

# Student Reactions to the Integration of Fun Material in a High-Anxiety Subject: A Case Study in the Teaching of College Introductory Statistics

**Lawrence M. Lesser and Reynaldo Reyes III,  
The University of Texas at El Paso**

## **Authors' Contact Information**

*Lawrence M. Lesser, Professor, Mathematical Sciences Dept.,  
The University of Texas at El Paso,  
500 W. University Avenue, El Paso, TX 79968  
Phone: (915) 747-6845  
email: [Lesser@utep.edu](mailto:Lesser@utep.edu)*

*Reynaldo Reyes III, Associate Professor, Teacher Education Dept.  
The University of Texas at El Paso,  
500 W. University Avenue, El Paso, TX 79968  
Phone: (915) 747-8817  
email: [rreyes9@utep.edu](mailto:rreyes9@utep.edu)*

## **Abstract:**

*There has been a recent emergence of scholarship on the use of fun items in the college statistics classroom, including types of fun, motivations, and hesitations (e.g., Lesser et al., 2013). This study sought to yield insight into how students respond to the dynamics of fun integrated within an instructor's pedagogy in statistics, a subject that historically students struggle with and are unlikely to associate with fun. Researchers collected data throughout a single introductory statistics course taught at a mid-sized emerging research university by an instructor experienced in the use of fun as a way to engage learners on an emotional level. During the spring 2013 semester, data were collected from multiple classroom observations (field notes and transcribed audio) and interviews of individual students in the course; anonymous end-of-course evaluations were also included in the analysis. Findings from this case study reveal that students in the introductory statistics course valued the experience and engaged more readily with the course material. Some ultimately expressed that it led to a better understanding of the material although the study did not look at academic outcomes in relation to the pedagogy.*

## **Key Words:**

Affect, case study, CAUSEweb Fun Collection, engagement, fun, humor, motivation, pedagogy, statistics education research.

## Introduction

Fun (or at least humor) has been studied in education for over four decades, as captured in the review of Banas, Dunbar, Rodriguez and Liu (2011). A review of the literature on statistics fun by Lesser and Pearl (2008) and Lesser et al. (2013) captures well the ways in which fun is consistent with statistics education best practices (as reflected by ASA, 2010). Lesser et al. (2013) surveyed 249 instructors attending a national statistics education conference about their motivations and hesitations toward using fun modalities in the classroom (and conducted follow-up interviews with 16 of them). The article offer tips for classroom implementation, listing a score of modalities of fun (games, cartoons, songs, etc.) and listing sources of statistics fun (e.g., <https://www.causeweb.org/resources/fun/>).

A consensus on the precise definition of ‘fun’ is elusive and variations have been noted in what statistics instructors report they count as fun (e.g., Sections 1.1 and 4.1.2 of Lesser et al. (2013)). A lack of consensus on the definition may reflect inherent subjectivity—what is fun to one person may not be fun to another. What may be fun or funny to a statistics professor may not be fun or funny to a statistics student. Tews, Jackson, and Ramsay (2015) “conceptualize fun instructor-initiated design and delivery elements as activities and interactions of an enjoyable, entertaining, humorous, or playful nature within a learning context.” (p. 17) For our study, we take an operational definition of fun as simply the purposeful use of one of the 20 modalities in Table 1 of Lesser and Pearl (2008) to accomplish one of more of: lowered anxiety, improved attitude, and increased learning. Examples of those modalities the instructor in this study used are games, cartoons, jokes, songs, magic, media news, and videos.

Fun is also nearly impossible to assess in a live classroom under controlled, replicable conditions, which is why researchers generally take the approach of a randomized experiment in which the treatment group receives an identical copy of a book or video with the insertion of one or more fun artifacts (e.g., Garner, 2006; Özdoğru & McMorris, 2013). With the advent of customizable open-source textbooks (e.g., <http://openstaxcollege.org/textbooks/introductory-statistics> or <http://www.openintro.org/stat/>), such experiments can be readily conducted.

From a general college teaching perspective, using some aspects of fun within the classroom leads to increased student engagement and can aid in the learning process (Carver, 2013; Garner, 2006; Robinson & Kakela, 2006; Tews, Jackson & Ramsay, 2015). The use of fun often leads to more student enjoyment and comfort in the classroom. In the teaching of statistics, Chew and Dillon (2014) review the literature of statistics anxiety and note a consistent negative relationship between anxiety and achievement. To perhaps aid in reducing anxiety in the teaching of statistics, one of their instructor recommendations based in this work suggests the use of fun/humor in the classroom. In their review of the literature on fun in statistics, Lesser and Pearl (2008) identify some modalities of fun (e.g., humor) as having the potential to do one or more of the following: reduce statistics anxiety or stress, improve attitudes towards statistics, improve attention, improve motivation, or increase student achievement. This study aims to contribute further to this research literature by offering 1) a qualitative perspective on the use and integration of fun materials in a beginning statistics classroom (observational data), and 2) qualitative data (interviews and course

evaluation comments) based on students' reactions to and interpretation of the instructor's use and integration of such fun items in the teaching of statistics. Considering the role and importance of affect in student learning (Linnenbrink, 2006, 2007), a qualitative exploration of how students respond to the integration of fun and how it may influence student emotions and feelings may help further in addressing issues of anxiety in the statistics classroom.

