Using Fun in the Statistics Classroom: An Exploratory Study of College Instructors' Hesitations and Motivations

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Abstract

This study examines statistics instructors' use of fun as well as their motivations, hesitations, and awareness of resources. In 2011, a survey was administered to attendees at a national statistics education conference, and follow-up qualitative interviews were conducted with 16 of those ($N = 249$) surveyed to provide further context for interpreting the quantitative results. Motivations were similar for men and women, but female instructors admitted more hesitations in many areas. While many instructors are using or are open to using fun in the statistics classroom, the findings suggest that not having available resources at hand and not being aware of resources such as the CAUSEweb collection are major hesitations. Methods of alleviating hesitations are discussed.

1. Introduction

Many statistics instructors value enhancing the teaching and learning experience (Delucchi 2004; Junius & Sidel 2009; Kranzler 2003; Rowntree 2004; Tsao 2006; Wulff & Wulff 2004). While there are many ways to do it, incorporating fun is one logical choice. Meng (2009, p. 208; italics in the original) calls for a "tremendous collective effort to change the 'Statistics is *easy to teach*, but *hard (and boring) to learn*' perception to one of a 'Statistics is *hard to teach*, but *easy (and fun) to learn*' reality." Baloğlu (2004, p. 38) documents that most college students experience high statistics anxiety and that "many students regard statistics as the most difficult and least pleasant course." Other educators (e.g., DeCesare 2007; Forte 1995; Keeling 2011; Marson 2007; Paxton 2006) have identified such sentiments for students within particular majors such as sociology, psychology, and social work. To the extent that issues of anxiety and lack of motivation are at least as high in statistics, mathematics, and natural science departments as in other subjects, any innovation that could increase student engagement, improve attitudes, or reduce anxiety among the students would be particularly important. The past decade has witnessed the generation of various innovative pedagogies, including those that we call "fun," in teaching statistics.

Lesser and Pearl (2008) provide a comprehensive overview of using fun in the statistics classroom, and the paper includes a table listing 20 modalities (with references or points of departure for each), implementation tips and some emerging evidence on potential effectiveness of some modalities. The accumulation of evidence is most established for the modality of humor and experimental studies of the pedagogical impacts of humor have shown significant positive outcomes in student ratings of the lesson, student ratings of the instructor, student anxiety, student attitudes towards statistics, and student recall and retention of information (Berk & Nanda 1998, 2006; Garner 2006; Neumann, Hood & Neumann 2009). It is noted that the

research on humor in the context of statistics is relatively recent in the overall four decades' worth of research on humor in educational settings (e.g., Banas, Dunbar, Rodriguez & Liu 2011).

The use of fun is consistent with and can support the College Guidelines for Assessment and Instruction in Statistics Education (GAISE) recommendations (ASA 2010), which note that active learning activities "often engage students in learning and make the learning process fun" (p. 18) and "should be fun!" (p. 26). In the spirit of the concept cartoons of Keogh and Naylor (1998) or the film clips of Fredrickson and Branigan (2005), the open-ended, outside-of-the-box nature of fun has the potential to spark or facilitate more conceptual and higher-order statistical thinking and readily and memorably bring focus to the big ideas of a concept. While made in the context of biological science, Ganschow with Ganschow (1998) find playfulness important when developing and testing hypotheses, a topic with strong implications for statistics. On a similar note, Jarrett and Burnley (2010) note that "inquiry learning, in which students have opportunities to answer their own research questions, collect their own data, collaborate with peers, and draw meaning from the data can provide enough fun to interest them in science" (p. 118). Isen, Daubman, and Nowicki (1987) provide evidence for the value of humor in rating, sorting, and word association tasks. Wood, Beckman, and Rossiter (2011) describe how humor influences the depth-processing of information and may lead to simpler strategies for solving problems in a managerial context.

Fun activities (e.g., Lee 2009) often involve class-generated (real) data rather than contrived textbook examples to illustrate concepts and to encourage student engagement in active learning. The residual plot surrealism of Stefanski (2007) is an example of fun that uses technology to develop conceptual understanding and analyze data. Finally, a game or an efficient "game show concepts review" can assess learning and provide students with self-awareness of their understanding in a meaningful low-stress manner (Grauerholz 1991; Wood, Beckmann, & Rossiter 2009). Henry Jenkins, Director of the Comparative Media Studies Program at Massachusetts Institute of Technology, notes that in addition to developing skills, play can also uniquely motivate students to develop basic competencies and interest in more specialized domains of knowledge by encouraging personal and social investments (Jenkins 2005).

1.1 Towards Conceptualizing Fun

Despite various attempts to define it or even create a scale for it (e.g., Slaughter 1984), "fun" does not have a single, universally-accepted definition. As McManus and Furnham (2010) note: "Conceptualising fun is not straightforward, in part because of the number of synonyms for fun such as amusement, enjoyment and entertainment….Fun is therefore a complex word with multiple meanings referring to affective and motivational properties….fun can be an activity, a state, or a trait" (p. 160). Jarrett and Burnley (2010) add that fun has both activity and emotion components and that research on fun has often focused on whether activities designed to be fun by educators are actually viewed as fun by the participants. Middleton, Littlefield, and Lehrer (1992) model academic fun as an activity for which arousal and feelings of control are sufficient for the activity being perceived as meaningful and as fun. This characterization also aligns with the experience of intrinsic motivation, wherein participants are energized by the activity itself and potentially deterred by the introduction of artificial contingent rewards (Pink, 2009). Fun also overlaps partially with the notions of play (e.g., Maier 1980), engagement (e.g., Fredricks,

Blumenfeld & Paris 2004), and (in a more indirect way) liberating structures (e.g., Kimball 2012). The scope of the current paper does not allow or require teasing out of all of these distinctions and interrelationships in an explicit, definitive manner.

Because the word "fun" is similar to "funny" (i.e., humorous) at face value, it is important to note that there are many instances in the research literature that suggest humor is generally viewed not as a synonym for fun, but rather as a type of fun. First, there is the use of phrases in the literature (e.g., Rieger 2004) such as "humor and other types of fun" or typologies of fun developed from models in the computer gaming industry (e.g., Winter 2011) that include humor as one type of fun. Second, there is recognition that activities that are funny (as in "laugh-inducing," not "strange") are generally viewed as fun, but the converse does not follow: there are activities (such as team sports or board games) that are generally fun, but not humorous. Third, in the specific context of games, Lazarro (2004) offers a typology of four types of fun, and one of those types includes the emotion of amusement: hard fun (e.g., involving challenge or mastery), easy fun (e.g., novelty, surprise), serious fun (e.g., excitement, relaxation), and people fun (e.g., amusement). Fourth, Jarrett and Burnley (2010) note that the related concept of playfulness has been described by a "classical study" (Lieberman 1977, p. 107) as "divided into sense of humor, manifest joy, and spontaneity." As an aside, we note that seeing humor as a type of fun makes the difficulties of defining fun all the more unsurprising in light of how "humor is not a homogeneous concept" (e.g., Banas, et al. 2011, p. 117).

