ~10 remotes each).

- Remember, if you are not grading them on their responses, you can distribute them randomly, no sign out or organization is needed. But be sure to have a system where they all get returned at the end of class (perhaps it's their "ticket out the door").

- For departmental or college purchases, funding for clickers can be spread out over several semesters, thus cutting the cost for each remote by four or five times, based on the number of uses. Since the software for TurningPoint clickers is free, the only costs are for the remotes and receiver, both of which can be used repeatedly, even during the same semester.

- Set up a schedule for when they are used/needed each semester and by which faculty. Be sure to block time for prep and organization before or after classes.

- Keep the remotes and receiver in one container/bag so it is ready to go and easy to return from a "home" location that is easily accessible by all in the department. On a card inside, keep the total number of remotes and the ID code for the receiver as well as support (ITS/TSC, CTLT) contact numbers and emails.

For department or college purchases, funding for clickers can be spread out over several semesters, thus cutting the cost of each remote by four or five times, based on the number of uses.

MANAGEMENT: STUDENT-SUPPLIED CLICKERS
(Ideas from pilot faculty)

- As a reminder to register their remotes, include a slide at the start of each PPT presentation with the directions (for the students AND instructor) – "Load participant data."

- Have a few extra participants in each class list and extra remotes for students who forget, lose, or have malfunctioning remotes (also have extra batteries, or require students to have some on hand). The extra participants are also helpful if students add your class later.

- Be sure to put a section in your syllabus about clicker use and the expectations you have for them such as to bring them to class and possibly have extra batteries (although they should run quite some time on the original set).

IN-CLASS USES (Ideas from pilot faculty)

- On first day, use an introductory, non-graded "quiz" – something light or fun – to get students used to the clickers and the process. Similarly, for occasional levity, some faculty will sneak in a humorous or random choice to increase interest or engagement.

- For non-graded questions, which should be the majority, provide a limited amount of time for responses (10-15 seconds), unless using a question that requires extended thinking, computing, or discussion, for which the timer feature can be displayed.

- Another alternative to the timer countdown is to vary the amount of time given, depending on the question and your students' comfort levels.

- Include an answer response of "not sure" or "not listed" to discourage random guessing. If many students answer this response, a discussion can follow to draw out possible misconceptions, lack of preparation (not studying or reading), or even other alternative answers that are "correct."

- Some faculty used the clickers completely anonymously, with no points or grades assigned, while others allotted approximately 10% of their grade to "clicker participation." Depending on the course and the type of questions asked (review, content, application, clarification, etc.), points can be assigned for each question, if desired. (See Concerns section for issues with graded questions).

- Use with complex charts or graphs – quiz them on how to interpret or apply the information.

Some faculty used the clickers completely anonymously with no grade attached, while others allotted approximately 5-10% of their grade to "clicker participation."

- Use them to start a discussion on a topic related to prior experiences, facts, perceptions, attitudes, values, etc. The steps: Ask question, show results, discuss (pairs, groups, whole class), then ask question again. NOTE: Indoctrination is not the goal, critical thinking is.

- Questions can be prepared ahead of time and inserted anywhere within the PowerPoint presentation (pre-questions or review, interspersed throughout lecture, or at the end/summative), but they can also be added "on the fly" when needed.

- Since the TP software is free, faculty can download the software on their home computer to develop questions at home. Moreover, students can also download the software on their personal computers and create slides for their presentation or for the instructor (as an assignment) to be used in class.

- Use the data and reports to analyze student progress. Provide printouts for students regarding their strengths and weaknesses and offer additional study sessions with the clickers.

"Since TP software is free, students can download the software onto their personal computers and create slides for their presentation or for the instructor."

- If students will see similar or same questions on their non-clicker quizzes or exams, encourage them to take notes or provide a copy of the entire PowerPoint with questions so they can review later.

- Focusing on Vygotsky's (1978) "zone of proximal development" and scaffolding principles, in a carefully designed or choreographed fashion, use the results to encourage discussion, discourse, and debate on certain topics so students can learn from their peers as well as the instructor.

CURRENT STATUS, TIMELINE, & FUTURE POSSIBILITIES : 2008 and beyond

Spring 2008

The TurningPoint clicker pilot ran throughout Spring 2008, with the same five faculty participants chosing to continue using the clickers in their courses. During the last few weeks of class, a survey was given to these faculty and their students, as well as students of two other faculty members who were not official members of the pilot, but were using TP clickers in their classes for the first time.

A final compilation of the survey results is available in Appendix B, consisting of a comparison of quantitative data from Pilot Students (N= 168) and Non-Pilot Students (N=173). Because only three pilot faculty responded this time (with very similar responses as the Fall survey), their data is not included in this report, but is available upon request.

Once again, the responses from the students, in both the pilot and non-pilot groups, were extremely positive. Their "overall rating" of using clickers in the classroom was 94.4% "good" or "excellent" for the Pilot Students and 78.6% for Non-Pilot Students. The difference between the groups is interesting, but perhaps not surprising when considering the lack of support (technological, peer, and pedagogical) and first-time use for these two instructors. For both groups (all students), their opinion on using clickers for graded quizzes or tests/exams is varied, averaging SD=16%, D=19%, N=21%, A=31%, SA=13%, with slightly more students agreeing (44%) with this use versus opposing it (35%).

For most questions, there was a slight "improvement" in the favoring of clickers to be used during instruction. This may be due to the instructor becoming more familiar with the system and procedures, making the process more of a habit rather than conscious, laborious task.

