

# Statistics 2011 Impact Grant Report

## Project Committee

### Statistics members; Project lead

Jackie Miller, Pilot Instructor

### Statistics members; Project contributors

Mark Risser, Graduate research associate (Au11-Su12)  
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Staci White, Graduate research associate (Wi11, Su12)  
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Kythrie Silva, Statistics learning technology (through Wi11)  
Michelle Everson, External evaluator  
Michael Posner, External evaluator

## Executive Summary

After semester conversion, student enrollment in Statistics 1450 (Stats 145 during quarters) is anticipated to climb from 350 students per quarter to 500 students per semester. Finding large lecture halls on campus at times when students want (and are able) to attend class will be increasingly difficult.

- Solution: Give students choices. Students will choose between face-to-face lecture, online lecture (synchronously), or online lecture (asynchronously).

Time in lecture will increase by 6.9% (1440 min per quarter, 1540 min per semester), while time in recitation will decline by 20% (960 min per quarter, 770 min per semester). Currently, a typical recitation includes a brief review of important concepts from lecture, an in-class activity, and question and answer time (covering the in-class activity, homework problems, and/or lecture questions).

- Solution: Given that we have 20% less time in recitation, lecture review is a luxury we can't afford. To tackle this issue, we used an online lecture review and assessment that was due after every lecture and before recitation. The online materials and assessment 'set-up' the recitation activity which helped students be better prepared to immediately dig-in to the recitation activity. Students spent time on activities and questions instead of lecture review during recitation. The streamed/online lectures were recorded, allowing students to review the lectures, any time/any place.

## Problem / Opportunity

Semester conversion will necessitate increased enrollment in courses across the university. GEC courses (like Statistics 145) could see enrollment per term increase by 50%, ignoring any increase that comes from the current growth of the course. Larger classes will be competing for the few large lecture halls on campus (currently only five lecture halls on main campus can seat 250+ students). Many courses taught with the lecture/recitation format will have time issues similar to Statistics 145, including several in our department (e.g., Stat 133 and Stat 135).

Statistics 145 can provide a model for our department and the university by leveraging technology to solve space constraints, while also providing rich and flexible learning opportunities for students.

## Project Goal(s)

The main goal of this project was to determine processes for managing a course concurrently delivering online and face-to-face content. Other goals included:

- Increasing student participation and engagement through a process that is scalable to larger lecture size and more students per lecture.
- Increasing concept understanding and course satisfaction.
- Incorporating a solution to allow students to attend face-to-face or online.
- Providing opportunities for students to ask questions to the TA or instructor.
- Determining a process for meeting core requirements for facilitating similar courses in the future.

## Success Criteria

Our definition of success included:

- Stable or increased student grades.
  - Success
- No increase in course drop rate.
  - Success
- Increase interest and enrollment in the course.
  - Success
- Positive student views toward the course.
  - Success
- Students complete the lecture review activities on time.
  - Success
- Students perceive they have a choice in how to access lecture material.
  - Success
- Student improvement from pre-test to post-test (START test) is statistically significant.
  - Success; 8% increase
- Student attitude toward the course is high.
  - Success

## 2011 Impact Grant Pilot Experience

### Students affected by pilot:

During Autumn quarter 2011, 163 students completed the pilot section of Statistics 145 (Introduction to the Practice of Statistics).

### Anticipated number of students affected by Hyflex course design in 2012-2013:

Students enrolled in HyFlex section of Stats 145 during Winter 2012	174
Expected enrollment for Statistics 145 in Spring 2012	174
Expected enrollment for Statistics 1450 in Summer 2012	100
Expected enrollment for Statistics 1450 in Autumn 2012	500-600
Expected enrollment for Statistics 2450 in Autumn 2012	150
Students currently enrolled in Dr. Miller's section of Statistics 427 (Introduction to Probability and Statistics I) for Spring 2012	200

Other courses are expected to make use of the HyFlex model after 2012, including Statistics 1350 (Elementary Statistics), which has more than 2,000 students annually.

