

Using Easy Excel Tools with Clickers to Make Large or Small Classes on Any Subject Immediately Engaging

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Abstract

The value of interactivity and enhancing student engagement in the classroom is well established. Using technology to make class more engaging is also widespread and often sought by Information Systems teachers. What this paper offers is three additional interactive techniques that can easily be used to enhance a variety of types of courses and class sizes, using the readily available Excel program found in the Microsoft Office Suite and clickers. Effective teachers are always looking for easy ways to improve the learning effectiveness in the classroom. The tools presented in this paper are easy enough for anyone to use, even those who only use Excel occasionally. Information Systems professors, in particular, could use Excel to improve classroom interaction and to teach productivity tools simultaneously. Each of these tools has been used by the author in an effort to increase student interest and engagement in classes in varying levels of courses with students ranging from freshmen to juniors.

Keywords: active learning, student engagement, Excel tools, interactive techniques, classroom technology

1. INTRODUCTION

Professors aspiring to become increasingly effective teachers who review the latest and greatest teaching techniques will have noticed a major theme emerging from the research on learning. Teachers who find a variety of ways to make the classroom more interactive and students engaged and participative are effective. Lectures that enhance student learning cannot be passive one-way experiences.

Not all interactivity is easily implemented. Time-consuming activities must be carefully structured to maximize material coverage. Consequentially, intelligent teachers look for readily available tools and techniques to enhance classroom interactions. Personal response systems (clickers) are used in many courses and have been shown to be easily

implemented, popular, effective in at least some situations in improving exam performance, and effective in increasing student participation. (Shaffer & Collura, 2009) (Stowell, Oldham, & Bennett, 2010)

Most university professors already have access to Excel, one of the commonly used horizontal productivity tools from the Microsoft Office suite. Increasingly, professors also often have or can easily obtain access to clicker systems. Easy tools that use clickers and Excel and can be used effectively for very large classes could help large numbers of faculty make classes (especially traditional lecture-based classes) more engaging. Information Systems educators, who may use Excel as a common tool that students use for personal productivity might be able to use Excel and clickers together to provide

interactive classes and promote knowledge of Excel tools simultaneously.

Information Systems educators have long been searching for ways to use technology in the classroom to facilitate active learning evidenced by articles in journals such as the Journal of Information Systems Education (JISE). (McGinnis, 2001) (Brandyberry & Pardue, 2001)

Although Excel is commonly found on campuses, not everyone is familiar with the ways of using Excel that will be presented here. If they are familiar with the tools, they may not have considered using them in the fashion described here. Numerous commands in Excel exist, obviously, so only three suggestions will be detailed. These suggestions include first using random number generation and lookup functions together to have "Excel" or "the Computer" select specific students randomly to answer questions or make choices that affect the class. A second suggestion involves using data validation or list sorting and filtering features to allow students to choose between several categories or topics to discuss or wrestle with in a specific course session. Finally, a description is given for using IF/THEN with OR and AND to create a simple interactive game called "Who Wants to get an A on the Test?". Each of the tools, with perhaps the exception of the third, take little time to set up and very little time to implement in a class. All of the tools are easy to learn for faculty who may or may not use Excel often in other ways. These tools become part of the instructor-created information system that provides an environment rich in learning opportunities for students.

2. NEED FOR INTERACTIVITY IN LECTURES

Interactive approaches in the classroom make class time more engaging and effective. Learner participation is key to effective learning even when it is most difficult to achieve as in very large classes. Academicians have recognized the need to make classes engaging in many ways. Uninvolved listeners lose focus. (Murray & Murray, 1992) Specifically, researchers have shown the efficacy of even simple active learning techniques on student outcomes. (Yoder & Hochevar, 2005)

The responsibility to create classroom environments that facilitate interactivity falls on the professor (Essid, 2006) so tools and techniques that make it easy to bring interaction

to the classroom are beneficial. (Butler, Phillmann & Smart, 2001)

Articles such as *Ten Easy Ways to Engage Your Students* discuss studies that show the need for interactive techniques in the classroom and offer techniques to facilitate those (Gray & Madson, 2007) while other articles provide specific advice on how to achieve student participation in lectures more effectively. (Smyth, 2009) (Sivan, Leung, Woon, & Kember, 2000)

Active learning is often broadly defined and can be as simple as a participative classroom discussion (McKeachie, 2002), but always involves students participating in the class rather than passively sitting in a room while a professor lectures. While the intent of an active learning exercise matters (Kille, Krain & Lantis, 2007), several authors have found that actively engaging students in almost any manner increases student performance when compared to lecture-only instruction. (Krain & Lantis, 2006) (Powner & Allendoerfer, 2008)