1.2 Modalities of Fun

The table in Lesser and Pearl (2008) listed these 20 modalities along with representative references or examples:

> cartoons, celebration days, comic strips, food, games (commercial), games (cultural), game shows, humor/jokes, kinesthetic activities, literature, magic, media bloopers, movies, music/raps/songs, poems, quotations, statistics fun books, striking examples, videos, and wordplay.

Additional statistics examples have since appeared in several of the aforementioned modalities of fun, including: magic (Lesser & Glickman 2009; Posner 2009), cultural games (Lesser 2010), songs (e.g., Lesser 2011a, 2011b, 2011c), celebration days (the UN Statistics Division launched the first quinquennial World Statistics Day on October 20, 2010), and videos (many fun examples in 2011 came from the first YouTube video contest of the American Statistical Association (ASA): http://www.amstat.org/youtube).

Other examples that have recently appeared might arguably be viewed as variations on existing modalities. Kuiper (2010), for instance, discusses how games that are not necessarily commercial or cultural can be used to teach statistical topics such as design of experiments (see http://www.cs.grinnell.edu/~kuipers/statsgames/, which won the Multimedia Educational Resource for Learning and Online Teaching (MERLOT) Classic Award in 2012). As another example, the statistics "mad-libs" in Trumpower (2010) could be viewed as a variation on the wordplay modality.

Some recently identified examples of fun may be sufficiently different to justify expanding the Lesser and Pearl (2008) table to include additional modalities. For example, Media Bloopers (e.g., Lesser 2009) do not include what Wall and Banerjee (2009) call "Strange News" – news items that do not necessarily have errors but that draw attention from their very unusual context. Related is the (edgier) collection of lively examples compiled by Andy Field from academic journals if not also from newspapers (e.g., Field 2009, p. 277). There are also fictitious journal articles in scientific humor magazines (e.g., *Journal of Irreproducible Results, Annals of Improbable Research*) or even occasionally in otherwise serious academic journals (e.g., Lesser 2012). Another example is the use of posters, stickers or clothing (buttons, t-shirts, etc.) that display fun or intriguing statistics messages. Examples of phrases on shirts that have been sold by the American Statistical Association include "I'm statistically significant!," "Friends don't let friends extrapolate," and "Statistics means never having to say you're certain."

1.3 Resources

There are collections of fun items in many disciplines, but most collections include only one modality or lack user-friendly features such as searchability. For example, the Gary Ramseyer site (now maintained by his daughter) has a substantial collection (http://my.ilstu.edu/~gcramsey/Gallery.html) of statistics jokes, but it is not truly searchable and only recently added a minimal level of indexing by statistical topic. Crowther (2012a) has a song collection that is searchable, but the focus is on science and very few entries have statistics content. The only major searchable collection in statistics education of fun items spanning several modalities is housed within the digital library of the Consortium for the Advancement of Undergraduate Statistics Education (CAUSE).

The CAUSEweb digital library for college-level statistics instructors is part of the National Science Foundation's (NSF) National Science Digital Library system and is also affiliated with MERLOT and Math DL. CAUSEweb.org is used by approximately 13000 unique visitors per month and contains approximately 2100 items indexed in the resources collection, 3200 annotated items in the statistics education research literature collection, and hundreds of items providing services or miscellaneous enhancements to community members (e.g., Wiki-based projects building capabilities for statistics education activists; archived issues of the now out-of-print ASA periodical *Stats: The Magazine for Students of Statistics* and archival audio/video from CAUSE conferences, workshops, and presentations).

The CAUSE fun items collection (Lesser 2006) is one of CAUSEweb's most-visited resources. Launched in 2004, the collection (http://www.causeweb.org/resources/fun/) contained over 400 items as of December 2012, including:

- 130 cartoons (including three animations)
- 167 annotated quotations
- 24 jokes
- 20 poems
- 69 songs (including 26 with MP3 recordings)
- 7 μ-Tube videos
- 3 wordplay items

- a gallery of 23 statistics-related works of art.

CAUSE is in the process of adding new categories (e.g., games, magic) as well as new items in existing categories, and an increasingly popular bi-annual "A-mu-sing" contest (awarding prizes in every odd-numbered year since 2007) has been generating excitement and new items by offering cash prizes to the best submitted jokes, cartoons, songs, poems, and videos.

1.4 Research Group

The authors of this paper are members of the Study of Fun Cluster, a CAUSE-sponsored interest group formed in 2009 that has worked on (1) a conceptualization of fun, (2) a taxonomy of fun, (3) further review and synthesis of fun-related literature, and (4) criteria for quality and usefulness of fun items in statistics courses. The current team of 11 researchers spans diverse types of institutions (e.g., community college, liberal arts college, research university), academic departments (e.g., business, sociology, psychology, mathematics, statistics), and student populations/demographics (e.g., some are private, some are minority-serving institutions).

2. Methods

2.1 Research Goals

The main research goal of this paper is to understand better the current usage of fun in statistics education, including reasons why some instructors use or do not use modalities of fun in their courses. More specifically, we examine whether gender, typical class size, institution type, and years of experience are related to motivations and/or hesitations for using fun in statistics teaching. Also, this study seeks to assess awareness of resources (see Section 1.3) for finding statistics fun items. To our knowledge, there is no previous study on this topic.

2.2 Questionnaire

The Cluster designed the survey for this study based on putative motivations and hesitations described in the literature on fun. The survey can be found in Appendix A. After an initial section asking for some background information (teaching experience/environment, gender, type of institution), the survey asks respondents to indicate experience and openness with respect to commonly used modalities. The next items ask about motivations and hesitations that affected respondents' use or potential use of fun in statistics teaching. The final question assesses familiarity/use of the fun resources collection at www.causeweb.org/resources/fun. The survey was administered May 19-20, 2011 during the fourth United States Conference on Teaching Statistics (USCOTS) (http://www.causeweb.org/uscots/), a biennial conference dedicated to the sharing of ideas, methods, resources, and research results related to undergraduate level statistics education (including AP Statistics). The three-day conference includes plenary sessions by international leaders on current trends, hands-on breakout sessions, and "Posters and Beyond" sessions for more individual interaction. All sessions are either invited or peer-reviewed.

For this study, we decided to survey the self-selected attendees of this conference for several reasons. We expected that instructors attending a teaching-oriented conference might have

considerable experience with a variety of pedagogical approaches (including fun) and would be more likely than others to be familiar with CAUSE resources. We felt that this particular (non-random) sample of educators would arguably be more likely to include critical masses of people who have and people who have not tried the various modalities in question. Additionally, we felt that CAUSE attendees are arguably more open than most instructors to improving or changing their pedagogy, and thus would potentially receive and give greater impact with respect to the fun resources and modalities that are being studied.