Although both students and faculty participants noted improvement, there still is room for improvement in areas such as student discussion, active learning strategies, purposeful reflection on data, and course assessment and evaluation practices using collected data (including from multiple sections). In other words, most faculty (especially early in usage) tend to use the clickers for students to respond to objective, fact-based questions or opinion questions rather than use them for decision-making, student group or class discussion starters, and higher level evaluative type questions in conjunction with another activity.

> ***"(M)ost faculty… tend to use the clickers for students to respond to objective, fact-based questions or opinion questions rather than use them for decision-making, student group or class discussion starters, and higher level evaluative type questions…"***

Summer 2008

Beginning in Summer 2008 (May), CTLT will conduct workshops introducing the clicker technology to faculty. Three workshops will be offered (Introduction, Basic, and Advanced) and pilot faculty will be invited to share their experiences. In addition to introducing the technological features and settings available from TurningPoint, each workshop will incorporate effective, research-based teaching strategies to improve student learning.

IMS will install the TP receiver in approximately 200 technology-equipped classrooms with funding from the Classroom Technology budget. For all other rooms on campus, faculty or their departments will have to purchase the receivers independently.

ITS will add the TP software to the campus image, including "black boxes" and lab machines, so that all faculty and students have access to the software for creating questions or analyzing the response data.

TurningPoint provides a Blackboard Wizard (Windows OS only) that will allow the collected data from a session to be instantly/automatically added to the grade book within Blackboard. This same feature allows students to register their remotes into BGSU's Blackboard system so individual class data can be directly linked to their corresponding course shell. Currently, both these Blackboard features are still being tested, but should be functioning by Fall 2008. Faculty who use Macintosh computers would be able to use this feature on a Windows OS computer to download or upload data, but use the Macintosh to create and collect student responses.

The bookstore will be taking orders from faculty and departments who are planning to use the TP system this fall. Based on faculty requests, they will stock both packaged texts with TP remotes and sell remotes separately for approximately $45. In addition, batteries will also be sold and a buy-back program will be in place for the end of Fall 2008 and beyond, with an estimated buyback price of $22.

After Fall 2008 - Possible Directions

As the pilot progressed, the inquiries lessened as faculty became more comfortable with the technology procedures and focused more on their teaching and student feedback, similar to a flywheel as described in Jim Collins' *Good to Great* (2001). Once a large flywheel gets moving, it continues with little effort due to inertia and momentum. In this case, a procedural habit has developed (no more forgetting to load the participant data at the beginning of each class) and the technology simply becomes seamlessly embedded in the teaching and learning process. With time, and reflective practice, faculty may seek even more improvements in student learning and try integrating other high-order-thinking skills uses into their instructional design.

"Learning must be centered more on critical thinking skills in order to achieve a higher level of learning, not just factual memory."
~ Holland, et al. (2006)

Focus on Assessment <u>For</u> Learning

With increasing use and a focus on transforming teaching strategies toward more learner-centered instruction and engagement, there will be a need for data to further inform teaching and learning. Therefore, in the future, analyzing student data to inform teaching practice or conducting a "audit trail analysis" (Kennedy, et al., 2006), including the development of scholarly research and publication on effective teaching and assessment strategies, will be a natural progression for individual faculty, departments, or colleges.

Of equal importance will be the planning and crafting of effective learning environments. Black, et al., 2004) suggest the following actions:

> "Plan classroom activities to give students the opportunity to express their thinking so that feedback can help develop it; formulate feedback so that it guides improvement in learning; use activities that demand collaboration so that everyone is included and challenged...; and be sure that students are active participants in the lessons and emphasize that learning may depend less on their capacity to spot the right answer and more on their readiness to express and discuss their own understanding." (p. 19).

Lastly, allowing students to assess their own confidence levels in their understandings or answers can add to metacognitive reinforcement and reflection. For example, asking students a Likert scale

question like, “How certain are you of your answer?” will provide more insights for the teacher and the students regarding their learning process and will uncover, or at least approximate, the number of guessers for a particular question.

Out of Classroom Uses

With more ubiquitous use, all freshmen may purchase (or be provided) a clicker that can be used throughout their tenure at BGSU; with perhaps a focus on First Year Experience courses. Additionally, visitors to BGSU, for orientation or open house events, may use the clickers to provide instant, valuable data that can be stored or analyzed in order to improve the overall experience.

“(O)ur aim was not only to improve teaching in the large lecture room, but also to improve the student’s experience of their first year at university.”

~ Boyle (2006)

Clicker Technology Advances

Some other options available from TurningPoint include VPad software for PDAs and, in the future, cell phones, which may become more practical than separate, individual remote purchases. ITS, IMS, and CTLT will continue to research the claims and realities of this (VPad) and other future possibilities of student response systems.

Leadership

For now and into the future, to develop consistency of practice and coherent polices, one individual or campus-wide committee, group, or office should take primary responsibility for the organization, planning, implementation, and development of clicker use. Without careful, cohesive planning and collaborative foresight, effectiveness of future implementation may be limited or stifled. As BGSU continues its mission to strive to be one of Ohio’s *premier learning communities*, the promise of receiving and responding to student feedback to improve learning should be a strong foundation to build upon well into the future.

HIGHLIGHTS :: STUDENTS
: survey responses (see Appendix for full list of comments)

Best Aspects of Using Clickers

- Able to respond anonymously, and the instant feedback for the teacher to determine if she needed to keep on a particular topic, or if she could move on.
- Giving your view without the fear of being wrong.
- It made me pay attention and really try to understand the material.
- Breaks the lecture up and makes it more interesting. It was also interesting that we got to see our class' real life data implemented statistically.
- I could see if I really knew the material or not and what I needed to study more in depth.
- Made the class more interesting and challenging.
- It helped our professor to know what we understood and not and he went over the things that we didn't do as well on again.
- Made me have better attendance.
- I stayed awake in class.
- PLEASE MAKE IT MANDATORY IN EVERY CLASS!!!!
- I don't think I would have done as well in this class had we not used them.