The qualitative study described here was part of a larger grant-funded program of research which included collecting quantitative data during fall 2013 from a randomized experiment at a university and a community college (with different and diverse student populations). The experiment (Lesser et al., 2014) was student-randomized to see if students exposed to particular fun modalities such as songs or cartoons inserted into otherwise conventional short content materials posted in their course management system would perform better on embedded related exam items, display greater improvement in attitudes towards statistics (as measured by the Survey of Attitudes Toward Statistics, SATS-36), or greater decrease in statistics anxiety (as measured by the Statistics Anxiety Measure, SAM) over the course of the semester.

This case study is based on qualitative data that were gathered in spring 2013 at an Hispanic-serving institution in the larger funded study, in the semester just prior to the beginning of the experiments. The broader study is given context with this case study by providing a look at an experienced statistics instructor's use of fun in the classroom and seeing how this might inform our understandings of the use and practice of fun in the statistics classroom.

Using a multiple source data triangulation method (Denzin & Lincoln, 2005; LeCompte & Schensul, 2010), this qualitative case study considers one statistics instructor's integration of humor and fun items aimed to reduce anxiety, create opportunities for students to engage, make memorable connections to the material presented, and explore concepts.

## **Background**

### **Setting**

The site of this case study is a moderately large doctoral/research university located in a large city in the southwestern United States near the border of Mexico. Roughly three-quarters of the student population (and of the city) is Hispanic, and 5–8% of the Hispanic student population are Mexican nationals. About half of the students at this university are the first from their family to attend college. Its mission of providing its regional population access to quality higher education makes this university a compelling study setting, and its high proportion of Hispanic students makes the population an interesting one to study because many parts of the country (and the world) are encountering rapid growth in this demographic group. Also distinctive about this student population is the relatively high proportion of students who are English learners.

### **Course**

The students in the spring 2013 semester study were enrolled in one of five sections of a statistical literacy course, which used the textbook by Utts (2005) and had a prerequisite of intermediate algebra. Typically, each section has 30–45 students. This course is required only for pre-service elementary and middle school teachers, and most enrollees are pre-service elementary teachers, with some pre-service middle or high school teachers; perhaps up to a quarter of the students may be non-education majors taking the course as a recently established option towards satisfying the university's core curriculum requirements.

On the end-of-course evaluations from the students in this particular spring 2013 section, 19 of 21 students (90.5%) indicated they took the course “to fulfill a requirement” and less than half of the students reported at least an average level of interest in the subject before taking the course (with only one student reporting above average prior interest). On a survey at the beginning of the course where students responded with a Likert scale rating (from 1 = strongly disagree to 5 = strongly agree) to the statement “I am anxious about this class”, 59.5% of the students answered with a 4 or 5 and only 21.6% answered with a 1 or 2. Such a course arguably makes the potential need or impact of fun all the more germane.

### **Professor**

The statistics professor (the first author of this paper), a white male native English speaker, had about 25 years of overall teaching experience by the time of the study, and had taught an introductory statistics course about 25 times, including 15 times at the institution of this study. The professor has a deep ongoing interest in pedagogy, as both a teacher and statistics education researcher, and has received regional teaching awards. The statistics professor has an informal background in fun, having taken lessons or non-credit courses in songwriting, guitar, magic, juggling, and stand-up comedy. The professor was a PI in a grant (see Acknowledgment) that provided support such as transcribing equipment and time for graduate student researchers to do the transcribing. More deeply nuanced understandings of the pedagogical approaches came from the collaboration of this professor (as the statistics content expert) with a tenured colleague from another college: a professor of bilingual, ESL, and multicultural education who is an experienced qualitative researcher, co-PI on the grant, and co-author of this paper.

### **Methodology**

As a case study, this paper looks at one bounded system—a contextualized and defined space of a particular phenomenon—using multiple sources of information (Creswell, 2007) that is a part of a broader inquiry of a study on “fun in teaching statistics” across three institutions. For this examination of pedagogical practices in a statistics course and how students respond to and learn in a course that intentionally incorporates fun items, we decided to study the first author's teaching for two main reasons: 1) to get a representative depiction of the use of fun in statistics by an instructor who was experienced in teaching statistics as well as experienced in using fun in that teaching; 2) to contextualize a larger study (see Acknowledgements) in which

the instructor was experimenting with the use and effectiveness of fun materials in engagement, statistics learning, and anxiety reduction. Because of this professor's cultivated background in fun, his selection for this study may be viewed as "extreme case" sampling (Miles & Huberman, 1994). Of course, using fun is not in itself an extreme act because the use of cartoons and games is not unusual among statistics instructors (Lesser et al., 2013).

In order to avoid any sense of coercion when recruiting students to participate in the study while the course was being conducted, the instructor was never present during recruitment, interviewing, or any conversations regarding the course or the instructor. Per IRB protocol, students were informed that their participation or non-participation would have no influence on their grade, and the instructor never learned participants' identities, even after the course concluded.

Qualitative methodological strategies used were classroom observation, the audio recording of classroom teaching and interactions, and individual interviews. Directed content analysis of interview data was done, guided by an initial framework and research questions. Summative content analysis of narrative comments from official end-of-course anonymous student evaluations counted and analyzed particular relevant words (Hsieh & Shannon, 2005). The end-of-course evaluation prompted students to comment on "the instructor (lecture style, attitude, teaching methods, standards, etc.)," "the course content (difficulty, textbook, exams, assignments, etc.)," and "the course administration (grading, number and fairness of exams, etc.)."