2.2.1 Modalities

Recognizing that a paper-and-pencil survey covering all 20 categories in Lesser and Pearl (2008) would discourage participation, the research team chose to focus on what were arguably the modalities most commonly used in the undergraduate classroom: Poems/Songs, Cartoons, Games, and Jokes/Humor. The consensus selection of this subset was supported by the relative prevalence of these modalities in the education literature as well as their prevalence in the field's major collection (CAUSEweb) of fun items. Another justification is that these modalities are among those that have the largest number of examples that can be readily found from a general search.

2.2.2 Motivations

An emerging body of research suggests that certain types of fun items can be effective in improving statistics student attitudes and reducing student anxiety while increasing student interest, recall of material, and conceptual understanding (Berk 2009b; Berk & Nanda 1998, 2006; Field 2010; Friedman, et al. 2002; Garner 2006; Lomax & Moosavi 2002; Neumann, et al. 2009). Other motivations from the literature reviewed by Lesser and Pearl (2008) include: building classroom community, reducing anxiety, humanizing the subject/instructor/course, fostering openness in the classroom, increasing students' attention and participation for the entire class period, providing a means of illustrating difficult concepts, and giving students a highly memorable way to recall specific content that will last well beyond the final exam (Friedman, et al. 2002; Schacht & Stewart 1990). Also, as mentioned in Section 1, the use of fun is consistent with the GAISE guidelines.

It is clear that the number of potential motivations that could be listed is quite large. Berk (2009b) lists no fewer than 20 learning outcomes that just one particular fun modality (video clips) can yield. For the survey, the Cluster selected four student-centered motivations (student learning/retention, anxiety reduction, engagement, and classroom community), which arguably can be mapped to most of the items on the Berk (2009b) list. For balance or completeness, the team also added two teacher-centered motivations related to instructor's popularity/ratings and instructor's enjoyment of teaching statistics. That said, we note that a positive framing of "popularity" (a teacher-centered motivation included in the survey) could be "making connections with students" without the ulterior motive of higher ratings (Bryant, Comisky, Crane, & Zillmann 1980). Jarrett and Burnley (2010) discuss a study in which "university students identified the attribute *made lessons fun/interesting* as one of the most important qualities of an excellent science teacher" (p. 112).

2.2.3 Hesitations

The options of possible hesitations were derived from the literature, though the connection was not always as direct as it was with motivations. While Lesser and Pearl (2008) do not explicitly catalogue what hesitations instructors have, they allude to some of them such as not having enough time (page 2 mentions a *p*-value jingle that takes only 10 seconds), perceived or real talent ("not everyone can readily improvise jokes or perform music, but anyone is capable of displaying a slide of a cartoon or hitting the PLAY button to play a recorded song", p. 6), or compatibility with students' cultures ("humor is best at the expense of one's self, not of one's students. Also, it works better to parody songs that are not coarse, sacred, or obscure." p. 5). Other literature (e.g., Lesser 2003; Ziv 1988) invokes the pitfall of instructors attempting humor if their natural style is sarcastic or aggressive, rather than gentle and self-directed. And reactions such as Morris and Styer (1989) remind us that, even among peers, the use of stereotypes in humor can be problematic and should generally be avoided.

Because the role of culture has been recognized in statistics education (e.g., Abdelbasit 2010), the option "incompatibility with students' cultures" was included in the survey. The "weak evidence of helping student learning" option was included to reflect the small number of rigorous statistics-related studies of effectiveness outside the modality of humor (Lesser & Pearl 2008). The two "need to be perceived as serious" options in this category of the survey are relevant in light of how fun is often viewed unduly as only an attention-grabbing opening hook, a supplemental/extra-time activity or an unrelated enrichment/reward, as if fun were an artificial diversion outside of the regular experience of the "real" content-based subject (Appelbaum & Clark 2001; Moyer 2001). Such a dichotomy sends a problematic message that the content area cannot be inherently fun, but rather is a "bitter medicine that needs the sugar-coating of entertainment to become palatable" (Resnick 1987, p. 1) and possibly reflects "a traditional practice of disjoining content and pedagogical knowledge in the practice of education" (Appelbaum & Clark 2001, p. 586). The term "hard fun" is used to describe how students often complain about hard homework, but these same students enjoy playing games that are challenging (Clifford & Friesen 1997-1998; Papert 1998). The idea of "hard fun" illustrates that "fun" and "hard work" are not necessarily opposites.

2.2.4 Completion Inducements

Informed by the research literature on questionnaire design and implementation, the researchers chose several strategies to maximize the likelihood that the survey would be completed, including:

1) arranging for the survey to be placed in the registration packet USCOTS attendees received upon their arrival at the conference, so that there was no chance they would not receive it in a timely manner
2) having the survey printed on light blue paper to help it stand out from the majority of materials in the packet. There is actually some indication that a lightly-shaded background color is helpful (Dillman 2000), and the use of green paper was found in a meta-analysis to have a statistically significant ($p < .05$) positive effect, relative to white paper, on response rate (Fox, Crask & Kim 1988).

3) using only one side of 8.5" x 11" paper (Dillman 2000)
4) printing the survey in vertical (portrait) orientation (Bradburn, Sudman & Wansink 2004)
5) using concise, simple wording, having questions in "closed form" (except for using an "other" option on a few items), and limiting the number of questions so that little time is needed (about 1-2 minutes) for completion (CDC 2010a)
6) having items organized in logical groupings, each with its own heading (Patten 1998)
7) piquing interest with the promise that preliminary survey results would be displayed at an USCOTS poster session less than 24 hours after the survey collection window; this also reminds respondents that their participation would be contributing to research in the field
8) allowing respondents to remain anonymous by not writing their name on the survey and putting it into a drop box themselves; also, the survey asked only sparingly about demographics/background (Patten 1998)
9) giving each respondent a free fun-themed notepad/pen combo as a token of appreciation upon turning in the survey, so that everyone who participates is rewarded; having that material incentive be low in value, however, avoids the pitfall of coercion (CDC 2010b)
10) allowing each participant to turn in a separate ticket to enter a drawing for a Nook Color e-Reader

2.3 Post-USCOTS 2011 Interviews

Most aspects of fun usage could be readily quantified, but to interpret the data more fully, it was clear that qualitative interview data would be needed, especially given the possibility that "fun" does not have a single, universally-shared definition, as noted in Section 1.1. Respondents interested in being contacted for an interview had the option of providing an email address on a form distributed at USCOTS 2011, and approximately 30 percent of the questionnaire respondents did so. These 73 respondents expressing initial interest were then emailed to confirm willingness and availability for interviews and all 16 respondents who were able to schedule an interview in the available time frame were interviewed by one of four of the authors of this paper.

To obtain more detailed information behind the responses to the survey questions, follow-up probe questions were prepared using a "Who, What, Where, When, Why, How" format (see Appendix B). The interview questions were designed to elicit descriptions of the students, the classroom culture, fun modalities in use in the class, and the settings of their use. Inquiries into why instructors chose to include some modalities and not include others were incorporated. The follow-up questions were then condensed into an interview guide. Semi-structured interviews (Flick 1998) were conducted by telephone between August and October 2011. They each lasted 20-30 minutes and the interviewer used the interview guide to obtain rich descriptive data on hesitations and motivations for the use of fun. The interviews were recorded and the interviewer took notes during the interview that included no information that could identify an interviewee. Informal cross-case analysis (Miles & Huberman 1994) was conducted to look for patterns by item across interviewees.