Worst Aspects of Using Clickers

- They always know when you're not there.
- If you missed a day of class (from being sick), not answering the clicker questions counted against you negatively.
- Waiting for EVERYONE to respond.
- Sometimes the time pressure did not help my understanding.
- No screen on them.
- The buttons don't depress very well (or it was at least hard to tell if they had or not).
- Signing them in and out.
- If u come late you receive no points.

Overall Thoughts on Using Clickers

- I would only like them for a review before tests, and not as an actual test or quiz. I would not have enough time to think about the question and answer it appropriately.
- I think that the use of the clickers really helped me in the challenging course.
- I think that the clickers are great for NON-graded material. The fact that the clickers can sometimes malfunction makes it unfair to use them for graded materials such as tests or quizzes.
- As a student planning of becoming an educator, I would love to use this in every class.

Any Other Student Thoughts Regarding the Use of Clickers

- Seems like it was a lot of extra work imposed on instructors.
- Not all classes will be interesting to all students. The clickers are a good way to keep students awake. This may sound like a weak point, but student who are awake and alert tend to learn more, this is a learning institution after all.
- The use of them this year is something that could have been done by a piece of scrap paper.
- I enjoyed them in class, but costs must stay low or else many students will not like them.
- I think generally it's a good idea and the idea should be encouraged. Actually one feels part of the class whether you are wrong or right on the answers and gives you a leeway to study more and participate to be correct. Good idea to me.
- Should be encouraged even to undergraduates.
- I think the clickers are very much worth it, but I think that the clickers should have to be only bought once and the university should have a universal policy that the clickers should be the same for each class instead of buying a different type for each class.
- The more classes that use them, the more valuable the clickers.

HIGHLIGHTS :: FACULTY
: survey responses (see Appendix for full list of comments)

- It helped me key into students' comprehension of the material. I knew for sure when students understood something or when they didn't. In fact, it speeded up my lectures. I ended up four weeks ahead of my material… so I introduced new stuff.
- They allow for the element of surprise – They think they know the answer, but "surprise," they didn't.
- Immediate feedback is a great way to gauge what students are thinking and what they know or think they know.
- Student involvement and interaction – I understood the concepts that they needed help with understanding – since it was also an assessment tool, instead of just exams.
- Gets students involved and force them to think in the classroom.
- Engagement of students in large lecture setting.
- Helped students realize that they didn't already know/understand key concepts.
- Helped students see that others believed as they did.
- It is a fantastic tool for engaging students.
- For use in large lecture, this technology allows the class to feel like we were in a small classroom. It gave the student the anonymity to be comfortable to guess their answer and then be able to discuss the concepts as a class if we needed to expand on the subject matter. It allowed them to participate throughout the lecture and not just passively listen or tune out – they needed to be on their toes, because they didn't know when they were going to need to participate. I want to permanently incorporate this technology in all of my courses.

APPENDICES

A – Fall 2007 Survey Results

- Students (N=179) and Faculty (N=6)

B – Spring 2008 Survey Results

- Pilot Faculty Students (N= 168) and Non-Pilot Faculty Students (N=173)

C – Resources & References

D – Acknowledgements & Contact Information: Participants & Support

APPENDIX A: FALL 2007 SURVEY RESULTS
: a window into student & faculty perspectives

Fall 2007 Clicker Pilot
Student Survey Results
(n=179)

Using clickers in class this semester made the class more engaging (I wanted to participate)

Strongly Disagree	3	2%
Disagree	6	3%
Neither/Neutral	16	9%
Agree	69	39%
Strongly Agree	85	47%

Using clickers in class this semester enhanced my learning

Strongly Disagree	2	1%
Disagree	5	3%
Neither/Neutral	31	17%
Agree	70	39%
Strongly Agree	71	40%

Using clickers in class this semester improved my attendance

Strongly Disagree	9	5%
Disagree	20	11%
Neither/Neutral	50	28%
Agree	37	21%
Strongly Agree	63	35%

Using clickers in class this semester made the class lectures/discussions more interesting

Strongly Disagree	3	2%
Disagree	7	4%
Neither/Neutral	27	15%
Agree	68	38%
Strongly Agree	74	41%

Using clickers in class this semester helped me to better understand difficult course material

Strongly Disagree	3	2%
Disagree	17	9%
Neither/Neutral	42	23%
Agree	68	38%
Strongly Agree	49	27%

Using clickers in class this semester made the class more challenging

Strongly Disagree	9	5%
Disagree	35	20%
Neither/Neutral	57	32%
Agree	49	27%
Strongly Agree	29	16%

Fall 2007 Clicker Pilot Student Survey Results (n=179)

Using clickers in class this semester made the class more fun

Strongly Disagree	3	2%
Disagree	7	4%
Neither/Neutral	23	13%
Agree	61	34%
Strongly Agree	85	47%

Using clickers in class this semester helped me to better understand how the course related to "real world" problems/situations

Strongly Disagree	9	5%
Disagree	19	11%
Neither/Neutral	62	35%
Agree	59	33%
Strongly Agree	29	16%

Using clickers in class this semester helped me to share my opinions/views anonymously

Strongly Disagree	5	3%
Disagree	10	6%
Neither/Neutral	35	20%
Agree	52	29%
Strongly Agree	76	43%

How were clickers used in this course?

