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Devices (Clickers)**

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Management Review: An International Journal

Volume 2, Number 1, June 30, 2007

Pages: 4-16

ISSN: 1975-8480

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Volume 2, Number 1, June 30, 2007
Pages: 4-13
ISSN: 1975-8480

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ABSTRACT

Net Generation students, those born in the 1980s and later, have grown up with entertaining media such as TV, video games, and the Internet for education as well as amusement. In comparison to these fast-paced, interactive media, traditional lecture classes are likely to be deemed dull and boring. Electronic response devices (clickers) have been found to increase students' engagement with course material while making class more fun. This study will examine students' responses to the use of clickers in business classes at a small campus of a large public university. Not surprisingly, students reported that the use of the clickers increased both their engagement with the class and the likelihood that they would attend class.

Keywords: Electronic Response Devices, Clickers, Learning Games

INTRODUCTION

Students of the Net Generation, also called Millennials, have grown up with entertaining media such as TV, video games, and the Internet for education as well as amusement (Oblinger & Oblinger, 2005). In comparison to these fast-paced, interactive media, traditional lecture classes are likely to be deemed dull and

boring. This poses new challenges for educators who must strive to engage students in learning. Although social, active, learner-centered educational environments are important to all students, Millennials in particular have a strong need for engagement, immediacy and learning in a social environment (Ramaley & Zia, 2005). Electronic response devices (clickers) have emerged as potentially useful technology to help educators meet this challenge. This student examines the responses of students in five business classes to the in-class use of clickers.

NET GENERATION STUDENTS

Net Generation learners pose specific challenges in terms of the instructional methods used. Growing up in a fast-paced environment in which they were entertained and taught through the use of technology, many Millennials have naturally developed an "entertain me" attitude and are bored by traditional lecture (Prensky, 2001). The use of clickers, which combine interactive technology with classroom activities can help educators meet the challenges of teaching the Net generation learner.

Immediate feedback and student involvement are often required to create ideal learning situations (Hequet, 1995; Foreman, 2003). Learning games have been reported to provide just this type of situation in that they create a responsive environment where learners immediately know how they are doing (Cruickshank & Telfer, 1980). In addition, Sugar and Takacs (1999) report that games create an interactive learning experience by transforming inactive learning material into learning episodes where the learners are active players and participants. Using clickers to elicit opinions and informally test students' knowledge could be considered a learning game in that students find them fun and enjoy the tech-based interactivity.

CLICKERS IN THE CLASSROOM

The clickers used in this study were small electronic devices resembling TV remote controls, approximately the size of a deck

of cards, but thinner. They were purchased by the university, rather than by students, to ensure that each student would have a device to use during each class in which clicker-based activities were included. Clickers currently use either infrared or radio frequency technology, with infrared having a lower price, but requiring a clear line-of-sight in order to operate properly. Despite a considerably higher price (approximately \$65 vs. \$15) the latter were chosen to eliminate problems regarding reception. Responses into clickers are transmitted to a receiver, which plugs directly into the computer with a USB connection. The software for the clickers created an interface with PowerPoint software, making it relatively easy to construct interactive slides.

For one review game, students were presented with multiple choice questions which they answered via the clickers. The percentage of students who chose each answer was shown graphically before the correct answer was indicated with a star. In one rendition of the game, students were allowed to discuss the question with classmates and the classes were "polled" twice, allowing students to change their answers the second time after consulting other students. In almost every case, 100% of the students registered correct answers when the question was asked a second time, leading to the assumption that peer-tutoring (Mazur, 1997) was effective in this situation.

In another game, questions appeared without answers, and teams raced to "buzz in" to win the chance to attempt to answer the question. The clicker software was capable of determining the first to respond, making this a fairer (more accurate) system than depending on a human to determine who had raised a hand first. Similar games without the clickers had been played in class, but this version was more like the TV game show "Jeopardy!" The clickers were also used in opinion polls that were interspersed throughout a lecture. The results of the polls were immediately shown in graphical and numerical form. The purpose of the polls was to create interest and stimulate discussion. Although this was not a "game" per se, students perceived it as fun, meaning it could be considered a game.

The anonymity provided by the use of the clickers as opposed to

raising a hand to indicate an opinion is likely to be a positive feature for students who are shy or afraid to voice an unpopular opinion, especially when discussing personal or controversial issues (Chickering and Ehrmann, 1996; Davis, 2003; Draper and Brown, 2004). On the other hand, students may have a greater feeling of participation as the clickers accurately register the response of every student that participates, even in classes of 250 students (Shapiro, 1997).

Despite these advantages, clicker use provides its own set of problems. Clickers that do not appear to work correctly because of dwindling battery power or other technical problems can frustrate students. Other students may simply be opposed to the increased use of technology in classes (Hatch, Jensen and Moore, 2005; Okan, 2003). Carlson (2005, p. 37) quoted a Millennial student who stated that "technology is a 'hook' for people who aren't going to study anyway."