3. Setting, Sample and Population

3.1 USCOTS 2011 Questionnaire

The fourth USCOTS was held in the Raleigh-Durham-Cary Research Triangle area of North Carolina in May 2011. In the USCOTS 2011 survey, the $N = 249$ respondents had the following gender and institutional backgrounds:

Table 1. Gender and Institution of Survey Respondents

Institution Type	Female	Male	Gender Not Specified	Total Survey Respondents	Overall USCOTS Attendees
High School	5	5	2	12	11
2-Year	15	12	1	28	37
4-Year	70	53	7	130	177
Research Institution	37	30	3	70	123
Other	2	4	0	6	32
No Response	0	2	1	3	N/A
TOTAL	129	106	14	249	380

Table 1 indicates all institution types were well represented among respondents. The apparent discrepancy with respect to high school teachers was possibly due to miscoding (on either the questionnaire or conference registration) or perhaps due to at least one instructor teaching in a boundary-blurring situation such as an "early college high school" on a community college campus or someone changing status between signing up for USCOTS and completing the survey at the conference.

The response rate was 66 percent (249 of 380), which seems very respectable given that (1) attendees needed to obtain, complete, and turn in the survey within 24 hours after the USCOTS registration desk opened, and (2) a comparative analysis of response rates in 175 academic studies (Baruch 1999) yielded a mean response rate of 55.6%. As noted in Section 2.2, this self-selected USCOTS sample is likely to be biased towards openness to the use of fun in the classroom.

3.2 Post-USCOTS 2011 Interviews

Table 2 describes the 16 interviewees. For 11 interviewees, the most typical statistics student in their courses is a female having little interest in the subject of statistics. The age of their students varied from high school to adult learners, with the modal interval being 18-22. A majority of the students were undergraduates with a great variety of majors.

Table 2. Description of Interviewees' Classes

Description	Frequency
Institution	
Research University	7
Four-Year College	6
Two-Year College	2
High School	1
Gender	
Male	4
Female	12
Required Course?	
Yes	14
No	2
Class Size	
Large >75	2
Medium 40-75	4
Small <40	10
Format	
Face-to-Face	12
Hybrid	1
Online	3
Student Ability	
High	4
Varied	10
Low	2

4. Results

The results include both the quantitative and qualitative reviews. We present the results as sections on modalities used, motivations, and hesitations. These results are purely descriptive and, as the sample is non-random, we draw no inferences beyond it.

4.1 Modalities of Fun Used

4.1.1 USCOTS Questionnaire

Figure 1 shows the percentage of instructor-respondents who use each modality in the classroom as well as the total percentage of instructors who either use or are open to using that modality. The figure shows that the most frequent type of fun modality used in the classroom is Jokes/Humor (74%), followed by Cartoons (60%) and Games (49%). The "open to using" section of each bar shows the potential for increasing the use of these modalities. Many instructors surveyed are not open to using poems and songs and indicated that this is due to having "no skills"—not wanting to sing or read poems in class or some other factors. In fact, no one in the survey used only Poems/Songs in their teaching. All 39 respondents who used Poems/Songs in their classroom also utilized other modalities, especially Jokes/Humor and

Cartoons. Responses given in the category of "Other" include videos, magic, art, candy, hands-on activities, juggling, and fun clothing.

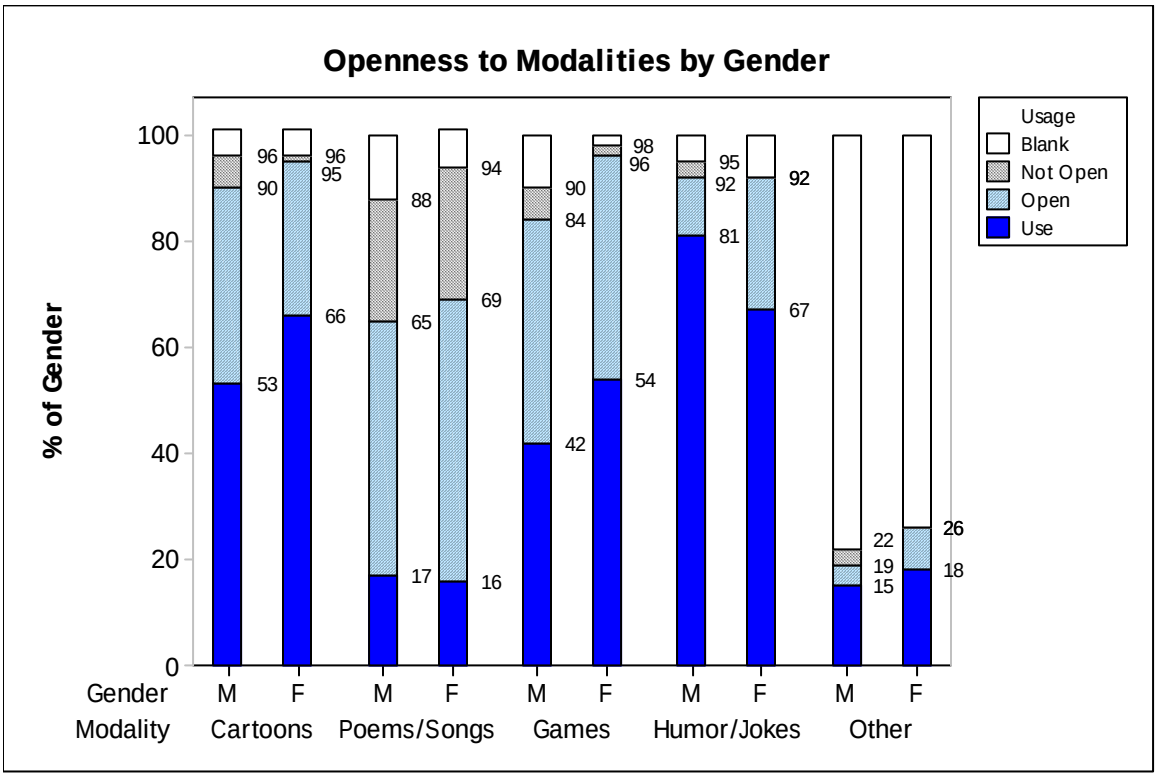

Figure 1. Instructor Openness to Different Modalities of Fun

Eleven respondents indicated that they were both open and not open to using the "Poems/Songs" category. Some written comments tended to suggest that these people may have been open to using poetry, but not songs, or that they were willing to play a recorded song but not sing. In Figure 1, we have counted those respondents as open to using the modality.

From the survey, it was also discovered that there is very little variation among different types of institutions (Two-year, Four-year, Research, and Other; plots not shown here). In addition, females in our sample more frequently use Cartoons (66% vs. 53%) and Games (54% vs. 42%) while males tend to use Jokes/Humor (81% vs. 67%) more frequently.