Review previous class material	125	70%
Review readings or homework assignments	52	29%
To take attendance	116	65%
For participation points/grade	106	59%
Throughout/during lecture to check understanding	148	83%
After/at end of lecture (as a review of entire lecture)	76	42%
As a graded quiz or test	8	4%

I would prefer to use clickers in the classroom

Never	7	4%
Sometimes (few times per semester)	38	21%
Often (most classes)	72	40%
Always (every class)	61	34%

I would recommend the use of clickers in other courses for reading or homework review (for facts, general knowledge)

Strongly Disagree	13	7%
Disagree	9	5%
Neither/Neutral	24	13%
Agree	76	42%
Strongly Agree	57	32%

I would recommend the use of clickers in other courses for graded quizzes or exams (multiple choice only)

Strongly Disagree	26	15%
Disagree	31	17%
Neither/Neutral	42	24%
Agree	47	26%
Strongly Agree	32	18%

Fall 2007 Clicker Pilot Student Survey Results (n=179)

I would recommend the use of clickers in other courses for general class discussions (non-graded or opinion questions)

Strongly Disagree	8	4%
Disagree	7	4%
Neither/Neutral	18	10%
Agree	69	39%
Strongly Agree	77	43%

I would recommend the use of clickers in other courses for teacher evaluation/feedback (i.e.-How well did you understand today's concept?)

Strongly Disagree	7	4%
Disagree	4	2%
Neither/Neutral	22	12%
Agree	67	37%
Strongly Agree	79	44%

Overall, what do you think about clickers?

Poor	5	3%
Fair	4	2%
Average	24	13%
Good	64	36%
Excellent	81	46%

After this pilot, students may have to pay for clickers. Answer the following scenarios to determine the value of clickers if student need to purchase them:

Is the educational value/helpfulness of the clickers worth having to pay ~$30-$40 for one? (with no additional costs)

Yes	35	20%
No	93	53%
Not Sure/Depends	48	27%

What if you can sell them back to the bookstore or lend to a friend in a different class? (would it be worth ~ $30-$40?)

Yes	85	48%
No	58	33%
Not Sure/Depends	33	19%

What if textbook costs were reduced by choosing a less expensive book or requiring fewer books? (would it be worth ~ $30-$40?)

Yes	111	63%
No	36	21%
Not Sure/Depends	28	16%

What if several of your instructors used them in their classes? (would it be worth ~ $30-$40?)

Yes	113	65%
No	37	21%
Not Sure/Depends	25	14%

Fall 2007 Clicker Pilot Student Survey Results (n=179)

Best Aspects of Using Clickers

- Able to respond anonymously, and the instant feedback for the teacher to determine if she needed to keep on a particular topic, or if she could move on.
- The anonymously answers, so if you got it wrong no one in the class would know it was you. It was great for reviews before a test.
- giving your view without the fear of being wrong
- **It made me pay attention and really try to understand the material.**
- improved knowledge of the subject
- breaks the lecture up and makes it more interesting. It was also interesting that we got to see our classes real life data implemented statistically.
- The teachers can gauge how much the students are learning
- it let me learn a lot and see if the other students were on the same page as me as far as understanding course material
- Way to be interactive / keep focus on what's going on. Interesting to see who understood what instantly.
- **I could see if I really knew the material or not and what I needed to study more in depth.**
- Getting involved
- nice twist to "standard" lectures
- Made the class more interesting and challenging.
- **It helped our professor to know what we understood and not and he went over the things that we didn't do as well on again.**
- We didn't wear them out by using them every day
- Made me have better attendance.
- I stayed awake in class
- **i had to pay attention**
- **PLEASE MAKE IT MANDATORY IN EVERY CLASS!!!!**
- The clickers are a great way to increase attendance and participation.
- I don't think I would have done as well in this class had we not used them.
- (Many responses about good for review, such as for quizzes or exams)

Worst Aspects of Using Clickers

- They always know when you're not there.
- If you missed a day of class (from being sick), not answering the clicker questions counted against you negatively.
- waiting for EVERYONE to respond
- sometimes the time pressure did not help my understanding
- waiting for all the responses
- Nothing really accept wasn't used enough.
- No screen on them.
- The buttons don't depress very well (or it was at least hard to tell if they had or not).
- signing then in and out
- if u come late you receive no points
- (And… MANY about nothing "worst" about using them)

Overall Thoughts on Using Clickers

- I would only like them for a review before tests, and not as an actual test or quiz. I would not have enough time to think about the question and answer it appropriately.
- I think that the clickers are great for NON-graded material. The fact that the clickers can sometimes malfunction makes it unfair to use them for graded materials such as tests or quizzes
- I think that the use of the clickers really helped me in the challenging course.
- As a student planning of becoming an educator. I would love to use this in every class.
- They were nice to have, although I think it may vary depending on the course and what materials are being covered.

Any Other Thoughts Regarding the Use of Clickers

- Seems like it was a lot of extra work imposed on instructors.
- Not all classes will be interesting to all students. The clickers is a good way to keep students awake. This may sound like a weak point, but student who are awake and alert tend to learn more, this is a learning institution after all.
- The use of them this year is something that could have been done by a piece of scrap paper.
- I enjoyed them in class, but costs must stay low or else many students will not like them.
- I think generally its a good idea and the idea should be encouraged. Actually one feels part of the class whether you are wrong or right on the answers and gives you a leeway to study more and participate to be correct. Good idea to me.
- should be encouraged even to undergraduates.
- I think the clickers are very much worth it, but i think that the clickers should have to be only bought once and the university should have a universal policy that the clickers should be the same for each class instead of buying a different type for each class.
- A universal clicker would be ideal.
- The more classes that use them, the more valuable the clickers.

