Using Low-Tech Chat to Foster High Quality Interactions in an Online Statistics Course

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Abstract

Current practice in statistics education emphasizes active learning and collaborative work so that students engage with the material and with each other. These two techniques are important in traditional courses, but are especially vital in online statistics courses that are typically designed for independent, solitary learning. To mitigate this passive approach, online instructors need to build "social presence" in their course by deliberately incorporating student-student activities. These activities, while relatively easy to add to a traditional course where students assemble three times per week, can be challenging to include in an online course where students are physically isolated. To develop this sort of activity, distance instructors can think small and plan smart by adding online chats. Chats are easy to add because they are low-tech, familiar to most students, and part of most course management systems such as Blackboard. When we incorporated regularly scheduled, tightly focused, required chat sessions into an introductory online statistics course, student ratings of the chats were overwhelmingly positive. Specifically, 87 percent of respondents (n = 16) reported that the chats were "rewarding or very rewarding" and 81 percent said that the chats were "helpful or very helpful in learning the material." Open-ended comments were overwhelmingly positive: "I was really worried about the chats in the beginning…once we started I used them well" and "chats allowed me to ask other students for help and get their input on how to solve a question from their perspective." Chats also received high marks from instructors for their ease of incorporating in the course and their low-tech simplicity. We found that chats gave students meaningful opportunities for active learning and collaborative problem solving that are difficult to include in typical online statistics courses. They are a regular part of our courses. Specifics on implementing chats, grading rubrics, and management strategies will be discussed.

Key Words: online, distance, active learning

1. Overview

Current best practices in statistics education emphasize active learning and collaborative work as discussed in the GAISE College Report (2005). While relatively easy to incorporate in face-to-face courses, these practices are very difficult to include in online courses which tend to be passive by nature. Unfortunately, this student-student exchange is even more important in distance courses because the nature of online education focuses more on individuals than a group, leaving learners in isolation (Sloboda, 2005). We

wanted to incorporate an active learning component in our course that would address those shortcomings.

One such type of component, synchronous question-and-answer sessions, was recommended as an essential component of statistical or math courses and as a way to enhance more personal contact among students (Thomson et. al., 2006). Additionally, King (2007) endorsed this type of session for instructors who are inexperienced with technology or are overwhelmed with the many options that are available. Ultimately, we selected this type of simple, synchronous communication tool - online chat sessions – and added it to our course in a pilot study. Here we report the results of our study with particular emphasis on how we integrated chat into the course, and student and instructor perceptions of learning and course satisfaction.

2.0 Incorporation of Chat into Online Course

2.1 Instructional Setting

Applied Statistics 311 is an introductory statistics course that is required of most non-liberal arts majors at New Mexico State University. Consequently the quantitative abilities and interests of students vary widely. Often students' anxiety levels are quite high because the material is considered "hard" and the course is a must-pass for graduation.

The online section of the course is delivered completely via a course management system (CMS) and consists of a technology introduction plus six units on statistics. The statistics units follow the "cognitive apprenticeship" strategy proposed by Vygotsky and referenced in Wilson et. al. (1993), where students work through a series of increasingly difficult problems, initially by using videos and detailed handouts from the instructor, next with coaching from their chat partner, and finally on their own with little scaffolding from instructor or other students. Course material is presented in 14-day units. Each unit has two assignments: submission of a chat transcript due on day 9 and submission of homework problems due on day 14.

Prior to incorporating chat, student-student and student-instructor feedback consisted of email, phone calls, and a discussion board where students could post questions and get help. None of these communication tools were required. It was possible, and very likely, that students would complete each unit with no interaction from other students or the instructor except for detailed comments from the instructor on graded homework assignments.

2.2 Integration into Course

Chats were incorporated as deliberate additions to the existing course structure. They were discussed in the syllabus, scheduled in the calendar, and assigned sufficient importance so that they were a portion of the overall semester grade. Chats were focused on two assigned problems so that the discussion would have a specific agenda. Each student submitted the actual transcript of his/her chat for credit. After the due date a key was posted. Within the two-week time frame for each unit, the chat problems were posted on Day 1 and the chat assignment had to be completed by Day 9, leaving time for students to coordinate schedules and complete the problems. Chat groups usually

consisted of two students, occasionally three depending on the number of students in the course. The instructor did not participate in the chats at all. The chat assignments were graded based on the quality of the discussion, not so much if the students arrived at the correct answer.