For triangulation purposes, these multiple sources of data were analyzed by the qualitative researcher (Marshall & Rossman, 2011): field notes, audio recordings of teaching, and structured interviews. The interviews were conducted based on an interview protocol (see Appendix) that contained fixed and open-ended questions relating to student thoughts and experiences prior to and during the statistics course. Prepared questions were based on the researchers' need to address particular topics related to the use of fun items and anxiety in a first statistics course, and potentially glean data on conceptual learning (or at least perceived) experiences connected through pedagogical approaches. Open-ended questions allowed research participants to construct their own meaning, and probing questions were used to pursue any key responses (Creswell, 2007).

### ***Student Interviewees***

We now describe the interviewees, and the procedure for soliciting and selecting them. One male and five female students were interviewed. One female student described herself as English/Spanish bilingual, while the remaining five participants spoke English only. The female students were all of Hispanic ethnicity, while the male was Anglo. The modal gender and ethnicity of the interviewees match the modal gender and ethnicity (female and Hispanic, respectively) in the section of the course taught by the instructor as well as in this university. Interviewee names appear as pseudonyms.

The qualitative researcher of this case study recruited students from the statistics professor's class through an in-person visit at the beginning of a class meeting (with the professor stepping out of the room for this). Students were informed of the nature of the study, provided with IRB and consent information, and given the opportunity to express

interest and provide contact information. The qualitative researcher then contacted those who expressed initial interest in participating in the study ( $n = 14$ ), with six of those students choosing to provide consent to be interviewed. All six of those students were interviewed, and each interviewee was provided \$5 compensation for participation.

Interviewees were asked questions related to initial anxiety in taking statistics, the effects of particular pedagogical approaches on them in the course, and their perceptions of statistics before, during, and after the statistics course. Interviewing took a structured approach, in which the interview was guided by the predetermined interview protocol (see Appendix), but clarifications could be sought in response to participants' answers. Such added questions were typically probes such as "Can you give me an example?" or "Tell me about \_\_\_\_\_". Audio recordings of the interviews were then transcribed by an independent researcher.

## Data Analysis

Table 1 lists the data collected in this case study. Five classroom observations were conducted, each for the full 80-minute class period (Mondays and Wednesdays, 1:30–2:50 pm), and the last three of those sessions were recorded with a digital micro-recorder for later transcription. The micro-recorder was placed on the front table, closer to the instructor to best capture the instructor's voice, since the instructor was the main focus of study while student reactions would be noted only in an overall, diffuse way. The observations were conducted with a structured observation protocol that was streamlined from an earlier version so that the field notes could focus on documenting the use of each fun item observed and student reaction.

**Table 1. Multiple Sources of Data for the Case Study**

Source of Data from one section of the course in the Spring (mid-January to mid-May) 2013 semester	Dates (2013)
(field notes of) observations of 5 class meetings	Feb. 6, 18, 25; April 8, 15
(transcribed) audio recordings of 3 class meetings	Feb. 25; April 8, 15
(transcribed) individual interviews of 6 students	conducted April 4–11
end-of-course evaluations (numerical ratings and narrative student comments; 21 of 35 responded)	conducted on April 17; released in fall 2013

Analysis of data was initiated with an open coding approach, looking broadly at the data as a whole, and is the first level of analysis that allows the process of creating categories (Strauss & Corbin, 1990). After initial analysis, categories began to emerge. In this level of analysis, we referred to the literature in fun and codes or themes that have been used in the research on fun in teaching (Abdelbasit, 2010; Lazarro, 2004; Lesser et al., 2013) to serve as a framework that might help us to recognize particular phenomena, discourse, and/or key terms or ideas that emerged from the data. However, we did not limit our analysis and coding to this list of codes, as other codes or themes also surfaced in the analysis. For example, a code and category for "student expectations"—that is, what students expected from the course—was created after analysis of interview data.

Analysis continued until various themes emerged, following the process involved with axial coding, which is the next level of data analysis that uses the categories or themes that emerged from the open coding approach, and verifies how data reflect the themes found (Strauss & Corbin, 1990). For further triangulation, another level of analysis was conducted when two representative quotes from interview data were presented to attendees at Lesser et al. (2014) to solicit their interpretation of the data from their perspective as statistics instructors. A large majority of session attendees responded and confirmed our findings of the overall theme of issues of engagement coupled with the importance of affect in the teaching and learning of statistics.

We discuss these themes along with analysis below. We begin with what was found in the classroom based on field notes, which were reconstructed from peer debriefing with the instructor to ensure accuracy of observations and what occurred in the classroom. Then data from audio recordings of the teaching are analyzed. Following these analyses of the classroom setting and teaching, we discuss multiple themes that emerged from the interviews with students based on their experience immediately prior to entering and during the statistics course. For further triangulation purposes and to determine if the student experience and perceptions of teaching aligned with findings from the observations of the entire classroom and the six interviews, narrative comments from official university end-of-course anonymous student evaluations of that course section were also analyzed.

