

Games, Clickers and Study Habits: Increasing Students' Motivation to Study and Participate

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ABSTRACT

Students of the Net Generation have grown up being entertained and educated through fast-paced media that can make traditional lectures seem dull. One way of using technology to make classes more engaging is the use of electronic response devices or "clickers." This study examines students' perceptions of games and clickers based on their self-reported study habits. It is determined that even some students who "never" study their notes before class would study for a game, while the majority of students, regardless of study habits, would be more likely to participate if clickers were used.

Keywords: Electronic Response Devices, Learning Games, Active Learning

INTRODUCTION

The Net Generation, also called Millennials, typically includes the population born in the 1980s or later. Having grown up in a fast-paced environment with TV game shows, interactive video games and the internet, they were taught, as well as entertained, through the use of technology. As a result, they respond best to learning environments that are social, active and learner-centered (Prensky, 2001; Ramaley and Zia, 2005). Preferring hands-on, experiential

activities instead of lectures, they are simply bored by what is usually offered to them as education (Oblinger and Hawkins, 2005; Prensky, 2001).

Learning games, particularly those that utilize clickers, provide a more effective method to teach Net Generation students because they create an interactive learning experience in which students are active players who know immediately how well they are doing (Cruickshank and Telfer, 1980; Prensky, 2001; Sugar and Takacs, 1999). In addition, these engaging activities may also better serve the needs of students whose learning styles are not well served by the traditional lecture format (Baker, Simon, and Bazeli, 1986).

Building on previous research regarding the in-class use of games and clickers, this study analyzes students' motivation to study to be better prepared to play a learning game, their willingness to participate when using clickers, and their normal study habits. The results show that students who study "sometimes" or "always" are more likely to study for a game, but even some students who "never" study their notes before class report that they would study for a game. The majority of students, regardless of study habits, reported that they would be more likely to participate in class if clickers were used. The following section reviews the literature on learning games and clickers, with the methodology and results of this study then presented.

LEARNING GAMES

Learning theories generally point out the need for immediate feedback and student involvement (Hequet, 1995; Foreman, 2003). Games create an interactive learning experience by creating learning episodes in which the learners are active participants, and can reinforce critical information while avoiding rote practice (Doyle, 2001; Rotter, 2004; Sugar and Takacs, 1999). By making learning fun, negative anxiety, especially pertaining to an upcoming test, can

be turned into more positively-charged excitement (Blake and Goodman, 1999; Revere, 2004). Play (fun) can even activate different parts of the brain and help improve learning (Bekoff and Byers, 1998). On a daily basis, games played at the beginning of class can diagnostically show faculty what students already know, while games played at the end of class indicate how well students understood the material presented that day (Blake & Goodman, 1999).

One popular game that has been adapted for classroom use, especially reviewing material for tests, is Jeopardy. A form of this game has been successfully used by many instructors in a variety of courses, especially those in the physical sciences (e.g. Azriel et al., 2005; Benek-Rivera and Mathews, 2004; Revere, 2004; Yolanda and Banbury, 2004). In Revere's (2004, p. 5) study, students reported that playing Jeopardy increased their test preparedness which then "contributed to a positive exam experience." After determining that playing Jeopardy was as effective as lecture-based review, Azriel and associates (2005) concluded that learning games may be very useful for making students happy while still satisfying other stakeholders such as parents, potential employers, and society. Like Jeopardy, a version of Who Wants to Be a Millionaire?, Wheel of Fortune, and Tic-Tac-Toe have also been shown to be useful in motivating students to study and become more engaged in class (Blake and Goodman, 1999; Cook and Hazelwood, 2002; Yolanda and Banbury, 2004). One explanation for this increased student interest is that people are intrinsically motivated to invest effort in activities they enjoy, and that games that allow for social interaction are not only fun, but also allow students to learn from each other (Jenkins, 2005). Health of a population is a complex and poorly understood issue, and that increasing access to health care may not be an effective way to improve health (Laaksonen, et al., 2005).