4.1.2 Post-USCOTS Interview

Interviews highlighted the extent and the ways in which fun could be conceptualized differently by the various instructors. The type of school, the prevalent educational culture of the school, the teacher's perception of the students, the classroom size, and the personality of the instructor are many factors that colored what counted as fun. Different definitions were also apparent within some modalities. For instance, some instructors viewed kinesthetic data collection (i.e., standing up by height, coin tossing) as a game. Some also considered playing video or movie clips in class an example of a fun modality. Despite the lack of consensus on what constituted fun, all instructors suggested that fun has to be added into the course rather than something that emanates naturally from the subject. This incorporation of fun revolved around the use of such

modalities as cartoons, jokes/humor, games, poems, songs, and videos (the only modality named that was not on the survey). Interview data suggests that respondents are reasonably open to using songs, as half of them indicated so (of those, three also reported being open to using poems). Three also stated that they are open to songs if songs are pre-recorded (many but not all of the songs in the CAUSEweb collection have accompanying soundfiles), short, and/or someone else sings.

Some interviewees suggested that students older than 25 years (i.e., non-traditional aged students) may be less open to any modalities. Instructors felt that class size and type of class influence the type of modalities used, while racial/ethnic and gender composition make no difference in whether students are open to modalities.

4.2 Motivations for Using Fun

4.2.1 USCOTS Survey

Figure 2 shows the motivations of instructors by gender. Most surveyed reflected the view that there are multiple motivations for incorporating fun into the classroom; in particular, the strongest motivations seem to lie in the belief that fun is effective in engaging students and helping them to retain important ideas.

Within each institution type, the percentages of each motivation choice were essentially identical (plot not shown here). Nine people listed "other" motivations, but these were often used to amplify what they already stated. All respondents selected more than one of the provided categories in motivation. It is worthwhile to note that inclination to adopt fun activities to boost popularity of ratings was similar by experience (23% of instructors with five or fewer years of experience versus 23% with over five years of experience).

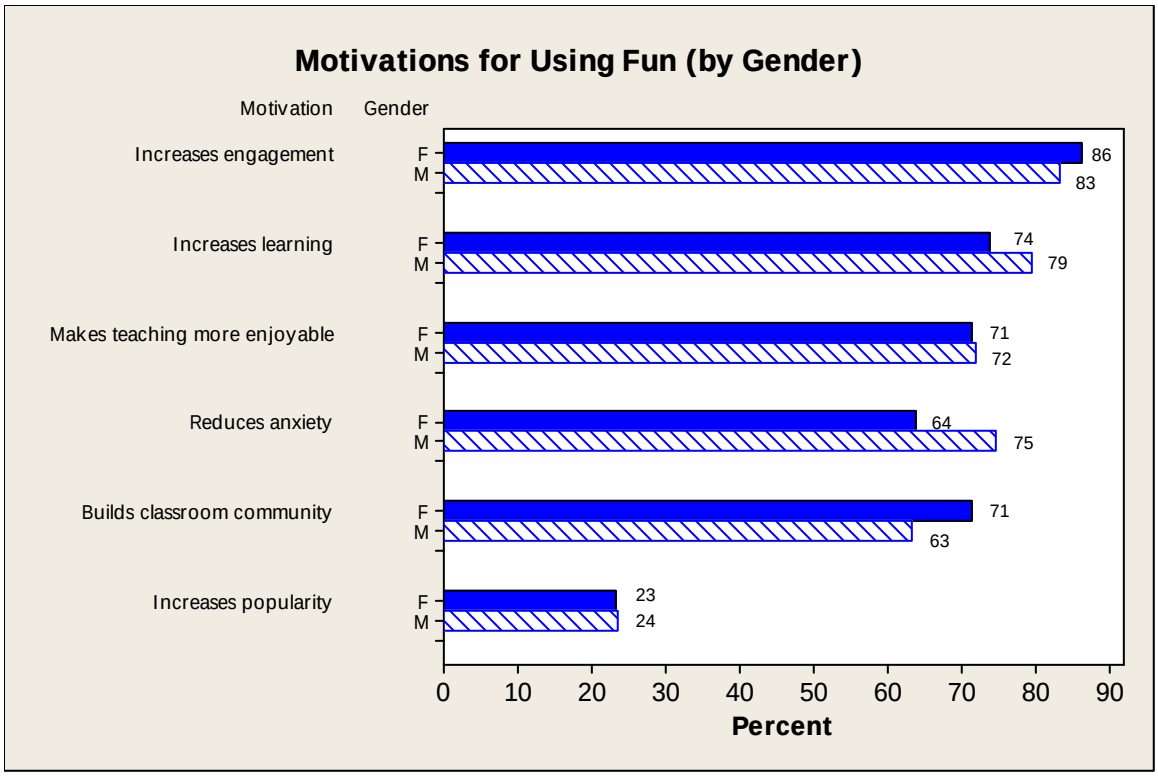

Figure 2: Motivations for Using Fun by Gender

4.2.2 Post-USCOTS Interview

Interview data also demonstrated a range of different motivations for using fun activities in the classroom. Regardless of whether the fun activity was directly relevant to the content of the lesson, the reasons mentioned most often for using fun activities included the impact on classroom atmosphere and on student motivation. Instructors reported that fun activities were useful for helping students relax and engage more easily with the material because of a more positive attitude toward it. Indeed, they use fun activities because these help "fearful students relax and believe they can do it" and because "humor breaks down barriers and fun promotes learning." In terms of gender, only two of the four interviewed males mentioned student-centered motivation, whereas eleven out of twelve females did. In contrast, of the five interviewees who mentioned using fun elements for their own motivation, three were males. Cartoons and jokes were specific modalities used with affective goals in mind.

The laughter elicited from a cartoon displayed at the beginning of a section, during break, and/or throughout PowerPoint slides was reported by instructors to be an effective way to temporarily reduce anxiety. Instructors admitted that jokes — as with cartoons — were not discussed after being told or displayed. Over half of the interviewees also used cartoons because they are visual as well as low-risk: involving little effort, harm, and/or energy to use.

Interviewees reported using these modalities as attention-getters at the beginning of class, but also as a mechanism to allow students to refocus in the middle of class. As one interviewee noted, "Stats can be dry. Fun breaks up a dull class." Of course, this strategy is warranted given what we know about the limits of attention, with adults being able to sustain their attention for an

average of 15-20 minutes (Johnstone & Percival 1976) and current students even less (Berk 2009a), with attention span varying among individuals (Wilson & Korn 2007). The benefit of the fun break extends beyond the student. Indeed, some instructors mentioned that fun modalities were motivating for them as well.