METHODOLOGY

This study examines students' perception of classroom clicker use to play a review game. Three management classes and two sections of a managerial accounting class were included, and respondents were freshmen, sophomore, juniors and seniors of a small campus of a large public university in the northeast United States. The responses of students who were in more than one class were included only once. Of 66 unique students surveyed, 47% were women and 89% were of traditional college age. The survey itself was conducted through the use of the clickers after the games were completed. Student comments were collected through a secure online site.

RESULTS AND ANALYSIS

The results of the study are shown in Tables 1 - 5, which are named by the question they represent. As shown in Table 1, most students prefer games that use technology, as only 9% of students did not prefer games with technology at least "somewhat." This is

not surprising considering that almost 60% of them play video games (for entertainment) and a similar percentage thought they were "cool." Again, a very small percentage had negative feelings toward clickers.

Table 1. In general, do you prefer games that use technology (are electronic)?

| Response | Total | Women | Men |
|-----------------------------------|--------------|--------------|--------------|
| 1 - No, not at all | 3.0% | 6.5% | 0% |
| 2 | 6.0% | 3.2% | 11.4% |
| 3 | 21.2% | 29.0% | 11.4% |
| 4 | 19.7% | 12.9% | 25.7% |
| 5 – Yes, a lot | 47.0% | 48.4% | 45.7% |
| Chi-square 6.042 sig. .196 | | | |

Table 2. Do you play video games?

| Response | Total | Women | Men |
|------------------------------------|--------------|--------------|--------------|
| Yes | 59.1% | 38.7% | 77.1% |
| No | 37.9% | 61.3% | 17.1% |
| Abstain | 3.0% | 0% | 5.7% |
| Chi-square 14.339 sig. .001 | | | |

Table 3. How would you rate the "coolness" of clickers

| Response | Total | Women | Men |
|-----------------------------------|--------------|--------------|--------------|
| 1 - Not at all | 7.6% | 16.1% | 0% |
| 2 – OK | 31.8% | 38.7% | 25.7% |
| 3 - Very cool | 60.6% | 45.2% | 74.3% |
| Chi-square 8.819 sig. .012 | | | |

Table 4. Would you be more likely to come to class if you knew we were going to use the clickers?

| Response | Total | Women | Men |
|---|--------------|--------------|--------------|
| Yes | 40.9% | 24.1% | 57.1% |
| No – always come to class regardless | 40.9% | 62.1% | 25.7% |
| No – nothing can motivate me to come | 9.1% | 6.9% | 11.4% |
| Abstain | 6.1% | 6.9% | 5.7% |
| Chi-square 9.446 sig. .024 | | | |

Table 5. Are you more likely to participate in a class opinion survey if you can use the clickers to do the poll, rather than raising your hand?

| Response | Total | Women | Men |
|---|--------------|--------------|--------------|
| No – always participate regardless | 15.2% | 9.7% | 20.0% |
| No – won't participate unless forced | 7.6% | 6.5% | 8.6% |
| Probably yes | 34.8% | 48.4% | 23.0% |
| Absolutely yes | 42.2% | 35.5% | 48.6% |
| Chi-square 4.992 sig. .172 | | | |

Although a chi-square analysis showed that there was an association between sex and video game playing (Table 2), with fewer women than men reported playing video games, additional chi-square analyses did not reveal significant associations between question responses and the video game variable. Sex-differences, however, were found in regard to the "coolness" of the clickers (Table 3), with more men giving them the best ratings. This is undoubtedly at least part of the reason more men reported that they would be more likely to come to class on a day when they knew clickers would be used (Table 4).

An important finding of this study is that students believe they

would be more likely to attend class on day when they know clickers are going to be used. While 40% stated they already attend class regularly, an additional 40% indicated they would be more likely to come to class if they knew the clickers were going to be used that day, leaving only 15% who abstained or simply would not attend for their own reasons.

Although men were more likely to report that clicker use would improve their attendance, an apparent reason for this is the considerably higher percentage of women who report that they normally attend class. Combining those who regularly attend class with those who responded they would attend class on a day when clickers are used, women reach 86.2% and men 82.8%. This would be a large gain considering that only 25.7% of men said they would normally attend, compared to 62.1% of women.

Similarly, increased participation in class could be expected as more than 40% reported that they "absolutely" would be more likely to partake in an in-class opinion poll, and an additional one-third saying they "probably" would (Table 5). In this case, the women seem to stand to gain the most from clicker use. While only 9.7% of women stated they already participate fully, 20% of men gave that response. Among women, 83.9% said they would or probably would be more likely to participate, whereas that proportion for men was 71.6%. With both groups, "I won't participate unless I have to" was reduced to less than 9%.

Student comments, shown in Table 6 and representative of overall comments, revealed that students found the clickers to be fun, which could likely lead to better attendance. Students also admitted that they participate more when using the clickers as compared to a normal class in which student volunteer answers for discussion.