From a technology standpoint, the chat tool itself needed to be readily available on all platforms, to automatically record and save the dialog, and to be user friendly. The CMS we used initially, WebCT and Blackboard, had internal chat tools that generally met those conditions. The current CMS, Canvas, has a chat tool but does not record the dialog, so we now use a cloud application, Google Docs.

To familiarize students with the technology and our expectations for the chat sessions, the first assignment was a dry run. Detailed instructions and a sample dialog were provided. Students had to enter a chat room, type in a few sentences as a "dialog", copy and save the dialog, and submit as a file in the CMS. Credit was given for this initial familiarization.

To evaluate the effectiveness of chats from the students' perspectives, we asked them to complete an anonymous questionnaire at the end of the semester. Of the 21 students in the course, 16 responded. The questionnaire consisted of 3 open-ended questions and 8 questions with Likert responses.

3.0 RESULTS

3.1 Student Outcomes

Although our sample size was small, results clearly indicated that chat sessions were beneficial according to those students who responded. Importantly, 81% of respondents reported that the chats were helpful in learning the material (Figure 1). Also important was the increase in involvement in the course for 88% of the respondents (Figure 2). Although student involvement is not a direct measure of learning outcomes, it is related indirectly to increased learning outcomes, as demonstrated by Magel (1998), who used cooperative learning in large introductory statistics classes.

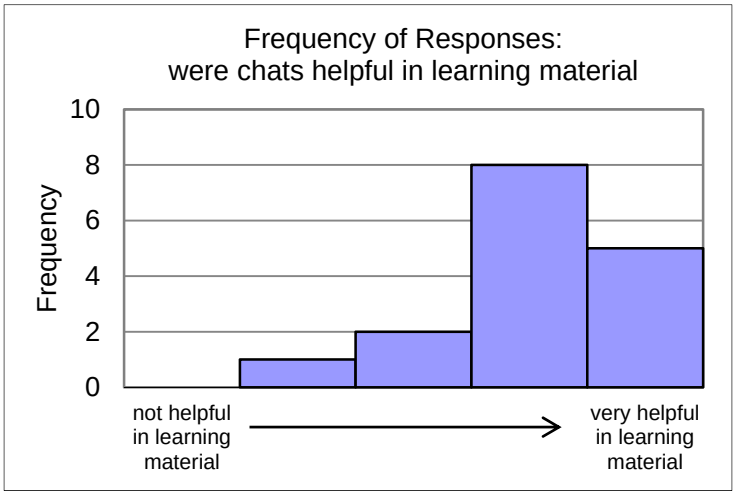

Figure 1. Frequencies of questionnaire responses: were chats helpful in learning the material?

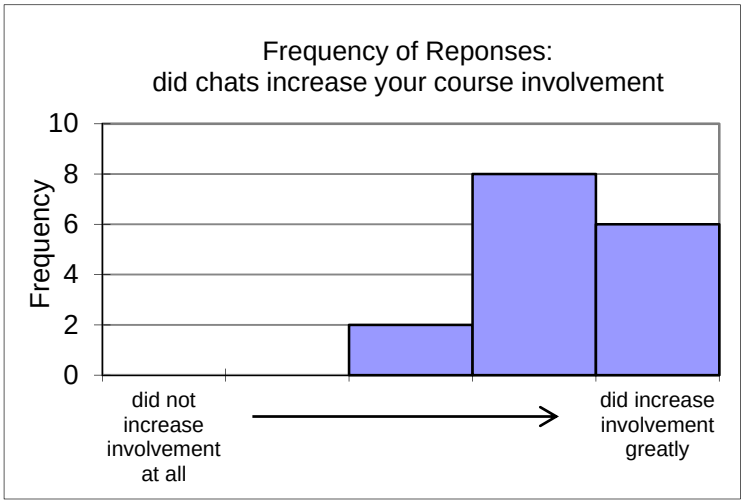

Figure 2. Frequencies of questionnaire responses: did chats increase your involvement with the course?