Overall, thirteen out of sixteen interviewees mentioned affective reasons for using fun in the classroom. While this suggests that the affective impact plays a big role in choosing to use fun activities, positive cognitive impact was also mentioned and witnessed. For example, one interviewee reported that viewing mock newscasts helped students identify their own misconceptions. Student-generated data, applets, and games were felt to increase subject knowledge. For instance, when students write their own statistics-related poetry and songs, they are able to synthesize and apply the information. The use of other modalities of fun, like video clips or sitcoms, was cited as having a high return on effort. One instructor stated that students seemed to understand the statistical ideas after watching them.

Using fun activities also allows instructors to bring a more diverse pedagogical repertoire to their classroom, which instructors see as a motivation for the use of elements of fun. Indeed, interviewees reported that they are addressing the learning styles and needs of a wider range of students by presenting material in several ways, as many respond differently to various learning approaches.

Presenting material in varied ways also has the benefit of letting the student process the material more deeply, which is known to have a positive effect on understanding and retention (Craik & Lockhart 1972). Instructors also report that fun activities promote an emotional connection between the student and the material, as well as with the instructor. In fact, this perceived closeness between the instructor and the student (i.e., immediacy) has been shown to correlate positively with student affect and affective learning (Gorham 1988), student cognitive learning (Chesebro & McCroskey 2001; Christophel 1990; Kelley & Gorham 1988; Titsworth 2001), and to improve learning in statistics classes (Williams 2010).

4.3 Hesitations about Using Fun

4.3.1 USCOTS Survey

Figure 3 shows the hesitations of teachers by gender. The three most frequently mentioned reasons for not using fun activities in the classroom were not being able to quickly find fun course material (47%), lack of skills (30%), and being hesitant to use up valuable class time for fun (29%). (The apparent inconsistency between these percentages and Figure 3 is due to the fact that the figure excludes respondents who did not report gender.) Five percent, or 12 of 249 respondents, selected an "other" hesitation, and then either elaborated on their reasons or mentioned personal responses like shyness, appropriateness, or quality of humor. While females and males have concerns about being able to quickly find good examples, females tend to be more concerned about lacking the skills needed to use fun and males tend to be more concerned about using up class time. Compared to 5 percent of the females, 19 percent of the males reported concerns about whether there is evidence that fun is effective within the classroom.

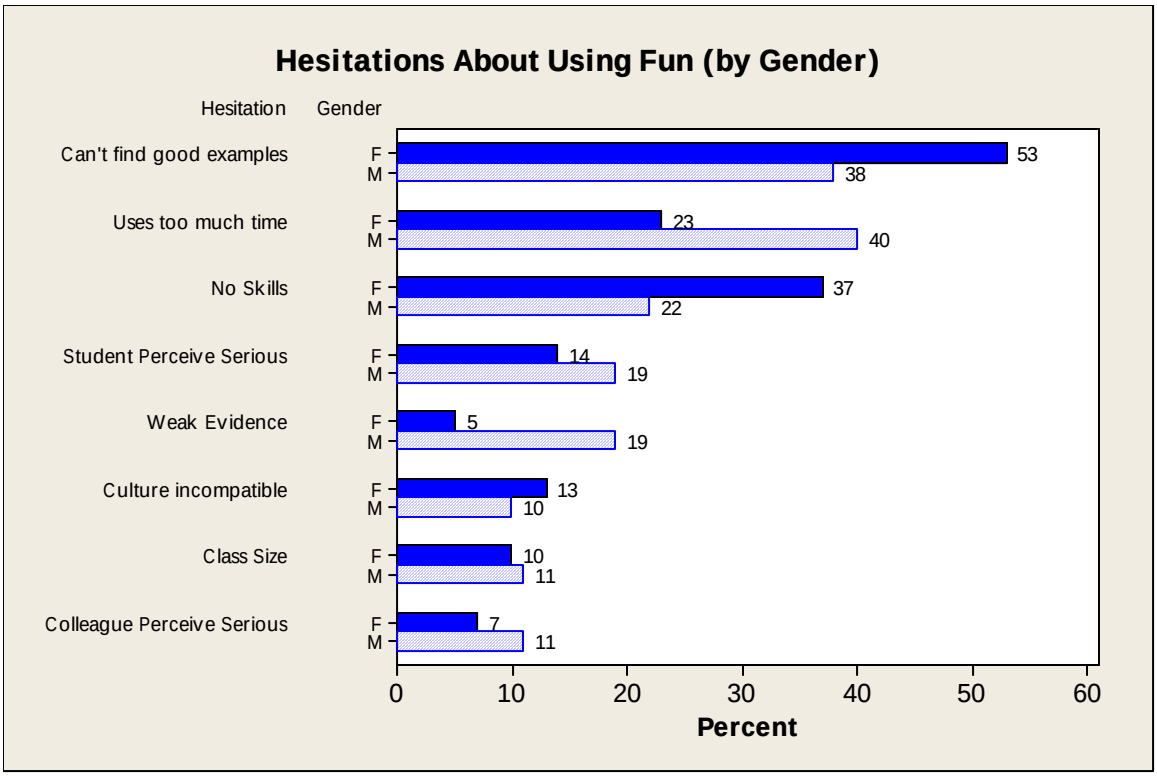

Figure 3. Hesitations for Using Fun by Gender

There is some variation in reasons for not using fun in teaching statistics among different types of institutions (plot not included). For instance, faculty at high schools and four-year institutions were more concerned with evidence of effectiveness than other institutions (17% at both high school and four-year colleges versus 3% at other institutions). Faculty at two year and high school institutions were more likely to feel they lacked the skills to use fun (48%) than those at other institutions (27%). Also, faculty at research institutions were more frequently concerned with incompatibility with students' cultures than faculty at other types of institutions (19% vs. 9%). While no faculty at high school or two-year institutions reported that class size is a barrier to using fun, 12% of faculty at four-year and research institutions indicated that class size prevents their faculty from using fun in their statistics teaching. Finally, faculty at research institutions were less likely to have difficulty finding good materials than faculty at other institutions (30% versus 51%).

When looking at hesitations by years of service, more experienced faculty tended to be more concerned about whether there is evidence that fun is effective. Faculty with less experience were more concerned with class size than more experienced faculty. Years of experience did not seem to be correlated with any of the motivations for using fun activities. The only relationship between each of the modalities and experience showed that more experienced faculty were more likely to use cartoons.

Since our respondents most commonly cited the difficulty in quickly locating good examples of fun materials as a hesitation, we looked at that response against their usage of the CAUSEweb Fun Collection (www.causeweb.org/resources/fun). This special site provides easy access to quotes, jokes, poems, songs (many accompanied by soundfiles), games, and cartoons. Notably,

permission is already granted for using any of these materials for noncommerical classroom use. Interestingly, respondents who were unaware of the collection or have never browsed the collection tended to report having trouble finding good examples. In the survey, 124 people (49.8%) either did not know of or had never looked at the CAUSEweb collection, a striking result given that these instructors were attending a conference hosted by CAUSE. Fifty-seven percent of that group reported having trouble finding good examples quickly. In contrast, only 44 percent of all respondents aware of the collection reported trouble finding good examples quickly. We are encouraged by this result, because the CAUSE fun resources collection can directly address this hesitation and can help teachers use different types of fun modalities in their statistics teaching. Examination of the current usage of CAUSEweb resources by institution type reveals that most respondents, especially those at four-year institutions, did not know about the fun resources collection at CAUSEweb.

