

## Virtual Discussion for Real Understanding

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### Abstract

One of the challenges of teaching is engaging students in a subject they do not see as relevant to them. This issue is especially prevalent when teaching statistics to health science students as many do not consider statistics an important piece of their medical training. Additional difficulty is presented when teaching courses via distance technology or courses that are partially or completely online as the valuable class discussion component is lost. This paper focuses on fostering “discussion” about statistical concepts and how they relate to each student on an individual level. The approach includes an online discussion board where students participate in guided questions and post and critique an article related to their field of study. The objectives are to enhance knowledge, develop critical thinking, and gain an appreciation of how statistics is used in their field. Students must reflect on why statistics is important in their field and respond to other students’ posts. This approach has been successfully used in an online class for Allied Health students in a large graduate level biostatistics class including both synchronous and asynchronous distance learners.

**Key words:** discussion board; online; distance learning

### 1. Introduction

Statistics is hard. Ask anyone. The mere mention of statistics or anything close to it is met with grumbles or comments about how much someone hated his or her statistics class. Add to it the fact that students think of statistics as something completely unrelated to anything they will ever do or anything they will ever need to know, and what you get is a very difficult class to teach. Many have proposed wonderful methods for engaging students in activities or discussions where hands-on learning or thought-provoking concepts can be utilized and explored (Melton 2004, Boyle 1999). However, the current trends in education seem to be leaning more and more toward offering online courses (Cox & Cox 2008). This trend is a double edged sword as it provides greater access to classes for students, although the quality or experience may or may not be the same (Webster & Hackley 1997, DeVaney 2010, Ward 2004). According to Galusha’s 1998 report on distance learning, “problems and barriers encountered by the student fall into several distinct categories; costs and motivators, feedback and teacher contact, student support and services, alienation and isolation, lack of experience, and training.”

Roblyer & Ekhaml (2000) and others have reported that increased student involvement and interaction resulted in increased learning, improved grades, and improved student satisfaction. There have been great developments in engaging students in statistics courses as well as in distance learning courses or online courses (Everson 2006, Everson & Garfield 2008, Brown 2001, Nicholson & Bond 2003, Wickstrom 2003, Cox & Cox 2008), and even using online components in a traditional statistics classroom (Ward

2004, Malone & Bilder 2001) but what about when one class contains all three: traditional classroom students, distance students, and asynchronous distance learners?

Levine (2007) provides guidelines and tips for using an online discussion board and Harman & Koochang (2005) discuss the online discussion board's role as a learning object to incorporate elements of constructivism learning theory such as: "collaboration, cooperation, exploration, higher-order thinking skills, knowledge construction, learner driven goals and objectives, multiple perspectives, multiple representations of content/idea/concept, negotiation among learners, learners previous experience, real-world situations/problems, social disclosure, social negotiation, and the use of primary sources of data." Many of these are elements that statistics instructors already diligently try to include in their classes. Teikmanis & Armstrong (2001) have used a discussion board in a pathophysiology course to shift learning from "teacher orchestrated to student centered" and discussion boards have been used in rural medical rotations (Baker, Eley, & Lasserre 2005) and many other subjects (Cox & Cox 2008, Nicholson & Bond 2003, Wickstrom 2003, Rainsbury & Malcolm 2003, Nodder & Young 2001), and have been effective in increasing student participation and understanding.

The purpose of this paper is to introduce an approach to engaging students, both those in and those out of the classroom, by using an online discussion board in a graduate level introductory biostatistics course. The activities used promote critical thinking and discussion on a deeper level than what is allowed during scheduled class time. The proposed approach can be used in any type of class, and has been used by the author in regular lecture style classes, an online class, and classes that include both synchronous and asynchronous distance learners.

## **2. The Issues**

The issues that this paper addresses are two-fold: (1) Increasing students' interest and appreciation for a subject that most have decided they don't like and don't need before they set foot in the classroom (real or virtual) and (2) creating a classroom of discussion, critical thinking, and inquiry when students are not starting on an equal playing field. By this, I mean they do not all have the same classroom experience. Some students are physically in the classroom, some are viewing the class via distance technology in another classroom, some are viewing class via live stream technology from their own home, and some are viewing asynchronously from another country. My goal is to make the learning experience as similar as possible for all these students.

## **3. The Approach**

The introductory biostatistics course I currently teach is once a week for two hours and 40 minutes. Each week it is structured so there is about 45-60 minutes of lecture, 20-30 minutes for in-class practice problems to receive immediate feedback, and then the same process is repeated with a new topic. The students also complete weekly homework assignments, a project, and 3 exams. As many instructors have experienced, class is barely enough time to cover the required topics, and does not allow for covering anything in detail or allow much time for discussion or critical thinking problems. Distance students find it difficult to participate in class discussion if they view through live stream as they must call in each time they have a question or comment, and impossible if they are asynchronous distance learners.