Fall 2007 Clicker Pilot
Faculty Survey Results
(n=6)

During this pilot (Summer &/or Fall 2007), I have used clickers for:

Compound Score	Uses
18	Throughout/ during lecture to check understanding
17	General class discussions (non-graded or opinion questions)
16	Review previous class material
15	For participation points/ grade
14	To take attendance
10	Review readings or homework assignments
11	To create/ assess "on the fly" questions/concepts
10	After/ at end of lecture (as a review of entire lecture)
7	As a graded quiz or test

Are there any other uses not listed in #1? Please describe each:

- As review for an upcoming test/exam

Using clickers in my course(s):

made me more aware of student learning

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	1	17%
Strongly Agree	5	83%

made students more aware of their own learning

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	1	17%
Strongly Agree	5	83%

made the students more engaged in the lessons

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	1	17%
Strongly Agree	5	83%

enhanced/improved my teaching

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	2	33%
Strongly Agree	4	67%

improved student attendance

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	4	67%
Agree	1	17%
Strongly Agree	1	17%

Fall 2007 Clicker Pilot Faculty Survey Results (n=6)

made the class lectures/discussions/interactions more interesting for me

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	3	50%
Strongly Agree	3	50%

helped students better understand difficult course material

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	4	67%
Strongly Agree	2	33%

made the class more difficult to teach

Strongly Disagree	2	33%
Disagree	2	33%
Neither/Neutral	1	17%
Agree	1	17%
Strongly Agree	0	0%

made the class more fun to teach

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	1	17%
Strongly Agree	5	83%

took too much time

Strongly Disagree	2	33%
Disagree	1	17%
Neither/Neutral	2	33%
Agree	0	0%
Strongly Agree	1	17%

helped me to better convey how the course relates to "real world" problems/situations

Strongly Disagree	1	17%
Disagree	0	0%
Neither/Neutral	2	33%
Agree	2	33%
Strongly Agree	1	17%

helped students share their opinions/views

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	2	33%
Agree	1	17%
Strongly Agree	3	50%

increased student interactions with each other

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	2	33%
Agree	1	17%
Strongly Agree	3	50%

Fall 2007 Clicker Pilot Faculty Survey Results (n=6)

increased class discussions

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	2	33%
Agree	2	33%
Strongly Agree	2	33%

helped student learning – overall

Strongly Disagree	0	0%
Disagree	0	0%
Neither/Neutral	0	0%
Agree	2	33%
Strongly Agree	4	67%

What type of support or documentation would be MOST to LEAST helpful to faculty using clickers? (rank in order, 1=MOST, 6=LEAST)

Compound Score	Use
18	PDF of pedagogical/teaching strategies for clickers
15	PDF of technological issues, set up, troubleshooting
13	In person support
13	Brief "cheat sheet" of common features/keys to use
12	TurningPoint phone support - help "on call"
8	BGSU/ITS phone support - help "on call"

If the use of clickers became unified and supported on campus, what needs/support would you or new users require? (think technologically and pedagogically)

- Training using the software and how to easily incorporate it into existing technology that is being used in the curriculum
- On call support would be of importance. Also, some type of support group or listserv would prove beneficial for sharing of ideas. Technologically, it would be important for all lab computers to be ready to handle the system. I found it easier to use my own laptop than try to use the computer in the classroom. It was easier in terms of saving sessions.
- Financial support for some students to purchase them.
- All the above (from previous question of the 6 items to be ranked)

What was the greatest STRENGTH of using clickers during this pilot (summer &/or fall)?

- Student involvement and interaction – I understood the concepts that they needed help with understanding – since it was also an assessment tool, instead of just exams
- It helped me key into students' comprehension of the material. I knew for sure when students understood something or when they didn't. In fact, it speeded up my lectures. I ended up four weeks ahead of my material… so I introduced new stuff.
- Get students involved and force them to think in the classroom
- Engagement of students in large lecture setting
- Helped student realize that they didn't already know/understand key concepts. Engaged students. Helped students see that others believed as they did

Fall 2007 Clicker Pilot Faculty Survey Results (n=6)

What was the greatest WEAKNESS of using clickers during this pilot (summer &/or fall)?

- When I had a glitch and shut down my PowerPoint presentation – but ITS fixed it very quickly
- Using the computer in the classroom (NOTE: rather than a laptop with more flexibility for storing sessions, etc.???)
- You are your own. No one in ITS or CTLT is willing to go extra miles to help you (NOTE: on-call, in classroom assistance was not available at all times during the pilot. Faculty were encouraged to try system before class began with ITS support staff.)
- Time to integrate questions into lecture PowerPoint
- Sometimes getting the technology to work; failing batteries after a (fairly) short time
- Took a great deal of time to set up the questions ahead of time. Because I didn't know if I could continue to use the system, I didn't devote as much time to it as I might have had I known I could continue to use the clickers

If you used clickers again, what NEW/ UNTRIED strategies/ features would you like to use (if any)?

- Quizzes, competitions if that was available for the Mac version
- Try to use the clickers more throughout the entire class instead of just at the beginning
- Adding sound, video, and pictures to questions
- I would use the clickers more often and I'd use them for opinion checks as well as fact/understanding checks

OVERALL, what do you think about the use of clickers in the classroom?