## **Findings**

The following themes and discussion of findings are presented through three data sources that provide triangulation, reflecting cross-checking for accuracy in representation of what occurred in the classroom and how students responded to those occurrences (LeCompte & Schensul, 2010). First, the context of the classroom and data from field notes is thematically representative of the various pedagogical practices within the statistics classroom. Next, the analysis of interview data presents student reactions and thoughts based in their experiences within the course. And finally, content and language from course evaluations provide a third source of data in this analysis.

### ***Strategic Use of Fun Items to Engage and Help Make Connections***

The instructor frequently used materials to go beyond the textbook so that the students were first engaged with such material and then immersed within the context of the content being taught. The process of “engagement, then immersion” was intended to allow the students to make socio-emotional, personal, and academic connections that function as scaffolds in the explanation and problem-solving aspects of teaching and learning. Students might initially become engaged by the intriguing (e.g., humorous) nature of the material presented, at which point they would then become invested because of the emotional appeal contextualized with the content being taught.

For example, in the February 18, 2013 class observed, the instructor showed the students a news piece (CNN, 2013) on the use of marijuana and driving that appeared less than a week before. In the 5-minute video, the reporter asked the volunteers in the experiment how they felt after completing a driving course while under the influence of increasingly higher amounts of marijuana. A response that gained particularly high

levels of laughter and interest from the statistics class was when a female in the video said “I still feel normal” even though it was evident she was not behaving and driving normally. The following excerpt from reconstructed field note observations illustrates how the instructor built on the momentum of the students being connected, as evidenced by extended laughing and smiling throughout the video, to the context of the material within the video, which is supported by the literature that suggests that video can influence the affective aspect of retention and learning (Batdi, 2014; Garner, 2006). The field notes below were recorded in phases—initial observations, but then checking with the instructor to fill in any gaps in what was observed. Information such as references to material in the textbook was also requested (and cited within the field notes below) to give the observations fuller context. The following occurs after the video is shown:

Students are then asked to turn to each and discuss the explanatory variable and the outcome variable. One student recommends that a double-blind experiment be done and the instructor suggests that it may be difficult to come up with a “placebo joint”. Students laugh. The instructor asks the students, “Can I say that marijuana influences driving ability? There may be confounding variables.” The instructor is attempting to make connections to an example the students read in the current chapter of their textbook (Utts, 2005, pp. 86, 100), an experiment involving drivers driving under three conditions: sober(S), alcohol-influenced(A), or marijuana-influenced(M). Referring to this latter example, the instructor asks students to use their ABCD classroom response card to show how many possible ways they think there are to order three different conditions (e.g., A = 3, B = 6, C = 9, D = none of these). Without revealing the correct answer yet, the instructor [seeing many incorrect votes for C] asks them to turn to their neighbor and discuss the question. The instructor then says, “Let’s have a second vote, to see if the votes are the same.” The instructor then asks the class to call out in alphabetical order (to make sure none are omitted) all possible orderings of the three conditions [AMS, ASM, MAS, MSA, SAM, SMA]. Halfway through, the instructor notices “MAS” spelled out and says, “There’s *mas* [more] and points at it, with some student chuckles throughout the class, and he quips, “My first bilingual joke,” followed by more mild chuckling from the class (Reconstructed Field Notes, 2/18/13).

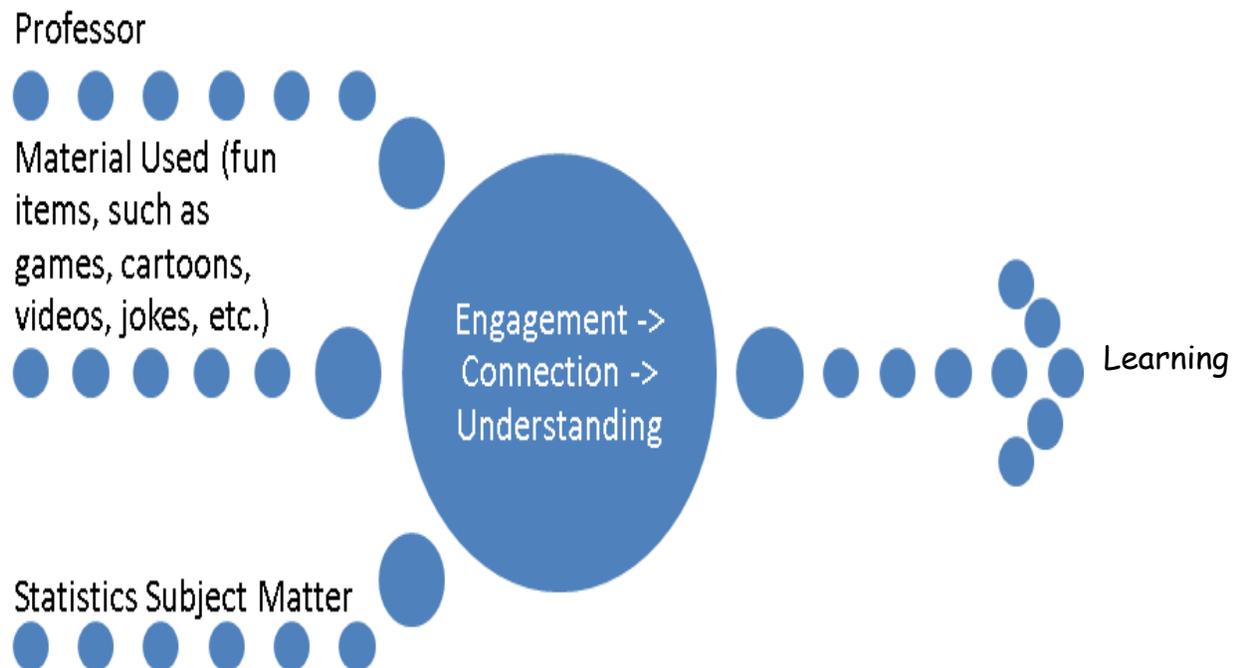
With or without fun items or other materials, the instructor of this statistics course always seemed cognizant of the need to engage the students at various moments throughout his teaching in order to help maintain a particular cognitive and emotional connection between the students and the material being taught. As indicated in the field notes excerpt, the professor purposefully contextualized his preplanned lesson on the content material with a visually stimulating and emotionally engaging multimedia text. Using momentum with already captivated students, he asked them, “Can I say that marijuana influences driving ability?” He attempted to assess formatively their understanding of the concept being taught at that moment by quizzing the students with their ABCD classroom response card, a piece of paper folded to discreetly display a response to a classroom voting (multiple-choice) question (Lesser, 2011). Further building on this momentum and considering the communal connection of humor or fun