### **3.1 Part 1: Creating a classroom of discussion, critical thinking, and inquiry that includes distance and online students.**

While creating class discussion might be easy in some subjects, in statistics it is not. Students are used to math, where everything is black and white, they think, “What is there to discuss, it’s math, the answer is either right or wrong.” Statistics, however, is not that way and many students are uncomfortable with that. Retraining students to actually think about a problem instead of simply trying to follow steps to get the answer is half the battle, and one that statistics professors have been fighting for years (DeVeaux 2007). This retraining must include giving students experience with problems that are not black and white, problems that are difficult and require thinking. Requiring thinking also requires that students have time to think, and extra time is not a luxury that most classroom instructors have. In a typical classroom these types of problems are often incorporated as group exercises either with or without guidance from the instructor. Students who are viewing from another classroom, their home, or using an archived video in another country lose out on these experiences. The question I have asked is “How can I bring these experiences to them?” or at least how can I make it similar for all students.

My solution was to put those types of problems on the course discussion board. Most classes these days have a course web-site where instructors can post things and students can check their grades. These web-sites often have other tools that can be very useful, one of which is the discussion board. Posting on the discussion board allows for follow-up on the class material, but at a deeper level. After class, students can look at the topic, have time to think about it, and post their response. They are also able to read posts from other students and discuss the topic in more detail. The questions or topics I post are often questions that do not have a right or wrong answer, they are aimed at getting the students to look beyond the surface of a problem and think about statistical topics critically and on a deeper level or so they can put statistical concepts into familiar terms to aid in understanding. The topics selected are both health sciences focused and general ideas, and are based on things that ideally I would like to discuss or have the students experience in class. However, this approach allows more flexibility as students have more time to think on their own, and most importantly it allows all students to participate at an equal level.

The first discussion board posting is on variable summary methods (adapted from De Veaux 2007). Students are given a variable with no background information and asked to find the best way to summarize it graphically and numerically. This lesson has several important points. First, it gives students practice with concepts covered in the first week of class: types of data, graphical summaries, and numerical summaries. Second, it lets them really dig in and play with the data right away on their own. Third, it gives practice working with the software package used in class, SPSS. Finally, and perhaps most importantly, it reveals to them right away that it is difficult to do anything, even something as simple as making a graph, without any context. Of course, they are told during class that it is important to know background information, type of data, etc. before doing any analysis but this activity helps to drive that point home. Students report being very frustrated by this activity as they are searching for the “right” answer, but they also enjoy looking at the data in many ways and exploring it themselves. This is the beginning of the retraining; in statistics there is not always one “right” answer.

Another example of a discussion topic is the classic problem of relating hypothesis testing to criminal trials (Pagano & Gauvreau 2000). Students are asked to think about criminal trials and put it in a hypothesis testing situation including stating the hypotheses, interpreting the conclusions if they were to reject or fail to reject the null, interpreting the two types of errors, and deciding which type of error has more serious consequences. The students discuss the last of these most, inevitably giving examples of when each type of error would be worse to make, and come away knowing that the worse error to make depends on the situation and the consequences of the error. Students will usually notice that someone has said that if we fail to reject the null (innocence), then the conclusion is the defendant is “innocent” and point out that the correct answer is the defendant is “not guilty”. This example helps students to put statistical terminology in familiar terms and to understand why the null hypothesis is not rejected instead of “accepted” by showing that lack of evidence for an alternative hypothesis does not prove the null hypothesis.

A third example includes having students watch a video segment from a Good Morning America (GMA) Consumer Alert about an important public health topic, nutritional information on food labels (ABCNews 2008). The video describes how GMA hired a lab to sample one package of twelve different products and explains how food products are obviously mislabeled since their findings did not match the label on the product. Students are quick to point out that sampling one of each product is not enough to represent all products. It gives them a real life look at sampling variability, why sample size is so important, and why we make inferences about means instead of individual observations. This is a way for students to see how statistical information is used by the media, and will help them be more skeptical and better consumers of information.

While these examples of problems are not new in themselves, the approach to class discussion of complex problems using an online discussion board is a creative and effective way to include or expand on topics with limited class time. Topics can be structured, predefined questions like those described above, or they can be derived from student interest or questions in class.