0	0%	Poor- not worth effort/cost
0	0%	Fair- little worth effort/cost
0	0%	Average- somewhat worth effort/cost
1	17%	Good- worth effort/cost
5	83%	Excellent- well worth effort/cost

What else would you like to share about your use of clickers for this pilot? OR What else would you like others to know about this teaching tool/strategy?

- For use in large lecture, this technology allows the class to feel like we were in a small classroom. It gave the student the anonymity to be comfortable to guess their answer and then be able to discuss the concepts as a class if we needed to expand on the subject matter. It allowed them to participate throughout the lecture an not just passively listen or tune out – they needed to be on their toes, because they didn't know when they were going to need to participate. I want to permanently incorporate this technology in all of my courses.
- Nothing else
- It is a fantastic tool for engaging students
- It requires an investment in time, but is worth it – or would be if faculty knew for sure the project would continue. Also, I use the clickers in one class last summer, but won't teach that class again until next summer. It will take several semesters to complete the up front prep work for each class I teach.

APPENDIX B: SPRING 2008 SURVEY RESULTS
: a window into student perspectives

Spring 2008 Clicker Pilot Student Survey Results (n=168)	Spring 2008 Non-Pilot Student Survey Results (n=173)

Using clickers in class this semester made the class more engaging (I wanted to participate)

Strongly Disagree	5	3%		
Disagree	4	2%		
Neither/Neutral	18	11%		
Agree	78	46%		45%
Strongly Agree	63	38%	**= 84%**	35% **= 80%**

Using clickers in class this semester enhanced my learning

Strongly Disagree	1	1%		
Disagree	2	1%		
Neither/Neutral	21	13%		
Agree	88	53%		49%
Strongly Agree	55	33%	**= 86%**	23% **= 72%**

Using clickers in class this semester improved my attendance

Strongly Disagree	15	9%		
Disagree	16	10%		
Neither/Neutral	46	28%		
Agree	47	28%		28%
Strongly Agree	43	26%	**= 54%**	48% **= 76%**

Using clickers in class this semester made the class lectures/discussions more interesting

Strongly Disagree	2	1%		
Disagree	4	2%		
Neither/Neutral	20	12%		
Agree	80	48%		46%
Strongly Agree	60	36%	**= 84%**	32% **= 78%**

Using clickers in class this semester helped me to better understand difficult course material

Strongly Disagree	0	0%		
Disagree	13	8%		
Neither/Neutral	36	22%		
Agree	79	47%		42%
Strongly Agree	39	23%	**= 70%**	14% **= 56%**

Using clickers in class this semester made the class more challenging (in a good way)

Strongly Disagree	3	2%		
Disagree	12	7%		
Neither/Neutral	44	26%		
Agree	75	45%		40%
Strongly Agree	34	20%	**= 65%**	13% **= 53%**

Using clickers in class this semester made the class more fun

Strongly Disagree	3	2%			
Disagree	4	2%			
Neither/Neutral	28	17%			
Agree	66	40%		43%	
Strongly Agree	66	40%	= **80%**	34%	= **77%**

Using clickers in class this semester helped me to better understand how the course related to "real world" problems/situations

Strongly Disagree	4	2%			
Disagree	10	6%			
Neither/Neutral	61	36%			
Agree	66	39%		24%	
Strongly Agree	27	16%	= **55%**	14%	= **38%**

Using clickers in class this semester helped me to share my opinions/views anonymously

Strongly Disagree	6	4%			
Disagree	11	7%			
Neither/Neutral	33	20%			
Agree	62	37%		42%	
Strongly Agree	56	33%	= **70%**	30%	= **72%**

Using clickers in class this semester made the class more difficult (in a bad way)

Strongly Disagree	64	38%		30%	
Disagree	70	42%	= **80%**	41%	= **71%**
Neither/Neutral	20	12%			
Agree	6	4%			
Strongly Agree	8	5%			

How were clickers used in this course?

•	review previous class material (before test)	88	53%	71%
•	review readings or homework (at beginning of class)	37	22%	65%
•	to take attendance	93	58%	79%
•	to gather opinions on an issue (no "right" answer)	44	26%	64%
•	to survey your prior experiences	45	27%	42%
•	for "on the fly" questions	63	38%	65%
•	for participation points or as a grade	85	51%	93%
•	throughout/ during lecture to check understanding	110	66%	75%
•	after/ at end of lecture (as a review of entire lecture)	49	29%	57%
•	as a graded quiz or test	17	10%	33%
•	general class discussions(non-graded/opinion questions)	67	40%	60%
•	in official "teams" or "groups" set up in TP	22	13%	43%
•	to ask a question, discuss responses, give more information, then re-ask the same question	54	32%	47%
•	during a debate to assess opinions on the two sides	15	9%	16%
•	for decision-making (using the ranking wizard)	28	17%	15%
•	conditional branching (different slides come up based on your responses)	8	5%	8%
•	for pairs or group responses (you discuss the question and come up with one answer)	19	11%	22%

I would prefer to use clickers in the classroom

Never	1	1%		
Sometimes (few times per semester)	23	14%		
Often (most classes)	97	58%		47%
Always (every class)	47	28%	= **86%**	20% = **67%**

I would recommend the use of clickers in other courses for reading or homework review (for facts, general knowledge)

Strongly Disagree	3	2%		
Disagree	5	3%		
Neither/Neutral	30	18%		
Agree	88	52%		44%
Strongly Agree	42	25%	= **77%**	23% = **67%**

I would recommend the use of clickers in other courses for graded quizzes or exams (multiple choice only)

Strongly Disagree	25	15%		17%
Disagree	33	20%		18%
Neither/Neutral	34	20%		22%
Agree	50	30%		31%
Strongly Agree	25	15%	("mixed bag" of comfort levels)	11% ("mixed bag" of comfort levels)

I would recommend the use of clickers in other courses for general class discussions (non-graded or opinion questions)

Strongly Disagree	2	1%		
Disagree	2	1%		
Neither/Neutral	15	9%		
Agree	82	49%		53%
Strongly Agree	66	40%	= **89%**	30% = **83%**

I would recommend the use of clickers in other courses for teacher evaluation/feedback (i.e.-How well did you understand today's concept?)