between the students, the professor then asked students to co-construct their understanding of the material.

The excerpt from the field observation notes reflects a pattern that was found in the five class observations. The professor frequently made mundane or everyday objects relatable by creating a humorous situation, wordplay or joke, sometimes using self-deprecating humor. For example, in one class session a student talks about gathering data on hair color (in Figure 9.1 of Utts, 2005, p. 164) and the near-bald professor said, "In my case, flesh-colored," and almost all of the class laughed at his making fun of himself (Field Notes, 2/6/13). In another session, the instructor used an online version of the NBC game show *Deal or No Deal* to explore concepts of probability, especially expected value. This required a student to participate. Seeing the game projected onto a screen, the students immediately responded by "ooing" and "aahing" at the sight of the game, its sound effects, its use by the instructor, and the participation in it by one of their classmates as the contestant. At the conclusion of the game and the participation by a male student, there was even "hooting" by some students, expressing a youthful, collegial sense of support of the classmate's participation in the game (Field Notes, 4/15/13).

In a class session in which the professor was discussing the concept of control groups, he displayed a cartoon (<https://www.causeweb.org/resources/fun/db.php?id=1>) and read aloud its caption, "I couldn't afford a control group so I decided to go with an out-of-control group," which garnered mild chuckles and smiles from the students, which, I sensed, seemed to lighten the overall mood of the classroom, (Field Notes, 2/18/13). Other uses of cartoons went beyond a quick moment of relief and served as a playful vehicle for sustained engagement with a content topic, such as interpreting scatterplots in cartoons (e.g., <http://causeweb.org/resources/fun/db.php?id=268>, <http://causeweb.org/resources/fun/db.php?id=5>).

What these data also reveal is that there was a unique intersection of attempting to help the students make connections simultaneously with the professor, the fun or engaging material, and the subject of statistics. This pedagogical intersection created the opportunity for students to feel more engaged, and ultimately connected so that they might begin to better understand the content being taught. Figure 1 illustrates this in the form of a trajectory.



**Figure 1. Actor–Material Pedagogical Convergence**

In this paper, we do not claim that in-depth understanding or learning occurred, as this case study did not attempt to measure this. We do, however, argue that the intersection of these elements in teaching a subject like statistics is important in placing students like those highlighted in this study on a trajectory toward the possibility of reaching a point of understanding, and, ultimately, learning.

In another example of the various uses of materials and approaches to create a fun classroom environment, the professor used local newspapers, as a nighttime talk show host might, to casually start a class meeting and discuss statistical concepts such as polls. Here is an excerpt of reconstructed field notes to illustrate, followed by analysis:

The professor begins the February 6 class by opening that day’s issue of the *El Paso Times*, reading from Borunda (2013) that El Paso was ranked the safest large city for the third year in a row. He asks students to discuss how they think the ranking was determined, and then asks students to guess the safest and least safe country. He then read some headlines from the most recent issue of the university’s student-produced newspaper (*The Prospector*, 2013), holding the paper so that he and at least some of the students could see it. After showing the page 5 headline “UTEP demographics reflect students from 70 different countries,” he asks the class “Which country is #1 here?” and a student replies “Mexico.” The professor at this border university playfully asks, “How did you know?” and several students chuckle. (Reconstructed Field Notes, 4/15/13).

The professor begins class by using material that is familiar to the students—the local newspaper. The source of discussion on the subject of polls is the content of a newspaper, an everyday medium that students recognize. Within this source of information, and the stories found there, the professor explores content and then punctuates the discussion with a joke that plays with the words “pole” and “poll.” This

appears to be a strategy to build an emotional and cognitive bridge for the purpose of helping the students to develop conceptual understanding of how polls might work in the context of a statistics topic. In a member-checking discussion with the instructor, he indicated that the use of items such as current newspapers is strategically planned as part of his opening instruction, pre-screened a few minutes before class to identify items with highest relevance.

