



Functional Fun in Statistics Teaching: Resources, Research and Recommendations

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Abstract

This paper presents an overview of modalities that can be used to make learning statistics fun. Representative examples or points of departure in the literature are provided for no less than 20 modalities. Empirical evidence of effectiveness specific to statistics education is starting to emerge for some of these modalities – namely, humor, song, and cartoons. To reinforce their effectiveness as an intentional teaching tool, the authors offer practical implementation tips.

1. Introduction

[Ramsey and Shafer \(2002, p. xxiii\)](#) begin the student preface to their textbook with: "Statistics is like grout – the word feels decidedly unpleasant in the mouth, but it describes something essential for holding a mosaic in place." Perhaps adding fun to a statistics course is one way to disrupt stereotypes or unpleasantness some students associate with statistics – the content domain, the profession, the course, or even its practitioners and teachers. For purposes of this article, "fun" includes not only humor, but also a variety of other playful vehicles for engagement and motivation of learning. Much of the literature on the use of fun materials focuses on cartoons, which are often advocated as a strategy for creating an active learning environment in courses in a variety of disciplines, including: social sciences ([Ostrom, 2004](#)), English ([Davis, 1997](#); [Brunk-Chavez, 2004](#)), geography ([Kleeman, 2006](#)), computer science ([Srikwan and Jakobsson, 2007](#)), geology ([Rule and Auge, 2005](#)), physics ([Perales-Palacios and Vilchez-Gonzalez, 2002](#)), biology ([Anderson and Fisher, 2002](#)), chemistry ([Gonick and Criddle, 2005](#)), mathematics ([Greenwald and Nestler, 2004](#)) and statistics ([Schacht and Stewart, 1990](#)).

The potential benefits are large if a small dose (e.g., the first author's 10-second jingle about p-values: <http://www.causeweb.org/resources/fun/db.php?id=86>) can build classroom community, reduce anxiety (Dickinson, 2001; Schacht and Stewart, 1990; Friedman, Friedman, and Amoo, 2002), humanize the subject/instructor/course and foster openness in the classroom (Kher, Molstad, and Donahue, 1999), increase students' attention and participation for the entire class period (DeArment, 2001), provide a means of illustrating difficult concepts in science (Keogh and Naylor, 1998; Kabapinar, 2005), and give students a highly memorable way to recall specific content that will last well beyond the final exam. We will touch on some emerging evidence for benefits in Section 3. Two main challenges in using fun in statistics teaching – finding examples/resources and implementing them – are addressed in Sections 2 and 4, respectively.

2. Resources

Finding fun materials for use in statistics teaching has become easier thanks to a recent significant increase in published print and online resources (see [Table 1](#)). In 2004, the Consortium for the Advancement of Undergraduate Statistics Education (CAUSE) launched the CAUSEWeb digital library (www.CAUSEweb.org) to provide research materials and resources to the statistics education community. An important component of this library is the fun collection that includes a searchable annotated electronic database of fun resources (see also Lesser, 2006 and related internet resources listed at the end of the paper). In 2007, CAUSE held its first biennial fun materials contest (the *A-Mu-Sing* competition) to solicit new items to build up further the collection of fun resources. As of early November 2008, the collection had 216 items: 45 songs, 68 cartoons, 12 poems, 14 jokes, 3 videos (a.k.a. "μ-Tube"), and 74 quotations. Statistics has played a role in other national humor contests as well, such as the "funniest graph" (2006; 50(1)) and the "funniest scale of measurement" (2007; 50(4)) contests recently held by the national science humor magazine *Journal of Irreproducible Results* (disclosure: the first author won first place in the latter contest). **Table 1** catalogs 20 types of statistics "fun" and notes key published points of departure of each type, as space does not allow a comprehensive detailed review of each category.

Types of Fun	Representative Examples or Points of Departure
Cartoons	CAUSEweb*, Gonick and Smith (1993)
Celebration Days	Lesser (2007b)
Comic Strips	Lesser (2008b), Reeves (2008)
Food	Lesser (2008a), Johnson (1996), Fricker (1996), Richardson & Haller (2002)
Games (Commercial)	Lesser (2007b)
Games (Cultural)	McCoy et al. (2007b)
Game Shows	Lesser (2007b)
Humor/Jokes	Friedman et al. (2002), Lesser (2007b, 2008a), Lomax and Moosavi (2002), CAUSEweb*
Kinesthetic Activity	Morrell & Auer (2007), human histogram (e.g., Miller and Spohn, 2006), creative hypothesis test (e.g., Lesser, 2006)
Literature	Lesser (2007b, 2008a)
Magic	Peterson (2001), Holland (2007)
Media Bloopers	Chance News*, Lesser (2007a)
Movies	Lesser (2008a)
Music, Raps/Songs	CAUSEweb*, Lesser (2002), Lesser (2001, 2007b)
Poems	CAUSEweb*, Gaither & Cavazos-Gaither (1996)
Quotations	CAUSEweb*, Gaither & Cavazos-Gaither (1996)
Statistics fun Books	Lesser (2007b, 2008a)
Striking Examples	Sowey (2001)
Videos	CAUSEweb*
Wordplay	Lesser (2008a)

Table 1: Taxonomy of Fun for the (Statistics) Classroom

* = URL is in "Related Websites" section at the end of this article.