Strongly Disagree	1	1%		
Disagree	2	1%		
Neither/Neutral	17	10%		
Agree	83	49%		50%
Strongly Agree	65	39%	= **88%**	28% = **78%**

I would recommend the use of clickers in other courses to determine prior knowledge or experiences

Strongly Disagree	0	0%		
Disagree	8	5%		
Neither/Neutral	27	16%		
Agree	80	48%		48%
Strongly Agree	53	31%	= **79%**	24% = **72%**

I would recommend the use of clickers in other courses for participation points/grade

Strongly Disagree	5	3%		
Disagree	12	7%		
Neither/Neutral	23	14%		
Agree	72	43%		42%
Strongly Agree	56	33%	= **76%**	36% = **78%**

I would recommend the use of clickers in other courses for decision-making

Strongly Disagree	5	3%		
Disagree	12	7%		
Neither/Neutral	42	25%		
Agree	74	44%		42%
Strongly Agree	35	21%	**= 65%**	18% **= 60%**

I would recommend the use of clickers in other courses for pairs or group responses

Strongly Disagree	6	4%		
Disagree	19	12%		
Neither/Neutral	29	18%		
Agree	74	45%		41%
Strongly Agree	37	22%	**= 67%**	18% **= 59%**

This semester, using clickers helped me participate more in this course than I normally would.

Strongly Disagree	0	0%		
Disagree	12	7%		
Neither/Neutral	35	21%		
Agree	69	41%		42%
Strongly Agree	52	31%	**= 72%**	36% **= 78%**

This semester, using clickers helped improve my learning/understanding in this course.

Strongly Disagree	0	0%		
Disagree	2	1%		
Neither/Neutral	35	21%		
Agree	84	50%		47%
Strongly Agree	47	28%	**= 78%**	23% **= 70%**

Overall, what do you think about clickers?

Poor	0	0%		
Fair	1	1%		
Average	8	5%		
Good	83	51%		47%
Excellent	70	43%	**= 94%**	32% **= 79%**

Best Aspects of Using Clickers (unique or common responses)

Spring 2008 Clicker Pilot Student Survey Results (n=168)

- It got me to actually understand and review the information given.
- participating with ease
- it was anonymous
- They kept us involved in the lecture.
- Asking old questions and then being able to understand the correct answer if you got it wrong before.
- I didn't have to get up to hand in a piece of paper
- A twist to teaching
- I was able to visually see the information, and remember information easier.
- Didn't have to buy it
- Made the class more engaging and more fun.
- I think seeing the questions in front of you along with the right answers helps you remember them better.
- the competition
- **It kept me focused during the lectures.**
- They keep you engaged in class

- Not having to speak in class, and we could just use the clickers to answer questions.
- **being able to read a question and make an educated guess before we really were taught the information, and then have the information explained to us.**
- turns learning into active learning
- good way to see where people stood before tests
- **I was interested in how well I knew the material compared to the rest of the class.**
- It made me think about questions that I had not thought of before, that were beneficial to know for the tests.
- **To give anonymous answers without worrying about giving a wrong answer or being embarrassed.**
- **I feel like I was more involved in the class when we used clickers and paid more attnetion to the material.**
- Knowing I wasn't the only person who felt confused on a question, and helped the instructor know what exactly the class had trouble with.
- No one knew what answer you gave so if you got it completely wrong no one had to know. It made me want to guess and to not be ashamed of my answer.
- it helped me understand the material. and gave me some help with the upcoming quizzes and exams

Worst Aspects of Using Clickers

- I didn't know if I could change my answer
- It let the teacher know when I was absent. :(
- Signing them in and out
- attendance everyday
- Became redundant.
- Kind of a pain to sign in and out.
- **That I only had one class with them**
- If you couldn't make it to class, the clickers kept attendance.
- having the questions worded weird and incorrect
- They seemed to always have an issue and took up a lot of time
- staying awake
- Taking a timed quiz. I did not like having the quiz timed because on some of the questions I needed more time to come up with an answer.
- if you didn't want to pay attention, you had in order to do well
- questions not taken seriously
- **Depending on the lecture if everything was a yes or no answer than that can disengage students too.**
- were not used enough in my classes
- buying clickers
- **we didn't use them enough.**
- I just didn't like participating in them when I did not know the answer
- some student don't vote
- **having to wait for everyone to answer**
- The clickers didn't always work the first time you aimed them at the screen to cast your vote.
- the pressure of time
- technical difficulties
- **the time limit does not give ample time to think the question through**
- The worst aspect would probably be that they weren't consistent (used every day).

