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PsychOUT! A Technology Classroom Review-Tool For General Psychology and Beyond[1]

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A computerized classroom game was developed in response to a brief review of the literature on techniques, pedagogical aids, and student-reports regarding successful performance in the classroom. Four basic categories were identified as being directly related to improved classroom performance and/or experience: (1) Use of multimedia, (2) Practice testing, (3) Vivid instructional techniques, and (4) In class participation. The game requires a computer connected to a classroom projection system and appears effective in both larger (about 60 students) and smaller (about 12 students) classes. Simply put, the game is played by two teams (e.g., the left and right sections of the classroom) and plays something like "Jeopardy meets Hollywood Squares." Students select a point value beneath a question topic (similar to Jeopardy) but must occasionally try to mislead the other team with their answer (similar to Hollywood Squares). With larger classes, students within each team are paired together and may consult with one another before providing an answer. For exceptionally large classes (e.g., 80 students or more) it is recommended that teaching assistants take smaller sub-sections of the class and play the game during a study session/review. There are 25 questions per board with up to three boards per game. Naturally, the ultimate effectiveness of the game is likely to be dependant upon the relevance of the questions used (as is true of any practice exam). A summary of students' reactions and comments to the game are provided as well as some data summaries concerning self-reported effectiveness and perceived value.

The dissemination and evaluation of instructional tools to enhance teaching, improve student learning, and increase classroom interest and participation are hallmark goals of a variety of useful and popular education publications. Such tools generally fall into one or more of the following four somewhat overlapping categories: 1) Use of new technologies such as computers, multimedia equipment, the internet – including online courses or components, smart classrooms, 2) Theoretical techniques for enhanced delivery such as instructional vividness, staged demonstrations, elaborative encoding, scaffolding, mnemonics, 3) Para-theoretically based applications for more effective learning such as varied testing, self-paced pedagogical aids, and 4) Approaches designed to elicit greater student commitment to learning (intellectual engagement) by increasing class participation and interest in the subject matter.

Depending on the printed source, as well as the type of article presenting or evaluating an "instructional tool," evidence supporting effectiveness varies and may include one or more of the following: Anecdotes, teacher or student or parental testimonials, students' self-reports, correlational data, and experimental as well as quasi-experimental outcomes. Although each data source has its standard criticism (e.g., anecdotal and testimonial evidence may be biased, self-reports may only reflect perceived rather than actual outcomes, correlational data do not speak to

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causality, and experiments are often limited in generalizability.), there can be little argument that tried-and-true methods have nonetheless emerged and that many newer ideas appear promising. Consequently, the present report documents our initial attempts to create and demonstrate an instructional tool designed to touch upon the four categories described above.

Technology

With decreasing costs and increased availability, teaching technologies are becoming more common in the classroom. It is beyond the scope of this article to address all of the possible technological enhancements available, but it is worth highlighting typical findings based on the most commonly available tools (multimedia presentation). In practice, multimedia presentations have been found to improve exam scores compared with more traditional format classes (Crosby & Stelovsky, 1995; Erwin & Rieppi, 1999).[2] In cases where multimedia formats have tended to perform less impressively, it has been argued that quantitative evaluations may not be as sensitive to the complexities underlying learning as more qualitative methods of evaluation (Proctor & Richardson, 1997). We were unable to find any literature to suggest that the use of multimedia was detrimental to students' performance.

Based on the evidence, it does not yet seem reasonable to conclude that multimedia use during lectures guarantees improved performance among students. Indeed, we can imagine many variables that could impact on the effectiveness of such applications in the classroom. On the other hand, there is sufficient evidence to expect that sound and consistent applications of multimedia support to one's lecture are likely to yield favorable returns.

Theory

Effective approaches to teaching are often assessed by how much information students are able to later recall (e.g., exam performance) or simply by asking students either directly or indirectly (e.g., as determined through end-of-the-semester course evaluations). For example, VanderStoep, Fagerlin, and Feenstra (2000) found better free-recall memory performance for information that was vividly presented in a general psychology class as compared with information that was presented in the more traditional lecture format. Vivid instructional techniques included video presentations of key psychological concepts and unusual in-class demonstrations requiring student participation.