One issue with learning games is that they can result in apparent confusion and an increased noise level (Cruickshank and Telfer, 1980). Indeed it seems to be "the nature of the beast" that the noise level in a class rises as students interact with teammates and compete with each other during the game. An important factor in minimizing noise is minimizing "down time." Students are more likely to engage in private conversations during the times in which they are not actively involved in answering a question or otherwise participating in the game. Therefore, the key to reducing noise is decreasing the time during which only one or a few students are involved in answering a question. The use of clickers is one way to allow all students to actively participate more often and reduce down time.

CLICKERS

Clickers, the common name for electronic response systems, are small electronic remote control-type devices approximately the size of a half deck of playing cards. In response to questions shown through presentation software such as PowerPoint, students press buttons on the clickers, sending signals to a receiver, which tabulates and graphically displays the results. Although clickers are not always used to play games per se, the activity of using the clickers is often perceived as fun.

Anonymity is one feature of the clicker system that may help to increase participation. Students' answers are displayed in an aggregated form, providing privacy for respondents. This encourages shy or self-conscious students to participate, especially when discussing personal or controversial issues (Chickering and Ehrmann, 1996; Davis, 2003; Draper and Brown, 2004). Whereas verbal responses or raising hands in large classes can be problematic, clickers can be used by all students to register their individual decisions or opinions (Shapiro, 1997).

However, the use of technology to make class more engaging is not whole-heartedly embraced by everyone because of frustrations with the technology or general objections 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." The question of which students benefit most is a valid one. To explore this issue further, this study analyzes students' responses to clickers and learning games based on their self-reported study habits. In the following section, the methodology of this study is presented, followed by the results and analysis.

METHODS

Based on the concept that Net Generation students would appreciate greater interactivity, review games that involved the use of clickers were created. The clickers were also used when new material was presented and opinion-based questions were asked during the lecture. Students indicated their answers by choosing from a multiple-choice list, and pressing the appropriate keys on the clickers. The entire class could then see the proportion of the class that chose each answer. For fact-based activities, students chose what they believed to be the correct answer. After viewing the class' responses, students discussed the question with a friend, consistent with Mazur's (1997) peer tutoring, and then voted again. Review games such as Jeopardy were also played, using the system's "first responder" capability that indicated the first team to "buzz in" to answer a question.

Some schools that use clickers require that students purchase clickers and bring them to each class. Naturally, the failure of students to bring the clickers to class can be a significant problem (Draper and Brown, 2004; Hatch, et al., 2005). To eliminate this problem, the students in this study used university-owned clickers that were distributed at the beginning of each class in which the

devices were used. The clickers were collected at the end of class and properly maintained with new batteries as needed.

Students in seven sections of business classes (management, accounting, economics) at a small campus of a large public university in the northeast United States were included in this study. Respondents, mostly of traditional college age, were freshmen through seniors. Although some students were in more than one class, their responses were included only once. Of the 120 unique respondents surveyed, 49 (41%) were women. The survey itself was conducted through the use of the clickers or paper surveys. Student comments were also collected through a secure online site.

RESULTS AND ANALYSIS

Students were asked to indicate how often they reviewed their notes before class, how motivated they would be to study for an in-class game, and whether they would participate more in class if clickers were used. After the data were collected, two answer categories to the notes review question were collapsed, with "1-5 times per semester" and "Couple of times per month" merged into "Sometimes", and "Once per week" and "Every class" merged into "Always" (see Table 1). Students were also asked how often they read their textbooks, but responses were virtually the same. Therefore, only the question regarding notes was used for this study.

The responses to the "motivated to study for a game", and "participate more with clickers" questions (see Table 2) were then analyzed by sex and study habit. This was done in order to determine if students reporting different degrees of studying (especially those who "never" study for class) would be more motivated to study or participate. The results of ANOVA and chi-square analyses are shown in Tables 3, 4 and 5. Although the analyses were conducted on raw data, the percentages shown for the chi-square analyses are the proportions of each sex indicating

each answer.