In the initial trial of the discussion board activity, students could participate for extra credit. During this phase, the goal was to see if the topics chosen were good, if students were getting what I wanted them to out of each topic, and to assess acceptability by the students. Once the questions were set, the discussion board participation was incorporated into the overall grade. There are typically at least eight topics posted per semester, and students are required to participate in a minimum of four posts. At least two posts must be their original replies to the topic I posted, and at least two posts must be responses to other classmates. The second requirement was to ensure that students would read each other’s posts to start discussion. The first semester this discussion board participation was required, I would announce in class when a topic had been posted and give students a week to respond, but many students would forget to post and run out of topics before completing the four posts. Instead, I now include each discussion due date in the syllabus with the course schedule. This lets students know what course topics have corresponding discussions and their approximate due dates. Participation is much better; students participate early to get it out of the way, and then continue to participate even though they have met the requirements because they enjoy the thought-provoking topics and discussion with other students. This is a great way for all students to be involved in a discussion no matter their location. It also gives students a safe place to contribute if they do not feel comfortable speaking up in front of the entire class.

### **3.2 The Approach Part 2: Increasing interest in and appreciation for statistics in the health sciences student.**

A familiar question in an undergraduate statistics or math class is “Why do I need to know this?” Students do not understand why they need to take a statistics course or how they would ever use it in real life. Recent changes in statistics curriculum that emphasizes numerical literacy and statistics in the “real world” has helped address this problem (GAISE report 2010). There is a similar issue in a graduate level biostatistics class, but another somewhat opposite issue is introduced, especially with a mixed audience. The course I teach, much like most others, has students with very mixed backgrounds. The majority are medical students, nursing students, basic science or public health students. From this diverse group emerge two themes. The first is similar to that of the undergraduate course where students do not think the course is relevant or useful to their medical or public health training. In the second, many of these students have been exposed to research and statistical methods on a variety of levels, from attending journal clubs in their department where statistical methodology is discussed, to reading journal articles containing statistical results, and possibly even publishing their own paper that includes the use of statistical methods. This second group also views the course as irrelevant to their study or career, but for different reasons as they may view their knowledge of statistics as beyond the level of the class. This was difficult to become accustomed to as I was used to an undergraduate classroom where students did not yet have statistical experiences or an in-depth understanding of their own subject. The need for more in-depth exercises for these future scientists and health professionals than one would find in an undergraduate course is one that had to be addressed. The activities proposed are great for graduate students who have had more statistical experience as they can question on a deeper level based on their experiences.

The approach to address this issue works for both groups and includes assigning each student to do an article critique. They can choose any article from a popular news source or scientific journal, and it must be closely related to their own field of study or interests. Article critiques are done in many courses, but the additions to this assignment are what make it unique.

For the assignment, the students first summarize the article and critique the use of statistical methods. The first thing students realize is that statistics can be found almost everywhere, in any media, and they report having a difficult time choosing an article, not because they cannot find one, but because there are so many choices. This is often very surprising to them if they had thought statistics was not relevant to their area of study. The next thing they realize, especially if choosing a journal article, is they do not understand a lot of the methods used. Even students who are very familiar with the subject matter report not understanding all of the statistical methods and results. I tell the students to expect this, but they are still very surprised at the volume of things they come across that are not covered in class. This is a very important lesson from the assignment; a t-test is not the only thing out there! Often times students will look up the methods they do not understand and be curious to learn more about them.

The second part is for students to write about how things we cover in class have contributed to their understanding of the statistical methods used in the article. Students will sometimes write that they understood a term incorrectly and how the class has helped them to understand it better. Third, students must provide their opinions on the uses of statistics in the article and how it contributed to or detracted from the understanding and

clarity of the article and provide suggestions for improvement. They only need discuss the parts of the article they understand, which usually consist of summary statistics, graphs, and simple tests. Students often comment on the graphs, either they were helpful or very difficult to understand.

My favorite part of the assignment is where students are asked to write about how statistics is used, why it is important to their field, and how they anticipate they will use statistics throughout their career. This portion of the assignment gets students to really look at their field of study, think about their career goals and realize that statistics is everywhere, part of every discipline, from being a physician to careers in public health. They may not be conducting their own analyses, but they discover why it is important to understand various topics even if they will not be actively using the methods themselves. This part is the most interesting for me as students reveal uses of statistics in their fields that had never crossed my mind.

Finally, students must post their articles and critiques on the course discussion board to share and discuss with others. This enables them to learn not only that statistics is important and useful in their field, but in others areas as well. Students report surprise that so many fields utilize statistical methods in so many ways, and that they never thought of statistics as that important until this assignment. In addition, in the end of course evaluations, many students have reported that this was their favorite part of the class and it led them to gain a deeper appreciation for statistics in general, its use in their field, and relevance to their everyday lives.

The assignment is designed so different students submit at different times during the semester. This allows students to focus on current topics of class in their critiques and to build on what they have learned as the semester progresses. After several posts, students are also able to see and discuss the differences in presentation of statistical information between popular media sources and scientific journals.

#### **4. Conclusion**

This paper has presented approaches for dealing with pressing issues in statistics classes in a new way utilizing existing technology. The proposed activities are aimed to foster discussion in classes where time is short, students are not all in the same room or not all viewing class at the same time, and to stimulate critical thinking, understanding and appreciation for a subject that is foreign and difficult. These approaches can be modified for any class, whether it is a traditional lecture style class or an online class, statistics class or another subject area; they are easy to employ, increase student interaction with other students as well as the instructor, help the instructor facilitate discussion, and are very successful and well received by the students.