There are many theoretical frameworks from which to choose if one wanted to account for why students find such material particularly memorable.[3] The bottom line, however, appear to be that the extent to which material is made more memorable depends on the degree to which the material is emphasized in the (usually contrasting) context of the course.

Para-Theoretical Techniques

Although book costs have increased, one of the advantages students have accrued as a result of competition among textbook publishers is the pedagogical support typically bundled with newly purchased texts. Pedagogical aids tend to come in the form of additional readings, summary reviews, self-tests, access to text-dedicated websites, notes, and critical thinking questions. Presumably, there would be little to gain in providing these "free" components unless there was at least a perception of potential effectiveness among teachers and students.

Among those who have attempted to empirically assess the effectiveness of such pedagogical aids, most researchers have found them to be of benefit. For instance, of 15 pedagogical aids evaluated, end of chapter self-test questions were ranked about 4th (behind glossaries and text enhancements such as boldfaced terms) in terms of perceived value among students regardless of academic level (Marek, Griggs, and Christopher, 1999). Self-tests were also perceived to be especially useful among students according

[2] A notable advantage to most of the software designed for multimedia classrooms is that they can often be adapted to lower-technology environments. For example, software designed for computer-fed projectors (e.g., PowerPoint) can produce hardcopy images that are easily transferred to static transparencies (cf. Gribas, Sykes, & Dorochoff, 1996; Lee & Patterson, 1997; Stafford, 1997).

[3] For example, encoding variability (cf. Anderson, 1980), Paivio's (1969) dual coding, Craik and Lockhart's (1972) depth of processing approach, the von Restorff effect (1933), and so forth.

to the findings of Weiten, Deguara, Rehmke, and Sewell (1999). Weiten, et al. found that self-tests were ranked among the five most useful aids by university, college and high school students and was also among the top five aids students reported they would be most likely to use.

Likelihood of use is apparently a critical factor in the success or failure of pedagogical aids. Balch (2001) reported that students rated self-tests among the least helpful aids but self-tests were also ranked as the least likely study tip used. Admittedly, it is not clear from these data whether the tests were not used because they were believed to be of little help (a metacognitive explanation), or, that they were least helpful because they were simply not utilized (an intellectual laziness explanation). Because Balch found no correlation between degree-of-use and course performance, the metacognitive explanation does not seem as likely as the intellectual laziness explanation.

The most economical conclusion to draw from these findings is that pedagogical aids (practice exams in particular) are useful but only to the extent that students take advantage of them. Instructors may choose to yield class time for enforced test reviews and often these reviews are not reliant upon text-bundled aids. For example, in terms of instructor-generated pedagogy, McCann, Perlman, and De Both (2001) found that 38% of instructors surveyed used test reviews to improve student performance. Interestingly, though, their cumulative ratings of perceived effectiveness were barely middle-of-the-road. However, practice exams (compared with exams given simply for review with answers provided) resulted in significantly higher final exam scores (Balch, 1998).

Intellectual Engagement

Students who become active participants in learning tend to outperform students who do not (cf. Herr, 1989; McManus, Dunn, & Denig, 2003; O'Sullivan & Copper, 2003). Various approaches and techniques for engaging students have been proposed. For example, techniques range from simply integrating student-reported topics of interest into lectures (Buskist & Wylie, 1998) to much more active role playing events (DeNeve & Heppner, 1997) and in-class simulations and collaborative teaching opportunities (Bernstein, Scheerhorn, & Ritter, 2002). It is also not unusual to see multiple techniques being endorsed (Reiser & Butzin, 2000). Bonwell (1996) even advises substituting multiple mini-lecture-plus-active-learning events for the traditional long-lecture routine. Generally, and not surprisingly, what one observes is a positive correlation between involvement and achievement.