4.3.2 Post-USCOTS Interview

The top three hesitations in Figure 3 (i.e., can't find good examples, no skills, and uses too much time) were also the hesitations most commonly cited in the interviews. Instructors who report not finding good examples mentioned that they are not aware of CAUSEweb, are not aware of appropriate examples, and do not have time to search. In fact, interview data distinguished between taking the time to search ($n = 5$) and taking the time to use ($n = 4$), a distinction that was not distinguishable from the survey. Another addition to the list of hesitations came from six respondents who mentioned wanting to avoid causing discomfort to students because of presumed culture incompatibility. Interviews also revealed that teachers recognize fun as running on a continuum from low-risk (e.g., prepared jokes, humor, and cartoons; pre-recorded song/video clips) to high-risk (e.g., singing a song, improvising humor, or playing a game). Low-risk fun is perceived to take less effort and/or investment of preparation time and class time; whereas, high-risk fun is perceived to take more effort and/or investment of preparation time and class time. Interview data suggest that statistics instructors are more likely to use low-risk fun in their classrooms. Jokes and off-handed remarks were the preferred modalities followed closely by projecting a cartoon or placing the cartoon in the syllabus.

This is not unlike the continuum articulated by Berk (2003, 2005-2006) and with the observation of Lesser and Pearl (2008) that "not everyone can readily improvise jokes or perform music, but anyone is capable of displaying a slide of a cartoon or hitting the PLAY button to play a recorded song and then facilitating a discussion from prepared accompanying 'conversation starter' questions" (p. 2). Crowther (2012b) articulates a similar continuum within the modality of song: "From least to most radical, these [options] include posting song links for students to explore on their own time, preceding class with a pre-recorded song, performing and discussing a song during class, and assigning students the task of writing and performing songs" (p. 28). Table 3 illustrates perceptions of risks and benefits by modality.

Table 3. Interviewee Perceptions of Risk and Benefits by Modality

Risk Level	Affective Benefits	Cognitive Benefits	Affective and Cognitive Benefits
Low	Prepared Jokes, Humor, Cartoons	Poems	Pre-recorded Song
High	Improvised Humor	Generated Data; Applets; Games	Live Performance of Song

In the interviews, most instructors demonstrated an interest in using some elements of fun in their classroom, but not just any kind of fun. Some modalities, such as the perceived high-risk activity of performing a song live, were discarded without further consideration. For instance, six of the 16 interviewees would never consider using songs in their classroom. Apart from specific modalities, hesitations revolved around three main themes: the instructor comfort level, the logistics of the activity, and the possible negative impact on students.

Instructor comfort

The first obstacle that instructors mentioned was how some fun modalities simply do not fit their personality. This obstacle can manifest itself in one of three ways. First, the modality must be of interest to the instructor. Without interest, the motivation to use that modality is gone. Second, some express a fear of looking silly, which can be accompanied by some performance anxiety. This performance anxiety is often related to a perception that they lack talent to handle certain modalities, with singing and reciting poems topping the list. The third reason is not specific to modality, but rather to the perceived/actual security in the instructor's position. As one interviewee mentioned, he (as an endowed chair) feels "more free to be more undignified than a new PhD." By extension, some younger instructors may avoid deviating from the typical lecture format, either due to a lack of teaching experience or due to the concern that it may negatively impact their prospects for advancement.

Logistics

Even if a modality passes the test of instructor personality, this does not guarantee that it will be used in the classroom, as the logistics required for using a modality could be viewed as a deterrent. This hesitation seems particularly addressable as instructors mention that they would be willing to use an increasing number of activities if they were easy to access and ready-to-use. However, as mentioned earlier, this time concern also extends to the classroom. There is a concern that activities, games in particular, will take too long to implement. Before they consider using fun activities, some instructors mention that they want to make sure that all the required material has been covered. On the other hand, if they are open to using fun activities, instructors want to make sure that the modalities they use will help them reach certain goals. In addition to grabbing students' attention, if used, fun activities should be designed to intellectually engage students and generate class discussion. As one interviewee put it, "Fun elements must be relevant and memorable, not just fun." Some instructors also hesitate to use certain activities based on the size of the classroom. Nonetheless, opinions are varied. Whereas some mention that "the smaller the group, the better the impact of the fun elements," others mention that certain fun elements work well with large lecture classes, such as when a large

group went out to a grassy area and physically simulated a random walk. However, there is greater agreement that online courses are not as conducive to the use of fun activities as are regular classes. One concern is that online courses do not allow getting a good sense of students' reactions to the fun elements.

Impact on Students

Even if a fun activity can be demonstrated to be useful, instructors still worry about students' reactions. One type of concern resonates with the instructors' own fear: that the students may not be comfortable with certain in-class activities, especially singing. Another type of concern involves the perceived desire for engagement. For instance, one interviewee mentioned: "I rarely feel students want to be engaged. It is difficult to get students to enjoy the class when they come with negative attitudes." Yet another student-centered hesitation concerns student personalities. Some instructors find that each section of a course has a different group character, and responds to humor very differently. While some students are business-like and prefer a task-oriented approach, others are happy to interact more and appreciate the humor. One last type of concern regards understanding. Some instructors occasionally doubt the ability of their students to understand the subtleties of various elements of fun (e.g., one interviewee said "I don't know if I give my students enough credit that they would understand poems.").

5. Discussion

5.1 Summary

This study focused on the hesitations and motivations of using fun in the statistics class. Both males and females assert that there are multiple motivations for incorporating fun. The fact that gender differences were found in the hesitations for using fun in the class parallels the literature. Females more often reported lacking the skill to use fun activities, while males were more concerned about the time needed.

The perceived amount of work necessary to use and to find a fun activity is a realistic barrier. With good reason, instructors are concerned with preparation as well as loss of class time. In section 5.3, ways to alleviate this particular hesitation, or barrier, are provided.

5.2 Limitations

Because the sample consists only of individuals who were present at USCOTS, generalizations cannot be made to statistics educators as a whole. Further, the interviewees were a self-selected group. This resulted in the underrepresentation of male educators and two-year college educators among the interviewees. Thus, meaningful comparisons could not be made by gender or by institution type. As noted in Section 1, the lack of a unique, fully-differentiated taxonomy of fun modalities makes it difficult to compare responses and results across people or studies. For example, Torok, McMorris, and Lin (2004) include Cartoon, Joke, Pun, Riddle as separate items on a list of "types of humor," while our study lists Jokes/Humor and Cartoons as separate modalities and would count puns and riddles in the Jokes/Humor modality.

While having a combined "Poems/Songs" category increased the parsimony of the survey, it is potentially problematic to the extent that it introduces the confounding variable of performance difficulty: far more faculty feel comfortable reading a poem than singing a song. That said, there is still a low-risk/high-risk continuum within the song and other modalities (Crowther 2012a), so that playing a pre-recorded song is less bold than, say, creating a poem on the spot.