Using Technology

Technology can be helpful in building learner participation into a course. Research has indicated that electronically enhanced participation such as using clickers significantly improves student participation and engagement. (Nagy-Shadman & Desrochers, 2008, p.204)

3. VALUE OF EXCEL AND CLICKERS

Powner and Allendoerfer point out that when considering the results of their research involving active learning techniques in the classroom, "engagement of any variety ... increases student performance" and that "various techniques...are equally good for improving learning..." They mention that preparation for some instructional techniques takes longer but it makes sense to use methods that do not take so long. "...balancing the time demands of preparation..." does not, according to the research majorly affect the learning. (Powner & Allendoerfer, 2008, pgs 75-89)

Because the lack of materials or equipment is often seen as a primary obstacle that prevents faculty from implementing active learning techniques in a classroom (Bonwell, 2000), it seems valuable to find easy ways to apply tools that are readily available to most if not all. Most people are familiar with the Excel spreadsheet program and may even use Excel to create their

grade books. Even a bit of familiarity with Excel makes it easy to learn to use commands one might not have used earlier. Clickers have become increasingly common and were around even 40 years ago. (Nagy-Shadman & Desrochers, 2008) Even those who do not have clickers can create a set of colored cards with A, B, C, D, E for each student and achieve some of the benefits from the system.

Clickers are wireless transmitter devices about the size of remote controls which are readily available; they require a receiver unit, and software. These systems provide immediate feedback for even extremely large classes, and every student's responses are captured and included in the results. Graphs instantly display the results of surveys or answers. Students generally purchase clickers at nominal prices. Research shows that clickers can be helpful for students. (Bruff, 2008) (Mula & Kavanagh, 2009) Particularly, classroom participation is significantly increased. (Stowell & Nelson, 2007) Clickers can increase understanding. (Caldwell, 2007) and students who used them in some courses stated that they attended more often when the class used clickers. (Nelson & Hauck, 2008)

Using Excel to provide interactivity in the classroom provides additional benefits. Students often need to use Excel in other classes and may find Excel at home and in the workplace. Therefore, any specific Excel commands used can be demonstrated so that students can also use them in a variety of ways after they leave.

4. TOOL ONE: HAVING EXCEL CHOOSE THE STUDENT

RANDBETWEEN and VLOOKUP

Most professors have a roster of student names and it is often easy to bring such a list into Excel. Once brought into Excel, numbering the list from one to the highest number may be facilitated by use of Excel's fill handle (simply put in numbers one and two, select those and double click the fill handle). At that point, the professor can use the list in a vertical lookup. To have the system randomly select a student and show the student's name on the screen one would:

- Create a list of student names numbered from one to the highest number (n).
-

- Select and name the list something like Student_Names.
-
- Write a Vlookup statement something like this, with a random number generator for integers.
-
- =VLOOKUP(RANDBETWEEN(1, n) , 2 , Student_Names, False)
-
- Build an interface around the statement to create a bit of drama such as the words "I CHOOSE..." or "THE LUCKY STUDENT SELECTED FOR THIS QUESTION IS" As part of the interface a macro button might be helpful. Create a simple macro that simply selects a cell and pushes enter. Assign it to a button that says something like "Select Student Now".

Effectiveness of this Tool and Method

The author of this paper has used this method of having the system select students to answer questions with positive results. Students in one class actually indicated that they were excited to see who would be picked next- not by the teacher, but by the computer. It makes sense to put the question up first so that all students reflect that they may be asked to answer the question. Then when the drum roll is sounded and the teacher presses the button, everyone should be ready to answer.

Calling on students individually can be an effective way to bring interaction into the classroom. In fact, one paper suggests that a student be called on every two to three minutes. Using the method described in Excel is much more effectively than the recommendation in the paper that shuffling index cards be used to make this endeavor appear neutral. The authors point out that "this technique creates a high energy level in class - students seem eager to know what is going to happen next, who will be called on next, and what he or she will say." (Gray & Madson, 2007, p. 86)

It should be noted that any time something is entered or changed in the entire spreadsheet, the name selected will change automatically. It makes sense to have the list of names on a different sheet than the one used to show who is selected. One useful fact about this tool is that the same students may be selected multiple times, sometimes even consecutively. Being selected does not remove one's name from the

list. Such a possibility keeps everyone on their toes.

Two possible pedagogical difficulties might be experienced with this tool. Students may feel picked on when they are put on the spot to answer questions. Of course, this problem is not a new one. It would occur anytime a professor called on a student in class. One way to get around it, however, is to have the system select the student but give options for students who are selected. One could have the system select the student to "find" the answer to a question in a five-minute period. They could use books, computers, notes, perhaps even other students nearby to discover the answer. Then the pressure is off for them to know the answer immediately but if they did know it, they could say it and not have to look it up. Additionally, using review questions with this tool assumes they should know the answer already. The second difficulty in using the tool is when attendance in the class is not so great. When the system chooses person after person who is not present, it can lose its efficacy.