Another example (discussed in Lesser, 2014) illustrates how the professor uses popular music to scaffold learning conceptual distinctions between the *mean* and *median*, which are poorly understood by many students. The professor here uses the knowledge that music is appealing, but what also happens is that the students are engaged by the novelty of the fact that most professors do not share, much less sing, songs to teach concepts. With several phones recording the professor, this is a captivating event. With all eyes on the professor and wide smiles, this experience becomes a memorable one within the context of statistics. One student expressed appreciation that the professor “shows us a lot of things that we can kind of relate to, and he actually takes an approach of having little riddles and songs when he’s teaching certain concepts, and those keep you actually entertained so that helps you absorb more of what he’s talking about” (Student Interview, Beatriz, 4/11/13). This student connects being “entertained” with her learning by allowing her to remain focused on the content material and task at hand.

Finally, we note that even in the occasional instance where a fun item appeared not to work as planned, the instructor was able to use the moment to engage the students. For example, as part of a discussion to distinguish personal and relative frequency views of probability, the professor posed an attention-grabbing question, “What is the probability he can make a die change color by giving its container a gentle shake?” The professor then put the students’ consensus answer of 0 to the test by shaking the clear container, which was actually a magic trick prop (made by Toysmith, 2010). When the trick did not work, the students and instructor shared a good-natured laugh as the professor noted, “It worked yesterday in my office.” Then the professor tried it again right away, getting it to work, and students gave an amused cheer (Reconstructed Field Notes, 4/15/13). We suggest that the organic nature — that is, the naturally-occurring and allowance for this process to occur naturally without interference from other external elements—of the failure can be just as powerful and important in engaging and connecting with students as a successful attempt. Such a connection with the students presents the professor as more human and makes it easier for mistakes to yield teaching moments. It may also help students view failure as an opportunity to learn rather than an obstacle to progress.

### ***Affect Influencing Student Interest and Engagement in the Subject***

Emotions (affect) have been found to influence learning, retention, and engagement with a subject of study (Linnenbrink, 2006, 2007; Meyer & Turner, 2006; Pekrun, Elliot & Maier, 2009). We found that the six students interviewed for this case study expressed how particular micro-gestures in the teaching—subtle use of words or wordplay, use of materials, or the general demeanor of the professor—all created a cumulative positive effect on how the students viewed and felt about not only the instructor, but the subject

of statistics. In essence, the way the professor taught made them feel good while being in the moment of learning statistics. In terms of pedagogical approaches, when the students were asked what the instructor did to make them feel more engaged, motivated, or comfortable in class, they mentioned how the subject of statistics was more interesting when the material made a personal connection with them, including items like songs and jokes. One student mentioned how “he [the instructor] shows us a lot of things that we can kind of relate to” (Interview, Beatriz, 4/11/13) while another suggested that explanations provided were well contextualized with “examples to make us understand what he is trying to explain. Like, real life experiences” (Interview, Ana, 4/11/13). Another female student commented on these explanations and how they were very “detailed” and made “a difference on keeping my attention on the subject.” (Interview, Carmen, 4/11/13).

Further analysis of student reactions to the use of fun items in the teaching of statistics found that some students did not feel that positive reaction to such items aided in the process of gaining conceptual understanding. One student expressed how she found that the use of songs was “funny” and “entertaining,” but indicated in the interview that they did not really help her to learn concepts well as an initial reaction to the use of such items. From the following, she seems to be expressing how the idea of the song itself and its use within the statistics class served as a tool to capture her attention and help her to remain focused, becoming a conduit to conceptual understanding. So items like a song, she felt, “helps me to pay attention more and be more engaged so that I understand the concepts but, the song itself, I thought it was just something more funny, like entertaining, but, it helps me to engage more in the class and pay more attention so that I can understand the concepts better” (Interview, Diana, 4/11/13). Ultimately, the song helped with the process of learning, even though the student may not have been aware that such learning was occurring.

In many college classrooms, or with teaching in general, capturing the attention of students is often the most difficult aspect of effective pedagogy. What the statistics instructor used in this example is called a “hook” or anticipatory set, which very often is used in teaching to grab the attention of students, build on prior knowledge, or simply make a connection with the student so that they begin the process of relating somehow to either the content being taught or the context in which the content is being taught. This last student interviewee was asked if she believed that such fun items helped her to learn the concept, to which she responded “no.” But students of all ages often do not realize that they are learning (Marsick & Watkins, 2001), which is often the result of the most effective teaching. As the student continues in her response, she suggests that such items “help her engage more and pay close attention,” actions of students who are willing to learn, ready to engage, and/or working in their zone of proximal development (Vygotsky, 1978), where their learning is being scaffolded by a more knowledgeable other, such as an instructor, who is engaging the student in a learning process that is not too easy nor too difficult, but just adequate enough to induce learning.

The findings from interview data indicate that students valued the instructor’s demeanor in his approaches to teaching, which was reflected in their end-of-course evaluation comments on the instructor. For this part of the analysis, all evaluations ( $n = 21$ ) from the course containing narrative comments were 1) analyzed for frequency of

particular words that thematically surfaced, and 2) explored the use and meaning of these descriptors and related words. Five of those comment sheets were not used because they either had no comments or provided only a minimal response such as “good.” From the content analysis of the comments, several patterns arose in the use of particular descriptors of the professor (see Table 2). In no case did more than one student use a particular listed word more than once. There were six examples of emotionally laden words that were used only once (five positive and one neutral/inconclusive): hyper, excited, exuberant, entertaining, enjoyable, and N/A (“not applicable”—student did not comment on the instructor).