### Approximate time spent by Mathematics faculty and staff on the revision project:

Team Member	Approximate Hours
Jackie Miller	300
Mark Risser	150
Taylor Blake	30
Staci White	50
Tom Marker	60
Allen Coleman	45
Mike Kaylor	15
Laura Fathauer	5
Kythrie Silva	20
Michelle Everson	10
Michael Posner	4
<b>TOTAL</b>	<b>689</b>

Approximate total cost (not including LT staff time):

Resource	Cost
Poll Everywhere License	\$699
External evaluator stipend(s)	\$500
External evaluator travel	\$933.49
Sloan-C Symposium	\$2184.48
eMerge Conference	\$550
Table PCs (2)	\$2,768.96
Audio equipment for tablet PCs	\$194.94
Wireless microphone and receiver	\$869.06
Additional wireless microphones	\$190
Gift cards for incentives	\$185
Computer bag for tablet PC	\$73
GRA support	\$20,000
Tom Marker release	\$2,000
Kythrie Silva release	\$750
Distance Education Certification Program	\$2,800
<b>TOTAL</b>	<b>\$34,700</b>

*Additionally, after the pilot, the team used some additional funds to enhance the HyFlex model:*

Resource	Cost
Poll Everywhere License (2012-13)	\$699
Jackie Miller 2012 travel	\$800
Lilly Conference 2012	\$1,250
iPad2 with cover, dock, VGA cable	\$527
Microphone	\$190
Other technology to be determined	\$707
Jackie Miller supplemental compensation	\$2,500
<b>TOTAL</b>	<b>\$6,700</b>

## Overview of Project Implementation

This project set out to develop a new curriculum model to both accommodate the increased enrollment and improve the quality of Statistics 145. Specifically, a HyFlex (hybrid-flexible) model was chosen, in which students have a choice about how to attend lecture: either face-to-face (as usual) or synchronously online. To counteract the loss of time in recitation, lecture review was to be removed from recitation and reformatted into an online assessment assigned after every lecture and due before the next recitation meeting. Technology would be further leveraged through online polling and a backchannel to facilitate student participation for both face-to-face and online attendees. While the progress made through this pilot was to be immediately beneficial within Statistics 145, the project also sought to find a design applicable for expansion into other similar courses across the university and within the Department of Statistics.

The new and improved Statistics 145 was unveiled in late September 2011 at the start of fall quarter. Despite a clear and organized plan, the project proved to be a work in progress over its ten-week pilot, but the general format of the lecture period remained consistent. During each lecture, both Dr. Jackie Miller (department lead and course coordinator) and research assistant Mark Risser were present, with Miller at the front of the classroom, lecturing, and Risser situated with a laptop among the students, monitoring the backchannel. To accommodate the online viewership, a good deal of technical setup was required: Miller wore a wireless lapel microphone to provide an audio feed, and the lecture slides were projected in class via tablet PC. Both audio and lecture slides were streamed live through Adobe Connect (Figure B.1), a webinar tool, for students to view. A wired network connection and audio were used to avoid potential difficulties with wireless alternatives. As well as being streamed live, Miller's lectures were recorded to enable future viewing and reviewing for the students in the class; recorded lectures were posted on Carmen for students in the pilot section.

Students who chose to attend class synchronously were still able to interact with Miller, Risser, and the other face-to-face attendees through the aforementioned polling and backchannel. It should be noted that the development of this component was, in many ways, the most important part of the entire project: this model would be nearly indistinguishable from a traditional online course without a way for synchronous viewers to interact with the class. Poll Everywhere, a web-based polling site, was chosen for use as a result of compatible cost and accessibility (although other options were, and continue to be, under consideration). The backchannel was built upon a free-response Poll Everywhere webpage such that students viewing online could submit a question at any time during lecture. The submissions would then scroll down the public backchannel site (Figure B.2), visible to other students attending synchronously. As backchannel moderator, Risser would then either respond to the question directly (also through the backchannel) or repeat the question orally in class for Miller to provide a more thorough response. (Risser was equipped with a lapel microphone so any comments shared were captured on the recording.) Additionally, Poll Everywhere was used to incorporate

online polling during lecture (Figure B.3), periodically providing a short answer or multiple-choice question for the students to respond to online.

These technological innovations also benefitted the students who chose to attend face-to-face. Both the backchannel and the online polls were set up such that students could submit either a question about lecture content (to the backchannel) or a response to the collective poll question via a text message from their mobile device. Of course, with wireless Internet access in the lecture hall, some face-to-face attendees brought laptops to class and interacted with the polls and backchannel through a web browser (much like the synchronous viewers). Otherwise, the students present in the classroom received a lecture experience much like a traditional course.