Privacy concerns raised by the students' names appearing on the screen seem unlikely. After all, students must be called something in class. However, if the list can be created using names the students pick to use in the class from the beginning, even those potential concerns could be addressed.

5. TOOL TWO: FACILITATING CHOICES TO INCREASE INTEREST

Lists, Sorts and Data Validation

Excel lists allow for filters on multiple columns. When filtered, the data in all other columns is hidden. One use for this tool in the classroom is when a teacher has several topics that could be covered from material on the same day, perhaps ideally all of them would be covered, but if they were completely covered, justice would not be done for any of them. However, students benefit from seeing a group of potential topics, then choosing one or more to spend time discussing. Allowing students to pick among topics may increase their incentives to consider more carefully any material presented on the topic. To use clickers for this event, topics must be limited to five or fewer.

An Excel list would first need to be created with at least two or three columns. In the first column would be categories. For example: in a

Foundation of Information Systems course using a textbook like *Using MIS* by David Kroenke, in a course session designed to discuss information security management in Chapter Twelve, categories might include A)Threats to Security, B)Technical Safeguards, C)Human Safeguards, D)How Organizations Should Respond to Security Incidents, and E) How Widespread is Computer Crime. In the second column, would be sub topics specific to each category. For example with Technical Safeguards as a category, subtopics listed in the second column might include: A) Identification and Authentication, B) Encryption, C) Firewalls, D) Malware Protection, and E) Design Secure Applications. (Kroenke, 2011)

The class is asked to use their clickers to select one of the topics: a graph is shown indicating the results. Then the filter is used in the Excel list to show only the records matching that category. Students can further vote on the subtopic. Then the use of hyperlinks on the topic could bring up a PowerPoint slideshow, an article on the subject, or perhaps an outline of a mini-lecture on a separate Excel sheet in the workbook. At that point a mini-lecture or discussion can take place on the topic.

Perhaps it makes sense to cover as many of the subtopics as possible within the class session but it may also benefit learning if sufficient time is spent to thoroughly cover a few topics that the students see as most meaningful. Students seeing the list of potential topics are made aware of how much material is needing to be considered, which they might not realize if a teacher simply begins lecturing.

In this situation students do not feel put on the spot, but they may be more willing to enter into an interactive discussion on a topic of interest to them. If the topics a particular student picks are not chosen by the remainder of the class, the student may be disappointed. It may be important to provide time and opportunity for questions to be asked on these other topics which may not be covered in detail during the class time.

The secret to success with this tool is choosing topics about which the professor is happy to lead a discussion. Depending on the topic chosen, there may be materials that are prepared and not used. However, it may be possible to make these extra materials, such as slideshows or

articles available for students to access for self-study.

Sorts, filters and data validation of lists in cells in Excel spreadsheets can all be used to create this sort of interactivity.

Effectiveness of this Tool and Method

The author has used this method only in the last semester and only in two course sessions. Perhaps the fact that it was not overused made it work well, and the author found it to be a great way to engage students. Perhaps the only problem noted was in one case several students seemed anxious to move the discussion along and move on to other topics before the class session was over. Even if materials that are not used in class are made available on a download directory, some students would rather specifically cover a topic that is considered "important" by the teacher in class.

6. TOOL THREE: GAME CREATION AND COMPETITION

Using IF/THEN to Provide Feedback

Games can be easily created and played using Excel. For example, the author has had great success with an interactive game that uses elements of "Who Wants to Be a Millionaire". Other authors have created "game shows" such as Jeopardy like games to beneficial effect. (Brandyberry & Pardue, 2001)

An Excel application is first created with multiple choice questions and IF/Then statements to indicate the correct answer. When an answer is entered in a cell (which could be named answercell) – for example an "A" – then an IF/Then in a different cell indicates if the answer is correct or not. The statement can be written so the cell looks blank until an entry is made. For example, the statement could be: = If(isblank(answercell),"",if(or(answercell = "A", answercell = "a"),"CORRECT", "INCORRECT")). It might be even more efficient to use tools like UCASE. The questions are set up in levels so that the easiest come first and become increasingly more difficult to answer. The final round of questions may be essay rather than multiple choice.