Table 1 Response Table by Frequency of Notes Review

| Study Frequency | Total | Women | Men |
|-----------------------------|--------------|--------------|------------|
| Never | 29 | 14 | 15 |
| 1-5 times per semester | 34 | 15 | 19 |
| Couple of times per month | 21 | 5 | 16 |
| Merged category "Sometimes" | 55 | 20 | 35 |
| Once per week | 31 | 13 | 18 |
| Every class | 5 | 2 | 3 |
| Merged category "Always" | 36 | 15 | 21 |
| Total | 120 | 49 | 71 |

Table 2 Questions Regarding Motivation to Study and Participate

| | |
|---|---|
| Would you become motivated to study to play a review game? | Would you be more likely to participate in a class opinion survey if you could use the clickers to do the poll, rather than raising your hand? |
| 1 - No, not at all | 1 – No, I always participate fully regardless |
| 2 - Somewhat | 2 – No, I won't participate unless I have to |
| 3 – Yes | 3 – Probably yes |
| | 4 – Absolutely yes |

Table 3 Frequency of Notes Review

| Frequency of notes review | Total | Women | Men |
|----------------------------------|--------------|--------------|------------|
| Never | 1.62 | 1.43 | 1.80 |
| Sometimes | 2.12 | 1.75 | 2.34 |
| Always | 2.32 | 2.40 | 2.24 |
| ANOVA F | 8.834 | 9.899 | .050 |
| Sig. | .000 | .000 | .050 |

ANOVA shows that overall and within the sexes the means are significantly different between the various groups based on study habits. Not surprisingly, those who study their notes tend to be the most motivated to study for a game. However, even some of those who stated that they never study for class would be at least a little motivated to study for a game, as indicated by the mean (Table 3) that is greater than 1 (No, not at all). Women who never study had the lowest mean for studying for a game, while those who always study had the highest mean. With men, however, those who study sometimes had the highest mean for studying for a game. In fact, men who never study had a higher mean than women who sometimes study.

Table 4 Responses Regarding Motivation to Study for a Game Based on Frequency of Notes Review

| Frequency of Notes Review | Total | Women | Men |
|----------------------------|-------|-------|-------|
| Never | | | |
| Motivate to Study | | | |
| Somewhat | 44.8% | 57.1% | 33.3% |
| No, not at all | 38.3% | 42.9% | 53.3% |
| Yes | 6.9% | 0% | 13.3% |
| Chi-square 2.947 sig. .229 | | | |
| Sometimes | | | |
| Motivated to Study | | | |
| No, not at all | 20.0% | 35.0% | 11.4% |
| Somewhat | 47.3% | 55.0% | 42.9% |
| Yes | 32.7% | 10.0% | 45.7% |
| Chi-square 8.893 sig. .012 | | | |
| Always | | | |
| Motivated to Study | | | |
| No, not at all | 13.9% | 6.7% | 19.0% |
| Somewhat | 41.7% | 46.7% | 38.1% |
| Yes | 44.4% | 46.7% | 42.9% |
| Chi-square 1.129 sig. .563 | | | |

To gain a better understanding of which groups would be more motivated to study, chi-square analyses were performed. Analysis of the results shows there is an association between sex and motivation only among those who sometimes study. As suggested by the means, men in the "sometimes" group would be more motivated to study for a game. Only 11.4% of the men who sometimes study would *not* be motivated to study for a game, compared to 35% of women in that category. In contrast, 45.7% of men, but only 10% of women, who sometimes study would definitely be motivated. Women who never study appear to be the least motivated to study for a game, as 57.1% stated they would not be motivated and none reported that they definitely would be.

Table 5 Responses Regarding Increased Participation with Clickers Based on Frequency of Notes Review