Finally, students were assigned to complete a lecture review quiz (LRQ) after the lecture period but before recitation. Each LRQ was designed to reiterate important concepts from Miller's lecture as well as hold students accountable for experiencing the lecture content (through either face-to-face attendance, synchronous attendance, or by watching the lecture recordings at another time). Risser created the quizzes, each featuring two-to-five multiple-choice questions, which were then administered through Carmen. Feedback was given through Carmen via a worked solution to the problem with the correct answer. One of the questions always asked students to report their method of attendance for the day's lecture and, in total, LRQ completion accounted for 3% of the students' final grade.

#### **Impact Grant outcome summary:**

Much data was collected over the course of the pilot study, including attendance information (albeit mostly self-reported), grades, an end-of-term survey, and several focus groups run by the University Center for the Advancement of Teaching (UCAT). The quantitative information gleaned from attendance and grade information has been important in assessing the effectiveness of the HyFlex model; the qualitative information gained from the survey and focus groups has provided a fairly clear sense of what students did and did not like about the new curriculum. Both sources of information will be heavily influential as this classroom model is developed and adapted for future terms.

In the end-of-term survey, students were asked 30 questions about the class, with responses solicited on a Likert scale (strongly agree, agree, disagree, strongly disagree). Most of the questions revolved around the technology used in the course, including both the technologies used previously, such as Carmen and MyStatLab (the publisher-created software used for online homework), and the new "instructional technologies" implemented throughout the term (instructional technology was defined to be any combination of tablet-based slides in PowerPoint, statistical applets, Poll Everywhere, and Adobe Connect).

A total of 77 students (about 50% of the class) responded to the survey, with the high response rate assisted by incentives (a completed survey qualified the student for a gift card drawing). The feedback was encouraging: in general, students found

the instructional technologies easy to use and helpful to their learning. For example, 80% of students either “agreed” or “strongly agreed” that it was easy to access the online lectures through Adobe Connect (another 12% marked “not applicable”) and approximately 95% “agreed” or “strongly agreed” that instructional technology made the course materials more interesting and increased understanding of the course concepts. Complete results are available in Appendix C (Figures C.1, C.2, C.3).

The feedback from the focus groups proved to contain much overlap with the comments shared in the end-of-term survey, although the presence of a UCAT moderator allowed for more in-depth discussion of students’ comments and concerns. Three separate focus groups were held, but only seven students were surveyed (despite incentives for participation). Of the participants, most had attended class in a variety of ways, although two only attended class face to face. As with the end-of-term survey, strong opinions prevailed from the students. The common themes were as follows:

- When asked about how they chose to attend class from day to day, most students replied that their decision was based on whatever worked in their schedule on that particular day. Weather, other class and extracurricular commitments, and the need for extra sleep motivated Adobe Connect attendance; a preference for consistency and face-to-face instruction motivated in-class attendance.
- Comparing the experiences of the various attendance methods, several students said live was better than the recording because of the increased participation and the ability to speak with the instructor after class. Additionally, face-to-face provided a more engaging experience for some, particularly with respect to interacting with Dr. Miller. Others said attending synchronously online was better than either watching the recordings or attending face-to-face: they were able to stay more alert, focused, and comfortable outside of the classroom.
- One of the most important areas of feedback was with regard to the feelings of community felt (or not felt) by students. One student commented that Dr. Miller’s inclusive style gave a sense of connectedness (e.g., when asking a question, Dr. Miller would often say, “For those of you watching at home, feel free to type in your response”). However, the prevailing sentiment was a lack of community in the classroom. Several students commented that not recognizing their peers at full-group meetings (e.g., at the midterm) was detrimental, and in general the lower in-class attendance had a negative impact on feelings of community. Students added that any sense of community came from recitation groups.

- Students overwhelmingly replied that learning technology increased their participation in class. For example, having lecture recordings for review enabled one student to go back and re-listen to how Dr. Miller explained a difficult topic; online homework through MyStatLab was deemed helpful, particularly the sample problems and “help me solve this” feature; students found the polls helpful and engaging, and a fun way to check comprehension without the pressure of getting an answer wrong.