To some extent, the roots of explanation for these findings may be traced to issues of achievement motivation. As described by Murray (1938), people have a need to accomplish or master difficult tasks and to do so as quickly and independently as possible. It stands to reason that environments which prevent or discourage such achievement will have the effect of reducing motivation to learn. Traditional lecture formats, although often unavoidable, are notorious for creating passive learning attitudes among students. The trick, then, is to find ways of integrating student driven tasks into lectures so that achievement motivation does not wane.

PsychOUT!

The present study reflects our attempt to develop an effective classroom tool that makes contact with some aspect of each of the preceding four categories. Specifically, this tool was designed as a class interactive review game called *PsychOUT*! that takes advantage of what is becoming increasingly standard in classroom technologies (computer and projector). Game play, sounds, colorful screens, and play-options are designed so as to create a particularly vivid experience. The pedagogy most emphasized is the review exam (self-test, etc.). Questions and answers are presented in a fashion similar to the familiar *Jeopardy* game and are easily adapted from instructor resources which often accompany the instructor's text. Depending on the play options selected, the degree of required participation from each student can be varied significantly.

Our goals for this initial study were to assess students' perceived effectiveness of the game in affecting their exam performance and study habits. Using both open and closed-ended questions, we asked students' to rate aspects of the game, lectures, and the class in terms of the issues raised above. In addition, we surveyed students for input as to the potential problems and benefits of using

the game in a classroom (educational) setting.

Method

Participants

The game was used over the course of one semester in three different classes: Two were undergraduate General Psychology courses (n = 43 and n = 25) and the third was an upper level Social Psychology course (n = 22).

Materials & Apparatus

Utilization of the game (*PsychOUT*!) requires access to a computer (PC running Windows 95 or later) connected to a color projector and speakers (although sounds are not essential, they do add to the experience during play).

The game of *PsychOUT*![4] derives its name from one of the play options. Much like the television game show *Hollywood Squares*, students may occasionally opt to try and answer a question with a bluff in order to "psych-out" the opposing team and win extra points. Standard play, however, is simply a matter of each team taking a turn at choosing a question topic and difficulty level and then answering it correctly for points.

Procedure

Students played the game during regularly scheduled class meetings; the meeting immediately preceding each semester exam (two times each for general psychology, three times for social psychology).

At the end of the semester, students were given the *PsychOUT*! survey to complete. The survey contained nine 7-point Likert scale questions and six open-ended questions (see Appendix). The Likert questions were designed to assess the degree to which students believed the game was an effective or valuable learning tool, etc. The open-ended questions allowed for greater range of expression from students (e.g., whether they played games in other classes, suggestions for improvement, effects of playing on study strategy, etc.).

[4] The game is distributed by *drspeg Software, Inc.* and inquiries pertaining to cost and availability may be addressed to drspeg@hotmail.com. It is recommended that the word "PSYCHOUT" be embedded in the subject line.

Results

As can be seen in Table 1, students' mean self reports of effectiveness, etc. were fairly high for all questions, including those assessing the four "effective experience" areas. The means across classes for each question did not differ significantly ($p > .05$). However, this may not be a fair test as there may not have been sufficient power to detect differences. In any event, detecting differences across classes was neither a goal nor a prediction of this study. Therefore, data will be presented based on all three classes combined.

Table 1. Mean ratings for the nine Likert scale questions (and standard deviations), as well as breakdowns in overall percentage of students indicating below and above neutral responses.

Item	Mean Rating	Percent Rated Below Neutral	Percent Rated Above Neutral
1	5.54 (1.27)	4.4%	85.6%
2	5.68 (1.26)	5.6%	84.4%
3	5.89 (1.28)	6.7%	88.9%
4	5.98 (0.91)	1.1%	93.3%
5	5.99 (0.99)	1.1%	92.2%
6	5.97 (1.33)	5.6%	87.8%
7	5.46 (1.35)	7.8%	76.7%
8	5.50 (1.16)	3.3%	81.1%
9	5.41 (1.39)	7.8%	75.6%

A summary of the top four most frequent responses to each question are provided in Table 2. This cutoff tended to divide responses according to majority reports. That is, the comments dropped from the summary tended to reflect the opinions of only one or two students. Because the responses to these questions were collected in order to obtain additional insights about the game rather than to test specific hypotheses, no analyses were performed on these data.