These qualitative and quantitative results taken together provide strong support for the use of clickers to improve classroom experiences for students. According to these Net Generation students, attendance would be likely to improve, as would participation during class. From an instructor's point of view, these are positive behaviors that should be encouraged.

Table 6. Student Comments

| No. | Comments |
|-----|---|
| S1 | I enjoyed the use of the clickers for the in-class learning experience. I prefer the clicker to regular class work and think it's a fun and innovative way to learn. |
| S2 | I think the clickers are a great tool for learning. With the clicker every student is always involved and therefore must pay attention, unlike in the past where sometimes you would just let your fellow group members answer the questions while you sit back. Also everyone is interacting together which is another plus. I would like to see the clickers used again and more often. |
| S3 | I truly believe that these devices guarantee that students are playing an active role during classroom lectures/discussions. These devices help students to think about the material at hand while encouraging them to learn it for a simple in-class "competitive" game. These devices will change the way students learn any material given to them. |

CONCLUSION

One important finding of this study that warrants further investigation is that both women and men stand to benefit from the use of clickers in the classroom. The majority of men said they would be more likely to attend class when clickers are used. Such a high proportion was possible because only one-fourth stated that they already attend class regularly. With women, over 60% of whom already attended class, the biggest benefit was seen in the willingness to participate in class opinion polls, taken to mean participation in class. Approximately one-third would "absolutely" participate more, and almost half "probably" would. Despite their higher original proportions for "I already participate fully," almost half the men said they would absolutely participate, with

another quarter saying they probably would.

Students who have grown up being entertained present particular challenges to teachers. This study has shown that clickers can be used to create a more learner-friendly environment for Millennials. If students accurately reported their future behaviors, both attendance and participation should increase with the use of clickers in the classroom. Clearly, future research should investigate not only the use of the clickers, but actual student behaviors related to them.

REFERENCES

- Carlson, S. (2005). 'The Net Generation Goes to College.' *The Chronicle of Higher Education*, 52: A34-A37.
- Chickering, A. and Ehrmann, S. C. (1995). 'Implementing the Seven Principles: Technology as Lever.' *AAHE Bulletin*, October: 3-6.
- Cruickshank, D. R. and Telfer, R. (1980). 'Classroom Games and Simulations,' *Theory into Practice*, 19: 75-80.
- Davis, S. (2003). 'Observations in Classrooms Using a Network of Handheld Devices,' *Journal of Computer Assisted Learning*, 19: 298-307.
- Draper, S. W. and Brown, M. I. (2004). 'Increasing Interactivity in Lectures Using an Electronic Voting System,' *Journal of Computer Assisted Learning*, 20: 81-94.
- El-Rady, J. (2006). 'To Click or Not to Click: That's the question,' *Innovate*, 2(4).
<http://www.innovateonline.info/index.php?view=article&id=171>, Retrieved April 3, 2006.
- Forman, D. C. (2003). 'Eleven Common-sense Learning Principles,' *Training & Development*, 57: 39-46.
- Hatch, J., Jensen, M., and Moore, R. (2005). Manna from Heaven or "Clickers" from Hell. *Journal of College Science Teaching*, 34: 36-39.
- Hequet, M. (1995). 'Games that Teach,' *Training*, 32 (7): 53-58.
- Mazur, E. (1997). Peer instruction: A user's manual. Prentice Hall.
- Oblinger, D. G. and Oblinger, J. (2005). 'Introduction,' In D.

- Oblinger and J. Oblinger (Eds.), *Educating the Net Generation*. Retrieved December 10, 2005 from <http://www.educause.edu/Introduction/6059>
- Okan, Z. (2003). Edutainment: Is learning at Risk? *British Journal of Educational Technology*, 34: 255-264.
- Prensky, M. (2001). 'Digital Natives, Digital Immigrants, Part II: Do They Really *Think Differently*?' *On the Horizon*, 9.
- Ramaley, J. & Zia, L. (2005). 'The Real Versus the Possible: Closing the Gap in Engagement and Learning,' In D. Oblinger and J. Oblinger (Ed.), *Educating the Net Generation*. Retrieved December 10, 2005 from <http://www.educause.edu/TheRealVersusthePossible%3AClosingtheGapsinEngagementandLearning/6064>.
- Shapiro, J. A. (1997). 'Electronic Student Response Found Feasible in Large Science Lecture Hall,' *Journal of College Science Teaching*, 26: 408-412.
- Sugar, S., and Takacs, G. (1999). Games That Teach Teams: Tale of the RAT. *The Journal for Quality and Participation*, 22: 54-5.

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Seoul National University

56-1 Shilim Dong, Kwanak Ku

Seoul 151-742, Korea

Printed in Korea

ISSN: 1975-8480 · Volume 2 · Issue 1 · Summer 2007