**Table 2. Frequency of Emotion-related Words in Student Course Evaluations**

Emotion-related Word	Frequency
(instructor or course was) fun	8
interest/interesting	7
enjoyed/enjoyable	3
positive	3
enthusiastic	3
unique	3
upbeat	2
great	2
good/very good	2

What was common in the use of such descriptors is that they reflected some socio-emotional aspect to learning, learning environment, and the professor’s teaching approaches. The use of the term “attitude” by students in the comments was of particular interest. Apparently, the attitude—the manner in which the professor approached his teaching—was important to the students. Considering how one can have a positive or negative attitude, the students revealed that a positive attitude in teaching made an impression on them and their experience in the course. The word “attitude” was accompanied by descriptors like, “nice,” “enthusiastic,” and “positive.” One student wrote that the instructor “always comes to class with a positive attitude,” while another expressed, “His positive and happy attitude makes the class more fun and keeps the attention of the students” (Statistics Course Student Evaluation Comments, Spring 2013).

From the interviews, Carmen suggested that this approach reduces anxiety in learning statistics. She said, “I honestly think it makes the class in general a little less stressful. Kind of, as far as me as an individual, puts me at ease that I can understand it better that way” (Interview, Carmen, 4/10/13). Another student, Ana, talked about how the instructor’s positive disposition also helped her feel at ease being in a statistics class: “He’s like a pretty motivated person. Like, you don’t get bored in his class with anything he does like with his songs that he makes up or like everything he does. Like, he’s a really upbeat person so that makes me feel like, more comfortable in the class”

(Interview, Ana, 4/11/13). Carmen also noted how “his attitude is, um, has a very positive impact on us, on the class. He’s very lively and very patient, and um, he goes into a very detailed explanation and he seems to keep the class fun. That, I think makes a difference on keeping my attention on the subject” (Interview, Carmen, 4/10/13). The instructor creating and maintaining a positive and lively classroom environment helped students like Carmen to not only feel comfortable in the class, but to stay connected with the subject matter being taught—statistics—which can be difficult for students who struggle with statistics, specifically, and math in general.

### ***Seeds of Learning through Affective Means***

Being emotionally connected with the subject not only helped with engagement in the subject and but also the beginnings of conceptual learning. The use of various materials, such as cartoons and songs, allowed students to build what we call an “affective schema” that supported their learning of the material. *Schema* is traditionally used to define cognitive functions. Here, though, we found an intersection of cognition and affect that helped to create a trajectory toward understanding of the content being taught. Like the student Diana mentioned earlier when discussing engagement, she found that the use of songs, for example, helped her to “pay more attention so that I can understand the concepts better” (Student Interview, Diana, 4/11/13). Diana recognized such practices by the instructor were effective in placing her within a learning trajectory toward conceptual understanding.

Similarly, in terms of keeping the student focused on the material being taught, another student mentioned how “we learned about mean, mode, and all those different things and he gave us a song about the mean using a Taylor Swift song. And it’s just like it kept us on point about what the difference between a mean, median, and mode and all those” (Student Interview, Beatriz, 4/11/13). Beatriz discussed how the professor’s teaching was a way to take an alternate route to learning the material. She suggested that the use of songs was “getting off topic pretty much and kind of just letting loose for a little. It’s still related to the subject and you don’t even realize it, it’s just related to the subject but somehow it eases the tension that you might think of is associated with any math course” (Student Interview, Beatriz, 4/11/13). She suggests that there is tension in learning statistics, and this approach helps to take away some of that tension, even if only momentarily.

This tension in taking and learning statistics was also reflected in the following comments by another student. She mentions how important the manner in which the professor teaches is important in simply getting the student to appear in class. She said of the professor’s pedagogy and his use of materials, “he knows how to use them to make us more engaged in the class. Like to, to actually make us want to go to a statistics class which most of us wouldn’t because we wouldn’t even like to go in the first place.” (Student Interview, Ana, 4/11/13).

### **Discussion**

This case study reveals that students respond to the strategic, planned by the instructor, as well as organic (the professor’s invoking his baldness, using the university newspaper, etc.) use of fun in the teaching of statistics, in which the instructor

seemingly allows fun or fun moments to occur naturally or emerge from the unplanned moments and interactions with students and the materials used to teach the subject. We realize that college instructors may not be inclined to teach statistics using fun in an organic manner, possibly for one of the hesitations identified in Lesser et al. (2013). While being comedic may not come naturally to an instructor, this case study suggests that the use of fun materials or being fun in the class is also a planning and preparation issue.

The findings in this case study mirror what Williams (2010) found in her work on the role of immediacy in reducing statistics anxiety—namely, that an instructor engaging the students in ways that present himself/herself as an approachable, and even fun, individual contributes to a positive teaching and learning environment. Even a few attempts to use fun materials may be appreciated by students who enter a statistics course expecting a bad experience. Those students may view the professor's attempts as genuine (even if unpolished or unusual) efforts to increase engagement and ultimately learning, as we saw in the magic trick episode described previously. The students' willingness to extend slack or goodwill for a professor's imperfect attempts at fun is arguably not so different than how students respond when professors make efforts to include any other innovation in their teaching, such as introducing technology which has some chance of a "glitch" on any given day.