Discussion

The main findings were that most students enjoyed and appreciated playing the game. According to the Likert responses, fewer than eight students (out of 90) ever gave a response lower than neutral, while all questions received a positive rating by at least 65 of the students. These findings are consistent with and support our attempt to develop an effective teaching tool based on the

four broad approaches toward enhancing instruction we discussed earlier.

Specifically, based on students' reports of perceived effectiveness (items 1, 3, & 8) combined with their view of the use of technology (items 4 & 5), we conclude that not only was the students' classroom experience enhanced, but playing this game likely improved their study habits, if not just their exams scores. A quasi-experimental study addressing this point would, of course, lend greater credibility to our conclusion. Nonetheless, students' perceptions are in line with our view.

Lowest rated, but still ranked much higher than neutral, were students' responses to the perceived vividness and participation/intellectual engagement issues (items 7 and 9 respectively). Because these items tended to produce the most neutral responses, it is not clear whether students fully understood the questions or not. There are also matters having to do with relative behaviors. In other words, students who already believe they are strong participants in class may not have rated the game as being crucial to their level of participation compared with students who rarely contribute during class time except when playing the game.

Open-ended questions were used to elicit more general input from students concerning the *PsychOUT*! game, games played in other classes, and how playing the game affected their class performance. Although nearly uniform in their positive and constructive nature, responses to the open-ended questions tended to yield few responses overall. Therefore it is important to recognize the likelihood that responses to these questions may not be well representative of the majority of participants' views.

Of particular interest to us were responses to the questions dealing with students' performance and behaviors (items 12 and 14). Nearly half of the students indicated that the game affected their study habits while more than 75% commented on why they believed the game was an effective teaching/review tool. Based on written responses and anecdotal evidence, the clearest influence game play had on students was that it revealed to them how poorly they had learned the material.[5] This metacognitive insight was most likely the key motivational force behind changes in study habits.

Table 2. Summarized (top four most frequent) responses to the open-ended questions. Each response type is preceded by the number of similar responses given. Note that for the last question we provided each of the four relatively critical comments.

10) Have you played games in other classes?

6 Form of jeopardy (like *PsychOUT*!)
2 Group question and answer game.
2 Quiz/memory game (ecology).
2 Game not specified.

11) In what other classes do you think it would be helpful to play *PsychOUT*!

19 Any.
19 Sociology.
17 History.
10 Economics (e.g., macroeconomics).

12) How did playing *PsychOUT*! affect your study habits?

15 Helped me realize I was unprepared.
10 Copied questions/answers & studied them.
5 It caused me to study more.
5 I knew exactly what to study.

13) What improvements should be made to future versions of *PsychOUT*!

7 More time for the game.
6 Smaller teams or allow partners.
5 More questions.
3 Better incentives to win.

14) In what way(s) do you think *PsychOUT*! is an effective teaching or review tool?

38 It reviews important information that will be on the test.
20 Makes you: Think; Want to know answer; Know how much you need to learn.
10 It helps us remember.
5 Gets students more involved.

15) Additional comments?

9 Good game.
4 It was helpful; should play more often.
3 It was fun.
4 Did not like it: Don't play. Useless. Made me feel like a dumbass in front of my peers. I really didn't enjoy playing it. *PsychOUT*! didn't help me because I usually hadn't started to study yet, so therefore I knew hardly anything.

[5] Indeed, based on his students' reactions to their initial *PsychOUT*! review session, the second author suggested that the game be renamed "Rude Awakening."

It was interesting to us to see that review games were reported by nearly twenty percent of the students. Because most of the students were freshmen, the finding that so many have already participated in similar games suggests that this approach to instructional enhancement may be relatively wide-spread (at least on our campus). There was also a great deal of encouragement from students regarding the likelihood that *PsychOUT*! would be suitable for non-psychology classes. This is based on the finding that more than 60 students envisioned its use in well over 80 different classes.