- That our responses were graded.
- I don't think there is anything bad about the clickers. It is a great opportunity to help track attendance, help understand & comprehension, and for review.
- **That my teacher only would give us 30- 45 seconds per questions. I feel it should have been longer.**
- having the clickers worth participation points because it was supposed to be a review and help us learn not "punish" by having a poor grade if you didn't understand
- **And MANY responses stating "NA" or "nothing" being the worst aspect**

Overall Thoughts on Using Clickers

- As a review tool and as a way for the prof to see how well students grasped a concept. I do not think it should be used in a graded assessment manner.
- I think they are a great way to engage the class!
- For SOME classes it lends itself great! Not for every class!
- I think they are very beneficial. I think they allow the instructor to know how many of the students really understand and also helps the students understand.
- Only when used for NON-grading purposes
- Good tool for people who do not like to speak out loud in class but want to voice their opinion on topics.
- **I think it is a great way to get students involved in class who may otherwise not.**
- She used them when needed; she didn't go overboard with it and have it count for attendance points; they're sometimes known to have technical difficulties.
- Time management
- The clickers keep your attention better so your mind doesn't lose focus of the material.
- The clickers help reiterate what the teacher is lecturing about.
- It is good for class discussion and quizzes, but not for a grade because it moves too fast and you can not change your answers like you can with the standard tests.
- They are a great way to make sure that important material is understood

Any Other Thoughts Regarding the Use of Clickers

- This is the first class I have used clickers for and they are excellent. I think many other classes should begin introducing them into their lectures.
- I liked using them more than I hated them.
- Good idea from a learning aspect and it allows the teacher to not waste time with attendance
- A lot of people purposely put the wrong answers down. I think you should have to get a certain amount of the questions right in order to get the attendance points. It is not fair for those of us who actually paid attention and got the answers right.
- The clickers were very helpful in class it made class not so monotonous, which is always a good thing.
- The clickers aren't bad but I don't ever want to hear the jeopardy song ever again!
- Very neat way to get the class to participate more.
- The clickers should be more advance like the ones at http://smarttech.com/. To enhance more classroom discussion and interaction.
- I liked them a lot made class very interesting and enjoyable to go to.
- Never used in any classes before this one, would have been useful in the past.

- Wished they had them in prior classes.
- I really enjoyed using the clickers this year. It not only helped me learn, but I could state my own opinion on things.
- I highly recommend incorporating them into more class lectures.
- it was fun to see what everyone thought of topics
- I liked that she used it for review questions for exams.
- should become more prevalent on university campuses!
- I would recommend professors to use this system in their classrooms! Not only does it improve attendance, but it also makes class more interesting.
- keep using them!
- I think they are great and should be used in EVERY class. I think that grades will improve much more!!!
- I think they can be used for many helpful reasons in a classroom and I strongly recommend them.
- They worked better than clickers I've used in previous classes.
- I especially like in a small class setting how you can be given a number and physically see when you have answered or changed your answered response.

APPENDIX C: RESOURCES & REFERENCES
: for more information

BGSU Campus Support

- Contact ITS/TSC for technical issues, troubleshooting problems, or "how to do __" with the software – Call 2-0999; or contact Bonnie Towe (bonniet) or Don Vogel (dvogel) for individual assistance.
- Contact CTLT for teaching strategies or effective clicker pedagogies to engage students and improve their learning – Call 2-6898; or contact Carrie Rathsack (carrier) for individual assistance.
- The TurningPoint website (http://www.turningtechnologies.com) has many helpful resources, including: online tutorials, webinars, presentations on sample uses and pedagogies, and phone assistance – 1-866-746-3015
- CTLT TP clicker resource page (http://www.bgsu.edu/ctlt/page49370.html) and workshops for faculty interested in using clickers (http://www.bgsu.edu/ctlt/page11755.html)

TurningPoint Resources (from Turning Technologies)

Toll-Free Phone Support
1-866-746-3015

Online Training Schedule
http://www.turningtechnologies.com/audienceresponsecommunity/onlinetraining.cfm

Case Studies & Examples
http://www.turningtechnologies.com/audienceresponsecommunity/casestudies.cfm

Best Practices
http://www.turningtechnologies.com/audienceresponsecommunity/bestpractices.cfm

Download TurningPoint Software (it's free; for Mac or Windows)
http://www.turningtechnologies.com/groupresponsesystemsupport/downloads.cfm

PDF Guides & Information Sheets

TurningPoint 2008 User Guides & Manuals
http://www.turningtechnologies.com/groupresponsesystemsupport/productguidesmanuals.cfm

EDUCAUSE – 7 Things You Should Know About Clickers
http//www.educause.edu/ir/library/pdf/ELI7002.pdf

Queens University TP Tutorial (TP 2006)
http://www.its.queensu.ca/etc/pdf/clickers.pdf

Classroom Clicker Research, Teaching Strategies & Tips

Vanderbilt's Center for Teaching – Classroom Response System
http://www.vanderbilt.edu/cft/resources/teaching_resources/technology/crs.htm

Clickers in the Large Classroom: Current Research and Best-Practice Tips
http://www.lifescied.org/cgi/content/full/6/1/9

Bloom's Taxonomy – Cognitive Domain (use a variety of questions to encourage critical thinking)
http://chiron.valdosta.edu/whuitt/col/cogsys/bloom.html

Video & Audio Resources on Clickers

After the Click: Broadcollecting – Tom Haffie from University of Western Ontario presents at Queens University (11/2006)
http://sunsite.queensu.ca/vmp/clickers/index.html
or RealPlayer link - http://sunsite.queensu.ca/vmp/clickers/rnh.ram

Teaching with Clickers – 29 min. video with Eric Mazur (Physics Professor; Peer Instruction)
http://isites.harvard.edu/icb/icb.do?keyword=k1985&pageid=icb.page29705&pageContentId=icb.pagecontent67719&view=view.do&viewParam_name=clickers.html&state=maximize#a_icb_pagecontent67719

TurningPoint Website Video and Audio Presentations
http://www.turningtechnologies.com/audienceresponsecommunity/presentations.cfm

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