What the findings from this case study also reveal is that often it was not a song or object that the students commented on that indicated its influence on their affect or engagement, but the manner in which the professor engaged the student in the delivery of the teaching or use of fun items or planned activities for the students. This reflects the finding of Tews, Jackson and Ramsay (2015) that the use of humor or fun in teaching, or the "delivery" of the material being taught, often has more of a positive effect on student engagement than do "fun activities" themselves. They found that fun delivery was the most influential factor in emotional engagement, again reflecting the nature of affect and emotion found here in this study.

This qualitative case study shows how an instructor's use of fun and engaging material created an environment that impacted the affective nature of teaching and learning. Emotion and feelings were an important part of how the students engaged in and interpreted that material being taught. Qualitative data from student experiences in this class revealed that certain pedagogical dynamics using materials or approaches with fun or funny items helped to alleviate for them some of the tension or anxiety related to the learning of statistics.

## **Limitations**

While the class was observed for only five of its 27 non-exam, non-lab meetings, this is believed not to be a major limitation because the observer was in the class for the full length of those five meetings and the dates were well spaced: the first three meetings providing a good picture of the first half of the course and the last two meetings providing a good picture of the second half of the course. Another possible limitation of this study is that being enrolled in the course taught by the instructor to whom they were referring during the interviews may have influenced student perception and their responses, although unlikely, since informed consent ensured that no identifying

information would be used and that even their status of participating would be kept from the instructor.

Another limitation relates to the classroom observations. When observations were done, the qualitative researcher was positioned in the back of the classroom (to be less obtrusive) where silent visual reactions like students' smiles may not have been fully observed. When students turned their heads and worked in pairs or small groups, more facial reactions were observed. Major reactions, such as laughter or chuckling from the students, were most audible and recorded in the field notes.

## **Future Directions**

Observations of future classes can be used to investigate rigorously a variety of specific research questions such as whether the use of fun was more effective when it appeared more spontaneous (or otherwise higher risk) or whether the use of fun was followed in close proximity by students asking questions that were higher on Bloom's Taxonomy. Other directions include discourse analysis of classroom interactions with students or analyzing how the instructor used the framework questions in Section 4 of Lesser and Pearl (2008).

Future studies that look specifically at ethnic, racial, and/or cultural factors in reacting to and/or interpreting fun in college classrooms may be considered. For example, in one study, Bui and Alfaro (2011) found no significant differences in statistics anxiety between Latino/Hispanics and Caucasians, and reduction of anxiety is a major potential benefit or aspect of fun. The qualitative researcher found that ethnic or racial identity or particular cultural or linguistic practices played only a minimal role in the in-class observations (two female, Spanish-speaking students were observed discussing a problem during one class session), and such issues did not arise at all during any of the interviews. Nevertheless, it is worth reflecting on the distinctiveness of the student population in this case study, to assess how compelling it may be to do a case study in a setting with a different student population.

Additional research directions may take into account culturally and/or linguistically responsive pedagogy in the teaching of statistics. How might students whose first language is not English respond to the use of fun and engaging approaches compared to native English speakers? Do different cultural and/or ethnic groups have different views of fun in the classroom, and how might this affect pedagogy? How might their K-12 mathematics experiences impact how college students respond to fun pedagogy?

## **Conclusion**

In our program of research, we have focused on an introductory statistics course because 1) the course is taken by a large number of students; 2) the course is taken by students from varied majors and mathematics backgrounds; 3) the course's reputation as a "dread" subject in higher education is supported by data from instruments such as Survey of Attitudes Toward Statistics (SATS) and Statistics Anxiety Measure (SAM).

This study contributes to the current dialogues in postsecondary education focused on student retention and completion by providing a qualitative understanding of pedagogical efforts to contribute to student learning and success. We hope that the

findings from this study add to the literature on the importance of instructor efforts to integrate various forms of fun and humor into their teaching to lower student anxiety and provide better opportunities for engagement in the subject, which hopefully will lead to better learning.

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### **Appendix: Protocol for Interviews of Student Participants**

1. What did you think of the subject of statistics before you took this course?
  - a. What did you expect when you entered this statistics course?
  - b. What were you expecting that this class would be like?
  - c. What did you expect that the instructor would be like?
2. Were there things that the instructor did that made you feel more engaged, motivated, or comfortable in the classroom?
  - a. Probe: Really? Tell me more about that.
  - b. Did they help you to understand the concept being taught by the instructor? Why or why not? Can you give me an example?
  - c. Do you remember a specific example of something taught by the instructor in a fun way? Can you give me an example?
3. What did you think of the use of cartoons/jokes/songs/games, etc. by the instructor?
  - a. Can you give me an example of when the instructor used these things mentioned that helped you to understand a concept?
  - b. So even today, do you remember that concept? Can you give me an example of what you remember?
4. So are there times when you feel like you are having fun in this class?
  - a. In a typical class session, how many times during a typical class meeting were there moments of fun?
  - b. Did you notice any pattern in which class meetings had more moments of fun than other class meetings?
5. (if information not already provided by student)
  - a. So, what do you think about this statistics course now?
  - b. So, what do you think about the way the instructor teaches statistics now?

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