Of some concern (based on responses to open-ended questions 12 and 14) was the perception that the game questions were representative of the entire contents of the upcoming exam. It was not our intention to use *PsychOUT*! as a vehicle for reviewing only what would be on the exam, nor would we recommend doing so. Nonetheless, some students may have assumed that because certain topics were covered in the game they were also going to be on the exam, and conversely, that if certain material did not appear in the game, it would not be on the exam. Such misperceptions may have resulted in students having studied some material more than, or instead of, other relevant material.

Finally, based on responses to the "suggestions for improvement" and "additional comments" questions (survey items 13 and 15, respectively), we believe that less satisfied students would have been better served by playing the game in paired groups (or triads, etc.), rather than putting students "on the spot" during game play. The number of students contributing a response during game play is obviously going to be a function of the class size. Larger classes (e.g., 40 or more students) might be ideally suited for this variation of game play. However, the obvious risk to larger answer-groups is an increased likelihood of social loafing. Students will have proportionally less opportunity to actively participate. As students become less active participants in learning, it stands to reason that performance will decline (cf. Herr, 1989).

In conclusion, based on our experiences with the game and students' formal (and informal) reactions to it, we believe that *PsychOUT*! can be an effective teaching tool. While it was designed for use in General Psychology, it has already enjoyed success in a more advanced psychology course (Social Psychology). Therefore, we see no reason why it could not be successfully adapted for use in almost any class; psychology or otherwise.

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Appendix

Survey questions. Items 1-9 were Likert response questions (with 4 indicating a neutral opinion), the remaining questions were open-ended. Response rates (replies) are out of a maximum of 90.

	Survey Question	Likert = 1	Likert = 7	Replies
1	Do you believe that playing *PsychOUT*! helped you to learn material for class?	Definitely did NOT help	Definitely helped	90
2	To what extent do you believe that playing *PsychOUT*! is a valuable use of class time?	Definitely NOT valuable	Definitely VERY valuable	90
3	Would you say that in-class games (like *PsychOUT*!) are effective methods for teachers to use in order to get students to learn course-related information?	Definitely NOT effective	Definitely VERY effective	90
4	In your opinion, is the use of multimedia technology in the classroom (e.g., PowerPoint, video-clips, games like *PsychOUT*!, etc.) something that actually improves most, if not all, students' performance in the course?	Multimedia does NOT improve performance	Multimedia DOES improve performance	90
5	In your opinion, is the classroom experience enhanced (made better) by a teacher's use of multimedia technology during lectures (e.g., PowerPoint, video-clips, etc.)?	Multimedia does NOT improve class experience	Multimedia DOES improve class experience	90
6	Do you feel that playing *PsychOUT*! serves as a good review tool before an exam?	*PsychOUT*! is NOT a good review tool	*PsychOUT*! IS a good review tool	90
7	How vivid (freshness of experience; memorable; etc.) was it to play the *PsychOUT*! game in class?	Definitely NOT a vivid experience	Definitely WAS a vivid experience	90
8	The idea of playing *PsychOUT*! is based on findings that practice testing improves student performance on exams. To what extent do you believe that this game was effective in improving your performance on exams?	Did NOT improve exam performance	Definitely DID improve exam performance	90
9	The way in which *PsychOUT*! is played is based on findings that class participation improves student performance. Given that playing this game requires everyone to participate, to what extent do you believe that playing *PsychOUT*! made you feel that you were participating in class?	Did NOT feel like I was participating	Definitely DID feel like I was participating	90
10	If you have played games in any other classes, please indicate what game(s) and in what classes:			17
11	Please list those classes, if any, that you think it would be helpful to play *PsychOUT*!:			62
12	If you believe that playing *PsychOUT*! affected your study habits, please indicate how your study habits were affected:			38
13	What improvements do you think should be made to future versions of *PsychOUT*!			31
14	In what way(s) do you think *PsychOUT*! is an effective teaching or review tool?			69
15	Additional comments about *PsychOUT*! may be written below:			20