A useful way to find or create further fun resources is to look for parallels to fields with different or more developed precedents for fun. For example, Pi Day has become increasingly popular in mathematics education (Lesser, 2004), and a statistics celebration that may be similar in spirit was the Students' Tea (in honor of the anniversary of Gosset's derivation of the t-distribution) held at the 2008 Joint Statistical Meetings. It also simply takes openness to possible application of material encountered in everyday life, such as media bloopers (e.g., Lesser, 2007a) or comic strips (e.g., Lesser, 2008b) in one's local newspaper.

3. Evidence

Anecdotal evidence of greater student satisfaction is noted by many researchers and has been seen in our own experience despite teaching required courses to students who reported low prior interest in the subject. (For example, narrative comments in course evaluations explicitly note the use of educational fun, with a relative frequency that far exceeds the actual proportion of class time when fun was used.) A multi-institutional survey of 365 college teachers and 206 students in Arkansas (White, 2001) found a perception in both groups that humor helped to relieve stress and improve attention in an enhanced learning environment. On the other hand, the use of humor to motivate, promote thinking and reinforce knowledge were seen as the primary reasons for its use by a majority of the instructors but only a small minority of the students. Both teachers and students felt that humor was inappropriate when used in a way that embarrassed or ridiculed, or intimidated students.

Beyond course evaluation and anecdotal data, there is now emerging experimental evidence specific to statistics education that usage of fun is actually effective in enhancing the quality of students' learning and overall experience. The specific connection to the context of statistics is all within the last five years as [Friedman et al. \(2002\)](#) were forced to advocate the use of humor by citing scholarship outside of statistics (e.g., technology education, library instruction, advertising).

[Garner \(2006\)](#) randomly assigned $N = 117$ undergraduates to review three 40-minute lecture videos (in "distance education format") on statistics research methods with or without humor inserts. This setup ensured that all other aspects of the "class" were controlled to be identical, as instructor variability can play a role in assessing the effectiveness of fun. Students in the group with the humor condition gave significantly higher ratings (each p -value was $< .001$) in their opinion of the lesson, how well the lesson communicated information, and quality of the instructor. Even more importantly, the group with the humor condition also recalled and retained more information on the topic (this p -value was also $< .001$).

Other recent randomized experiments involving humor in a statistics context include [Berk and Nanda \(2006\)](#), who found that humorous directions given to biostatistics students on an exam had a significant ($p < .05$; effect size = 0.43) impact on structured-response item performance. [Berk and Nanda \(1998\)](#) report statistically significant effects (and practically significant effect sizes) in the predicted directions for attitudes toward content and anxiety for statistics courses and moderate correlations with overall achievement as well.

While humor is the type of fun (inside or outside the realm of statistics) that has received the most research attention, there is also emerging evidence in support of using song. For example, [VanVoorhis \(2002\)](#) conducted a study on two sections of (psychology) statistics students of equal GPA's. One section read 3 definitions in prose form, and the other sang jingle versions of the definitions. The singing section performed significantly better ($t_{69} = 2.01, p < .05$) on a set of four short-answer test items. That section had a significant correlation ($r_{31} = .37, p = .04$) between performance and student self-rating on familiarity with the jingle. The effectiveness of songs has recently been increasingly researched in other fields, such as [Crowther \(2006\)](#) and [McCurdy et al. \(2008\)](#).

For an example of yet another type of fun in statistics education, [Schacht and Stewart \(1990\)](#) found that students believed strongly that the instructor's use of cartoons reduced their anxiety but was somewhat less helpful for understanding and retention of material. They found that anxiety reduction also showed up in pre-post measurements using the Math Anxiety Rating Scale (MARS) developed by [Richardson and Suinn \(1972\)](#). In addition to the limitations Schacht and Stewart acknowledge about their study, there now is an anxiety scale specific to statistics that would be more relevant to use in any followup study. Evidence for other types of fun is currently quite sparse and there do not yet appear to be conclusive studies specific to statistics education in these other types of fun.