| Frequency of Notes Review | Total | Women | Men |
|-------------------------------------|-------|-------|-------|
| Never | | | |
| Increased Participation | | | |
| No, already participate fully | 6.9% | 0% | 13.3% |
| No, won't participate unless forced | 6.9% | 14.3% | 0% |
| Probably yes | 48.3% | 64.3% | 33.3% |
| Absolutely yes | 37.9% | 21.4% | 53.3% |
| Chi-square 7.390 sig. .060 | | | |
| Sometimes | | | |
| Increased Participation | | | |
| No, already participate fully | 10.9% | 5.0% | 14.3% |
| No, won't participate unless forced | 9.1% | 10.0% | 8.6% |
| Probably yes | 41.8% | 35.0% | 45.7% |
| Absolutely yes | 38.2% | 50.0% | 31.4% |
| Chi-square 2.534 sig. .469 | | | |
| Always | | | |
| Increased Participation | | | |
| No, already participate fully | 11.1% | 20.0% | 4.8% |
| No, won't participate unless forced | 16.7% | 13.3% | 19.0% |
| Probably yes | 30.6% | 20.0% | 38.1% |
| Absolutely yes | 41.7% | 46.7% | 38.1% |
| Chi-square 3.092 sig. .378 | | | |

Almost 43% of women and 67% of men who never study would be at somewhat motivated, to study for a game. These could be considered positive results given this group's normally poor study habits.

Among those who already study frequently, 86.1% (93.4% of women and 81.0% of men) would be at least somewhat motivated to study for a game. This proportion drops to 80.0% (65.0% for women and 88.6% for men) among those who sometimes study, and 45.2% (42.9% for women and 66.6% for men) among those who never study. These findings are not surprising as it seems reasonable that those who already study frequently would be the most likely to become motivated to study more.

In regard to increased participation, the majority of students indicated that they would probably or absolutely be more likely to participate in class when clickers are used. It is important and encouraging to note that the highest percentage of people who would participate more is found amongst those who never study (86.2% overall, 85.7% among women and 86.6% among men), with those who sometimes study having a similar percentages (80.0% overall, 85.0% among women and 77.1% among men). Among those who always study, 72.3% (66.7% among women and 76.2% among men) are likely to participate more if clickers are used. Therefore, the lowest increase in participation would be expected among those who study the most, but even in this group, almost three-quarters of the students would participate more.

Interestingly, the highest proportions of students who state that they won't participate unless forced are found in the category of "always" study. Whereas 19.0% of men who always study are in the "forced" category, none of those who never study stated that they would refuse to participate. The percentages for women were similar for those who never (14.3%), sometimes (10.0%) and always (13.3%) study. The greatest range for the response "I already

participate fully" was found among women as 0% of those who never study stated that, while 20% of those who always study said they participate fully.

Chi-square analysis showed no statistically significant association between sex and study habits in regard to participation. In order to conduct ANOVA on the data from this question, those who reported that they already participate fully were temporarily eliminated, leaving an ordinal scale. However, no significant differences were found. Overall, these results clearly indicate that the use of clickers would be likely to increase participation among most of the students, even those who never study.

CONCLUSION

This study supports the findings of other educators who have successfully implemented learning games (e.g. Azriel et al., 2005; Benek-Rivera and Mathews, 2004; Revere, 2004). These results show that games can also motivate many students--even those who do not normally study for class--to study for games. While other teaching methods may also provide focused review, the advantage of learning games is that they allow students to become actively involved with the content. Games also provide both the instructor and student with an assessment tool whereby they can immediately determine areas of weakness (need for greater study or emphasis).

Millennial students are highly motivated by competition, even when the only prize is the glory of being proclaimed winners. The competition level that is involved in some types of learning games, such as Jeopardy, stimulates an interest that may not be achievable with other teaching methods, especially among men, who tend to enjoy competitive activities. This competition may be linked to another important factor to students--fun. Together, these factors could lead to the motivation to study for a review game. It is significant that approximately half of the students who never

review their notes--potentially the most difficult students to motivate--would be at least somewhat motivated to study for a game and participate in class. However, the greatest gains are likely to be seen among those who sometimes study, and are motivated to study more with the encouragement of a game.

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, participation should increase with the use of clickers in the classroom. It was expected that those who never study would also be the least likely to participate (unless forced). On the contrary, those who always study were more likely to refuse to participate. One limitation of this study is that it does not take different learning styles into account. Some students may learn better by reviewing notes they have taken while sitting quietly in class, while others may benefit more from socially participating in class rather than reviewing notes individually. However, it is just because of differences in learning styles that various methods should be used in class in order to reach out to all students.

Future research should continue to investigate the use of games and clickers, especially in regard to related changes in student behaviors.

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