#### **5. References**

ABCNews (2008), Available at

<http://abcnews.go.com/Video/playerIndex?id=4602602&afil=ketv>

Aliaga, M., Cuff, C., Garfield, J., Lock, R., Utts, J. and Witmer, J. (2010), “Guidelines for Assessment and Instruction in Statistics Education (GAISA): College Report,” Published by American Statistical Association.

- Baker, P., Eley, D., and Lasserre, K. (2005), "Tradition and Technology: Teaching Rural Medicine Using an Internet Discussion Board," *Rural and Remote Health*, 5(4).
- Ben-Zvi, D. (2007), "Using Wiki to Promote Collaborative Learning in Statistics Education," *Technology Innovations in Statistics Education*, 1(1).
- Boyle, C.R (1999), "A Problem-Based Learning Approach to Teaching Biostatistics," *Journal of Statistics Education*, 7(1).
- Brown, R. E. (2001), "The Process of Community-Building in the Distance Learning Class," *Journal of Asynchronous Learning Networks*, 5(2).
- Cox, B. and Cox, B. (2008), "Developing Interpersonal and Group Dynamics through Asynchronous Threaded Discussions: The Use of Discussion Board in Collaborative Learning," *Education*, 128(4), 553-565.
- DeVaney, T.A. (2010), "Anxiety and Attitude of Graduate Students in On-Campus vs. Online Statistics Courses," *Journal of Statistics Education*, 18(1).
- De Veaux, R. (2007), "Math is Music—Stats is Literature," [presentation] Available at <http://web.williams.edu/go/math/rdeveaux/>
- Everson, M. (2006). Group discussion in online statistics courses. *eLearn Magazine*, <http://www.elearnmag.org/>.
- Everson, M. G. and Garfield, J. (2008), "An Innovative Approach to Teaching Online Statistics Courses," *Technology Innovations in Statistics Education*, 2(1).
- Galusha, J. M. (1998), "Barriers to Learning in Distance Education," Available at <http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED416377>
- Harman, K. and Koohang, A. (2005), "Discussion Board: A Learning Object," *Interdisciplinary Journal of Knowledge and Learning Objects*, 1.
- Levine, S.J. (2007), "The Online Discussion Board," *New Directions for Adult and Continuing Education*, 113.
- Malone, C.J. and Bilder, C.R. (2001), "Statistics Course Web Sites: Beyond syllabus.html," *Journal of Statistics Education*, 9(2).
- Melton, K. I. (2004), "Statistical Thinking Activities: Some Simple Exercises with Powerful Lessons," *Journal of Statistics Education*, 12(2).
- Nicholson, S.A. and Bond, N. (2003), "Collaborative Reflection and Professional Community Building: An Analysis of Preservice Teachers' Use of an Electronic Discussion Board," *Journal of Technology and Teacher Education*, 11(2), 259-279.
- Nodder, C., Young, A., and Joyce, D. (2001), "Using an Electronic Discussion Board to Supplement Classroom Sessions with Post Graduate Teacher Education Students," *Proceedings of Society for Information Technology & Teacher Education International Conference 2001*, 2864-2867.

- Pagano, M. and Gauvreau, K. (2000), *Principles of Biostatistics*, 2<sup>nd</sup> Edition, Pacific Grove, CA: Duxbury.
- Rainsbusry, E. and Malcolm, P. (2003), "Extending the Classroom Boundaries—an Evaluation of an Asynchronous Discussion Board," *Accounting Education*, 12(1), 49-61.
- Roblyer, M.D. and Ekhaml, L. (2000), "How Interactive are YOUR Distance Courses? A Rubric for Assessing Interaction in Distance Learning," *Proceeding of the Distance Learning Administration Conference*.
- Teikmanis, M. and Armstrong, J. (2001), "Teaching Pathophysiology to Diverse Students Using an Online Discussion Board," *Computer Informatics Nursing*, 19(2), 75-81.
- Ward, B. (2004), "The Best of Both Worlds: A Hybrid Statistics Course," *Journal of Statistics Education*, 12 (3).
- Webster, J. and Hackley, P. (1997), "Teaching Effectiveness in Technology-Mediated Distance Learning," *The Academy of Management Journal*, 40(6), 1282-1309.
- Wickstrom, C.D. (2003), "A "Funny" Thing Happened on the Way to the Forum: A Teacher Educator Uses a Web-Based Discussion Board to Promote Reflection, Encourage Engagement, and Develop Collegiality in Preservice Teachers," *Journal of Adolescent & Adult Literacy*, 46(5), 414-423.