Once the Excel application is ready and brought to class, the students are divided into groups and each group chooses a representative to answer questions for the group. The representatives may be brought to the front of

the room. One at a time the student sees a question brought up on the screen. Using clicker software allows for a timer to show on the screen as well with the time ticking away. Students may be given 30 seconds or more to answer a question. Higher levels of questions may be allowed more time. If a student wishes, she can use lifelines such as being allowed to ask her group for their answer. They could use the book to look it up. Another lifeline would be to poll the class for the answer using their clickers and showing the graph of the results. Other lifelines such as individual access to a book might be provided but it is useful to have the class and the groups involved as much as possible.

When the student answers the question, the professor can ask if the answer represents the student's final answer to the question – or do other things to make the activity more suspenseful and dramatic. Then the answer is typed into the answer cell. The IF/THEN provides feedback on whether or not the student's answer is correct. An incorrect answer sends the student back to her group with no points. A correct answer advances the student to the next round of competition. Rewards for the game may include 1 point on the next test for the student's group in the first round, up to a letter grade for the group in the final round. It might be noted that with a 50 point test, only 5 points will make a letter grade difference. Nonetheless it seems to excite students. The author calls the game "Who Wants to Get an A on the Test".

This game has been used most effectively as a means of reviewing for a test. It could, however, be used as a way to ask questions and really get students to attempt to answer them before covering the solutions. According to some researchers,

"Asking before telling... helps students link what they are learning to what they already know. Students apply more effort to the learning situation because they must generate possible answers on their own. Students are markedly more interested in your answer because they have tried to articulate their own." (Gray & Madson, 2007, p. 84)

Students may feel put on the spot in this game with significant peer pressure to do well for their groups. Letting the groups select their representatives seems to help make the

situation less threatening. Further, having various lifelines means that it is likely the student who does not know an answer, at least at the beginning of the game, can find the correct answer anyway. Generally most representatives, and consequently most groups make it past the first level. As the levels can be presented as getting more and more difficult, there is less egotistical dismay in missing the harder questions. Often the students who serve as representatives find the game most entertaining. It is hard to know if these would simply be the more engaged students anyway and that is part of the reason for their status. It is hard to do this game with more than 7 or 8 groups and groups ought not be larger than 4 or 5. Therefore class size should probably be no more than 40 for this game to be most effective. It may work better for smaller classes.

The game may be more exciting if students are given the option to keep the points they have and quit at each level or to give up the points they have and go for more. However, the author has found it easier to allow each group to keep the points earned up to whatever level the representative misses a question.

The game would most effectively be used only once or twice in a semester. It enlivens the class and stands out as unique. One negative result might be that students who know they will be getting free points on the next test as a result of the game might be less motivated to study the material. Also, it takes a fair amount of set up time. Students who are not chosen as representatives may pay more attention to each question if they are told that some of the questions (perhaps differently worded) may appear on a test.

After using this game, students often indicate that they found it fun and exciting. It is important to keep accurate records of who answers what question and at what level. The students and their groups will express unhappiness otherwise. Consequently, the author creates a place in the spreadsheet to enter who answers each question, what groups they were in, and what level the question was as the game progresses.

7. METHODOLOGY

The author experimented with using the techniques described in this paper in two

Fundamentals of Information Systems Course sections in the Spring of 2011 as a way to improve student learning over one section of the course taught in the Fall of 2010. Although the overall average grade of students for the Spring sections did improve to 81.67% over the Fall Section's 78.26%, each class section had only 25 students and there were too many other factors that might have impacted the outcomes to specifically target the use of these active learning techniques. The author will continue to experiment with using various pedagogical tools such as these to improve learning and motivation for students. Particularly useful for comparative purposes would be a study that compares results in the classroom on specific tests or assessments when some of the tools are used versus when they are not.

How much each tool helps specifically might be difficult to measure. The goal is not to use one tool alone or even to use one tool extensively but to add to the instructor's toolbox some new and different instructional methods. Using a variety of tools and techniques provides diversity and gathers attention. As Russell Poldrack, a University of Texas professor of neurobiology points out, varying approaches to provide "novelty" is a powerful way to gain attention which is the starting point for learning. (Poldrack, 2010, p. 9)

8. CONCLUSION

Finding ways to enhance interactivity in the classroom is an ongoing endeavor. Several simple tools in Excel, along with the use of clickers, may engage students in new ways in a variety of courses. Specifically Excel can be used to select students randomly to answer questions or choose topics, to allow a class to pick from a list of topics to cover to increase interest levels, or to create simple games such as "Who wants to get an A on the Test". Each of these techniques brings increased interaction and opportunities for active rather than passive learning. Each of these tools allows the instructor to enhance the learning opportunities in the information system that is being created and maintained in the classroom.

From anecdotal experience, the author has found that students enjoy these interactive measures, that they are more engaged with topics when these tools are used, and that using such tools and others like them provides the instructor an easy way to quickly improve interactivity in the classroom.

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