In terms of the qualitative data, researchers were limited in the types of data gathered, which in turn limited opportunities for triangulation (Miles & Huberman 1994). For instance, there was no observational data of respondents' teaching. Though interview findings were discussed by multiple researchers, each interview was conducted by only one person. Further, there was not a gender balance in the pool of interviewees. Hence, gender breakdowns were not possible.

5.3 Opportunities for Intervention

A common hesitation concerning using fun in statistics class was not having resources available. Because many respondents reported that they were not aware of the CAUSEweb collection, there is an excellent opportunity to remove this particular hesitation. The intervention includes expanding the collection of available fun items, making fun items more visible, and making fun items more user-friendly (e.g., by enhancing search features and pedagogical annotations). Indeed, expansion and annotation of the collection are currently being facilitated by two NSF projects, an ASA/CAUSE collaboration for the 2013 International Year of Statistics, and by the biennial A-Mu-Sing competition for fun items. The value of increased visibility can also be tracked by examining whether changes in the number of fun items downloaded from CAUSEweb are associated with the timing of the release of electronic journal and newsletter articles or other dissemination activities related to fun resources. For other instructors who reported other hesitations, a different type of intervention, such as professional development workshops, may be necessary. Thus, there may be a natural progression or hierarchy of overcoming barriers, in which instructors move from "can I?" to "should I?" as shown in Table 4.

Table 4. Ways to Alleviate Barriers

Instructor Barrier	Intervention
Not aware of resources	Introduce to collections such as CAUSEweb
Not sure how to use resources	Develop mini-lesson plans for collection's items
Not convinced use of fun is effective	Disseminate research; offer professional development linked to learning outcomes

5.4 Future Research

In a future version of the survey, it would be useful to make some changes such as including more modalities and incorporating the high-risk/low-risk continuum element. Also, conducting more extensive interviews and doing observations of classes in action would give a richer picture of the qualitative aspects of using fun. With the increasing trend towards offering courses online, it would be good for future research to include explicitly this environment where some forms of fun have potential for success (e.g., Anderson 2011; LoSchiavo & Shatz 2005; Shatz & LoSchiavo 2006), even if they may play out differently. While some instructors mentioned

online environments during the qualitative interviews, the quantitative survey did not address it. Also, more attention can be given to the use of fun at key transition points in a course (e.g., first day of class, the day before/after an exam). More generally, technology can be used to "facilitate a more individualized educational experience" by providing more fun to students who are more receptive (e.g., Banas, et al. 2011, p. 138). Finally, more rigorous experimental approaches can be used to examine how certain fun items with appropriate mini-lesson plans might affect formal assessments of achievement, attitude, and anxiety.

Appendix A
Survey from the CAUSE Study of Fun Cluster Group

Please respond to this anonymous survey as you reflect on the last time you taught an introductory statistics course. Put the completed survey in the box located on the registration table (on Thursday) or at *USCOTS Central* by 4:30 pm on Friday to receive a "Study of Fun" notepad. When you return your survey, you can also drop your raffle ticket in the bowl for a chance to win a Nook Color e-Reader. Stop by our table at the Posters and Beyond session on Saturday at 9:30 a.m. and you can see the aggregate survey results and demonstrations of Statistics Fun!

BACKGROUND INFORMATION (fill in the blank or check your responses)

# of years teaching statistics ____ typical class size ____ Gender: □ Male □ Female

Institution: □ high school □ 2-yr college □ 4-yr college □ research institution □ other

USAGE

Check each modality of fun that you **have used** in your statistics teaching:

□ Poems/Songs □ Cartoons □ Games □ Jokes/Humor □ Other:_____

Check each modality of fun that you have **NOT used**, but are **open** to using:

□ Poems/Songs □ Cartoons □ Games □ Jokes/Humor □ Other:_____

Check each modality of fun that you are **not open** to using:

□ Poems/Songs □ Cartoons □ Games □ Jokes/Humor □ Other:_____

MOTIVATIONS

Which of the following are your main **motivations** for using (or considering the use of) fun in your statistics teaching? (check <u>all</u> that apply)

□ increases student learning/retention
□ reduces student anxiety
□ helps my popularity/ratings with students
□ builds classroom community
□ makes teaching more enjoyable for me
□ increases student engagement
□ other (please specify):_____

HESITATIONS

Which of the following are your main **hesitations** about using fun in your statistics teaching? (check <u>all</u> that apply)

□ no skills/talent
□ can't quickly find good examples
□ weak evidence of helping student learning
□ uses too much class time
□ need to be perceived as serious by students
□ size of class
□ need to be perceived as serious by colleagues/supervisor
□ incompatibility with students' cultures
□ other(please specify):_____

CAUSEWEB.ORG

Have you used items from the "fun" resources collection at www.causeweb.org/resources/fun?

□ many times □ a few times □ once or twice □ no, but I've browsed
□ no, and I haven't browsed □ no, and I didn't know about this collection

I am open to being interviewed by phone about this topic □ no □ yes (print e-mail)_____

THANK YOU!

Appendix B
Interview Protocol

1. Who: Provide a brief description of the typical students in your statistics course.
- age distribution
- ability level
- interest level
- majors
- gender distribution

2. What: Which of the modalities (Poems/Songs, Cartoons, Games, Jokes/Humor, Other) have you tried?
- Please describe each of them.

3. Where: Of the modalities you have used, in what setting have you used them? Discuss and explain.
- Lecture versus Discussion
- Large versus small classes
- Basic versus more advanced material
- Elective versus required course
- In class versus on-line environment
- Did any of the modalities work better for some settings than other settings?

4. When: Of the modalities you have used:
- How often do you use each type
- How much class time is devoted to the modalities?
- When do you typically schedule the use of those modalities in a class period [toward the beginning, middle, or end of the class period]
- When do you typically schedule the use of those modalities in a topic area [toward the beginning, middle, or end of the topic area]
- When do you typically schedule the use of those modalities in a term/semester [toward the beginning, middle, or end of the term/semester]

5. Why:

a. Of the modalities you have used:
- Why did you choose to use each of those modalities?
- Which have you found effective and which ineffective? Explain.
- Did any work better for some types of students than others?
- Do you have insights into why some were effective and others were not?
- How did the students respond to them?

b. Of the modalities you have not used but are open to trying:
- Why have you not tried them yet?
- Do you have plans to try any of them?

- What might facilitate their use?

c. Of the modalities you have not used:

- Why did you choose to not use each of those modalities?

6. How: Of the modalities you have used, what delivery system did you use?

- Performance versus technology [i.e., live performance vs. using technology to share]
- Instructor directed versus laboratory investigation
- In-class versus out-of-class
- Did any delivery system work better for a particular modality than another?

7. Can you provide additional information concerning your hesitations for top three modalities not open to using?

- What change would allow you to be more open?

8. Can you provide additional information concerning your motivations?

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