Other indications of chat usefulness were encouraging as well (Table 1). Chats fostered a sense of community. The majority of respondents felt chats were rewarding and helpful in meeting others. Interestingly, respondents rated their own level of preparedness somewhat higher in general than their partner's level. Overall, they felt the quality of the discussions was high.

Table 1. Percent of responses about chat sessions from post-course questionnaire

Questions	Percents of Likert responses (n = 16)				
	1	2	3	4	5
useless...rewarding overall	0	0	12.5	50	37.5
not helpful...very helpful to meet others	0	18.8	12.5	37.5	31.3
low...high quality of discussion	0	0	25	50	25
difficult... easy to schedule with partner	0	6.3	31.3	31.3	31.3
low...high level of partner preparedness	0	0	30.8	30.8	38.5
low...high of my preparedness	0	0	12.5	68.8	18.8

Based on responses to open-ended questions, most students felt group sizes of two or three were optimal. Respondents were evenly divided on whether partners should be rotated. Unresponsive partners were particularly frustrating. Students were very concerned about wasting time on meandering discussions, thus confirming the importance of assigning specific problems to discuss. As one student noted, "The best way to prepare for the chats was to have questions to talk about. I really appreciated

that." A few students commented that they appreciated the chat transcripts as a learning tool for reference during the course.

Students were initially very resistant to chats. They did not trust that their grade would be based on the quality of their dialog and were cautious about sharing answers with their partners. After the first two chats were graded, they were much more relaxed with the process and our expectations. ("I was really worried about the chats in the beginning because I really had no idea how this class was going to go. Once we started I was less apprehensive and used them well.")

3.2 Instructor perspective

Students' attitudes toward chats changed through the semester, finally coming to see the sessions as opportunities to work problems in a nonthreatening environment with their partner. They became more responsible, entering the chat room promptly and more fully prepared to discuss the assigned problems. The quality of the sessions greatly improved as well. Some students used the chat logs that were always available in the CMS as study tools. We saw more consistent student engagement throughout the semester instead of the usual flurry of activity near an exam.

We were pleased with many aspects of the chats. For instance, our choice of synchronous chat rather than asynchronous discussions facilitated immediate resolutions to problems. Additionally, our assignment of two specific questions was very effective, maximizing students' time on task and focusing their energy on the problems at hand. According to TaiSeale and Thompson (2000) this type of "assigned conversation" increased students' level of preparation, active participation, and the amount learned. Finally, the 9-day turn-around time from the initial posting of partner assignments and problems to discuss to the deadline for submission of the assignment worked well.

Chats had their challenges as well. The partners themselves could be problematic. No-shows, unprepared partners, and unresponsive partners increased the instructor's workload and stress level. Occasionally students with very dissimilar levels of expertise were paired. In those cases, the instructor contacted the better performing student and diplomatically asked if he/she would be comfortable in more of a teaching role than a real partner role. (The response was almost always positive and usually included the observation that teaching was a good way to learn.)

A second challenge was evaluating the chat discussions because that sort of judgment was less familiar than grading quantitative assignments. To illustrate some of the considerations in grading chats, consider the following excerpt from a chat log with three students (#1, #2, and #3) in the group. The question to be discussed was on using the normal probability table to find a proportion:

> High birth weights are associated with negative maternal factors such as abnormally high blood sugar levels, pre-pregnancy overweight, and excessive pregnancy weight gain. What proportion of newborns are termed high birth weight, that is, they weigh more than 4500 g regardless of gestational age? Birth weights in the United States are normally distributed with a mean of 3420 grams and a standard deviation of 495 grams.

1: Hey folks! Not sure of the exact format we should be following here

2: Oops. I am still working on completing the homework problems, but feel pretty good about the ones I have completed.

3: How do we covert the variable birth weight to a standard normal variable (z score)?

2: We were to use information from the previous page that stated that we are to assume that birth weights in US are normally distributed with a mean of 3420 grams and a standard deviation of 495 grams. The random variable X to birth weights.

1: There is a formula we use: z = (x-m) divided by the standard deviation

3: 4500-3420?