4. Implementation

In order for fun to avoid being (or being perceived as) frivolous or unrelated to course objectives, it is important to present it with structure and intention. For example, cartoons or comic strips yield instant enjoyment and attention but can also yield deeper engagement when accompanied by thoughtful questions. So if a class sees a cartoon about the mean (possibly already waiting for them as they enter the classroom), after a moment's pause of enjoyable laughter, the students should be asked, "Okay, why did we laugh? What misconception about the mean is the joke based on?" Other comic strips and cartoons lend themselves to a series of questions, as illustrated by [Lesser \(2008b\)](#). [Reeves \(2008\)](#) is full of examples and also has an introduction that gives general information about suggested uses, including introducing a topic, pre-assessment, wrap up, group work, extra credit, shortened class period, holiday

activity, parents' night, review for assessment, club resource, and student cartooning.

Music can be used as a teaching tool in a variety of ways for statistics courses (e.g., [Berk, 2001](#); [Lesser, 2001](#)). Perhaps as students enter the classroom, they would hear a song playing (e.g., from a soundfile at CAUSEweb or MASSIVE; see related websites) about a statistics concept to be reviewed or introduced that day. If merely pressing "play" on the computer does not sustain enough impact, students and teachers can try doing the performing (or even writing) themselves, perhaps leading to an end-of-term statistics karaoke party.

Sometimes, activities and applets can become more engaging by reframing them as games. For example, the free-standing applet at <http://www.stat.uiuc.edu/courses/stat100/java/GCApplet/GCAppletFrame.html> is now contextualized as a game in which students compete for the longest streak of correctly guessed correlations at <http://serc.carleton.edu/sp/cause/games/examples/13892.html>.

In developing new and using existing fun materials in the classroom, instructors are recommended to reflect upon the general pedagogical criteria at <http://causeweb.org/resources/criteria.php>. At a minimum, however, [Lesser and Pearl \(2007\)](#) recommend that it is useful to prepare mini lesson plans in which the following five questions are answered explicitly:

1. What is the item or artifact of fun? (e.g., a particular comic strip)
2. What is the course goal or statistical concept you would associate with the item?
3. Where would you use the item? (e.g., in class or on website)
4. What would you do/say/ask in class before using the fun item to "set it up"?
5. What would you do/say/ask in class after using the fun item?

For example, consider the short (2.2 minutes) and engaging film *Probability* written and produced by Samuel Rapien of the University of Nebraska (www.causeweb.org/resources/fun/db.php?id=226). In the video, a man named Jon opens a fortune cookie and reads: "There are many odds in life, but only one outcome for you." From that point on, each chance situation he repeats continues to give the same outcome (every coin flip is heads, every die roll is a three, every card he draws is the ace of spades, etc.). In the end, he dies choking on that fortune cookie just as the TV announces the lottery numbers he bet on (1,2,3,4,5,6) have won. Before playing the video, a teacher might discuss the idea that chance behavior is unpredictable in the short run but follows a predictable pattern in the long run. Then conclude – "... unless you are Jon..." – then play the video. After the video plays, ask: "How many heads (or threes, or aces) in a row should make someone suspicious?" and use that conversation to motivate the underpinning of hypothesis testing. As a second possibility, this video can be adapted for use in teaching the difference between the chances of an unusual event *happening somewhere* versus the chances of it *happening now* when it is predicted. Accompanying these mini-lesson plans for fun items, an instructor should also be sure that course assessments include items to evaluate student understanding of the learning objectives underpinning them. If in-class time is limited, students could be given the URL of the video with the homework assignment to view the video and to write a short journal entry or reflection paper that responds to specific questions provided.

A tip for instructors considering modifying or parodying a song, movie, game show, or TV show as a vehicle to motivate content, is that it will be useful to make sure it will be sufficiently familiar (and not offensive) to the students. Towards this end, some instructors ask students the first day of class to write their favorites on index cards which can then be collected and compiled (and perhaps also used to illustrate basic topics of descriptive statistics, to boot). In general, 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.

So teachers must know their students, but they should also know themselves. With at least 20 types of fun

to choose from (see [Table 1](#)), teachers should start off with the lower-risk modes that fall most within their comfort zone or personality. For example, 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.

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Related Websites

CAUSEweb Resources for Fun: <http://www.causeweb.org/resources/fun/>

Chance News: http://www.dartmouth.edu/~chance/chance_news/news.html

Game-Based Learning: <http://serc.carleton.edu/sp/cause/games/index.html>

MASSIVE: <http://www.live365.com/stations/trappedinlab/> and
<http://www.science-groove.org/MASSIVE/>

Ramseyer's gallery: <http://www.ilstu.edu/~gcramsey/Gallery.html>

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