1: divided by 495. Then we go to the back of the book and look at the normal tables to find the area.

3: Z score would equal to 2.2? Correct?

2: is this then indicated (per table if I am reading correctly) as .9783?

1: 4500-3420 divided by 495 = 2.1818? Then on the table it would be = .9854

3: would we round it off? or just simply a 2.18? How did you get that number? Where is the table you guys are talking about?

2: My book is the old edition. Tables are the first two pages of the book.

1: You are looking for the "normal" tables in the back. Should be first set.

2: Table A - Standard normal probabilities.

3: What page is that?

#2: I see where I was reading the table incorrectly with my previous response. Thanks for the insight

3: Okay, got it.

1: page T-2 or after 695

2: Did we get all the questions answered? # 1 provided the formula to find the z score and we did the calculations to determine it was 2.18 and found it by utilizing table a .

3: I think we are done here?

2: I think so too. Good job everyone.

This particular transcript shows the strength of chats as a teaching tool as well as the variability of students themselves as group members. Students #1 and #2 were very cooperative, teaching #3 how to solve the problem in detail. Student #1 even typed the

formula, and in doing so, substituted the description "standard deviation" for the symbol σ. By translating the formula into words, the student demonstrated a thorough understanding of the formula itself. Student #2 found her own error in reading the normal probability table by comparing her answer with #1's value. Note that no one answered the problem correctly: they found the proportion of newborns who weighed less than 4500 g, instead of the proportion who weighed more than 4500g as the question asked. No points were deducted from any grades for that error; however, we told all three students to check the key for the final step in the process of finding the proportion of observations greater than X. This dialog also shows that #3 was not well prepared and had not attempted to do the problem, even by guessing at the formula or appropriate examples in the text. It is difficult to discern if a student has really struggled with a problem and could not get started, or if the student has simply not tried at all.

A very positive aspect of reviewing the chat dialogs was that we saw clearly how students put the pieces together to form an answer and where that assembly might be incorrect. Also, chats forced students to phrase their reasoning in correct statistical and mathematical terminology so their partners would understand. Something as basic as the symbol "≥" proved challenging for some students to describe in text. Chats facilitated this sort of learning experience, as noted by Pollanen (2006) and illustrated in the excerpt above.

4.0 Conclusions

As a long-time instructor of online statistics noted, distance math courses can be successful as long as they contain interaction components such as small group discussion among students (Tudor, 2006). We found that chat sessions provided that kind of dynamic dimension in a relatively simple framework. Chats increased continuous student involvement in the course and helped build a learning community that had been lacking. They gave evidence of learners scaffolding knowledge on complex topics such a probability models and inference.

Mathematics instructors have increasingly used technology to further social constructivist learning: to do this, the communication tool must be an integral part of the course requirements, and the online participation must be assessed (Dogan-Dunlap, 2004). Other implementation strategies include:

- Incorporate chats into the instructional design of your course and the syllabus, as assignments for credit, not optional busywork.
- Include a sufficient number of chat sessions so they comprise about 10-15% of the course grade. Also this gives students an opportunity to become comfortable with the assignment itself and improve their discussions.
- Do a dry run for credit to give students experience with the technology before adding the course material. Be sure the instructor is very familiar with the chat tool as well.
- Assign 2 or 3 specific problems for one session. That should take no more than 30 minutes to discuss – much less if both partners are well-prepared.
- Assign groups of 2 or 3 students, no more.
- Allow sufficient time for students to arrange a common time to chat and to complete the problems on their own.
- Assign credit based on the quality of the chat, not the correctness of the answer

Challenges to consider include:

- Carefully consider how to assign partners: similar or dissimilar levels of preparedness
- Plan in advance how to deal with unresponsive partners or last-minute emergencies

As Velleman and Moore (1996) noted: "our task as teachers is to use the new technology wisely, taking advantage of its substantial strengths while not overlooking the importance of the human factor in education. Our task is also to improve the pedagogy built into the technological platform itself." Chats accomplish both tasks. Yes, they ARE work for the instructor, but they are well worth it. They are a readily available, low-tech, high-reward means of fostering active learning and engagement in statistics courses.

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