Participants also gave some suggestions for future students taking this HyFlex course. One student encouraged an open mind to the attendance options, elaborating that he didn’t expect to like the structure at the beginning of the quarter but loved the options by the end. Another provided a warning for future students to make sure they enjoy technology-based courses, as “everything is online.” Other suggestions for improvement from students were as follows:

- Make lectures available for download on iTunes or Spotify.
- Include more online polls to promote student engagement. (x2)
- Make lecture review for full points, or have it due after recitation.
- The online homework was good, but too expensive.
- Communicate to students beforehand about the level of technology to be used in the class.

Relevant student quotes from both the end-of-term survey and the focus groups are available in Appendix C.

A variety of quantitative data summaries are provided in Appendix A. Several points are particularly noteworthy:

1. Grades in all categories, and particularly for the final course grade, are quite consistent, with students in the “Recording” and “Not Attend” categories often scoring even higher than those who attended “Live.” Table A.2 contains a comparison of grades by primary (self-reported) attendance method (for example, a student in the “Adobe Connect” category attended class most often synchronously, via Adobe Connect).
2. Grades for students in Dr. Miller’s pilot section were slightly, but not significantly lower than those in the other fall sections (also including data from previous years). Table A.3 shows that students in the pilot section have mean and median course totals that are less than the other fall sections, but differences are within what might be expected from natural variation (for example, the mean from Dr. Miller’s section is less than two percentage points lower than the other day section, which is only a fraction of the standard deviation of 14 percentage points).



3. The mean course total is slightly less than previous years, but again not significantly so. Table A.4 compares combined data from all fall Stat 145 sections with previous terms. Furthermore, it should be noted that the grading scheme was adjusted starting in Autumn 2011: quizzes were weighted 10% (not 20%), the midterm was weighted 25% (not 20%), and the final exam was weighted 35% (not 30%). Given the difficulty level of each assessment, this would explain the decrease in grades.
4. Finally, we are able to demonstrate that the day of the week does impact how students decide to attend class. Table A.5 contains attendance information by day of the week. A Chi-squared test for independence gives that day of week and attendance method are *not* independent ( $X^2 = 57.3$  with  $df = 8$ ,  $p < 0.0001$ ). It may not be surprising that students are less likely to attend class in person on, for example, Fridays. That students were more likely to watch Friday lectures via Adobe Connect, however, suggests that the HyFlex model provides a tool for mitigating loss of learning due to the effect of weekends on attendance

Preliminary interpretation of the data has already identified a number of intriguing patterns:

- Course scores were not significantly different in the technology-enhanced section.
- Course scores were not significant different from prior terms, despite increased weights toward exams.
- Day of week did impact student attendance method.
  - More students attended face-to-face on Monday/Wednesday than on Friday whereas attendance synchronously online remained consistent each day of the week.
  - Face-to-face and synchronous online attendance was greater at the start of the term than at the end.
- 98% of the students would recommend the course to other students.
- 96% of students said the technology made the course materials more interesting.
- 95% of the students were satisfied with the course.
- 95% of students said the technology increased their understanding of course concepts.
- 94% of students prefer courses that use technology in the classroom.
- 92% of students said the technology was worth the time spent using it.
- 83% of students said the technology helped meet their preferred learning style.
- 71% of students said the technology increased their class participation above what they would have expected starting the course.

- 5% of students said, given a choice, they would most likely attend a face-to-face course without any technology.
  - 57% would attend face-to-face with technology.
  - 38% would attend a course solely online.

#### Reflections on the grant process – what went well:

A fantastic team of individuals were and continue to be invested in the success of this project. Without this team, the project would have been much less successful. Also, a university-wide HyFlex community is in the early stages of development, and Dr. Miller hopes to see Ohio State become a leader in the HyFlex model.

- (Comments from Tom Marker) “The ease with which the students have embraced the technology, and the minimal problems with the client end, has been amazing. I have been truly impressed with the overall robustness of the Adobe Connect server and the ease of use across platforms.”
- (Comments from Staci White) “I think the project was executed very nicely; the teamwork was amazing. There were so many people involved, especially in the beginning, to make sure every lecture went as planned. Even when technology issues did arise, there was a knowledgeable group of people to help find a solution quickly. My biggest concern prior to the project was losing all ‘vocal communication’ to technology. However, I found that this was not the case: the technology simply provided students with another option for communicating during class. I think this has created a greater sense of community in the classroom.”

#### Reflections on the grant process – what did not go well:

- The use of external evaluators is discouraged unless their duties are clearly spelled out while the charter is being written. For this project, it is uncertain whether the external evaluators were under-used or simply not needed. Secondly, it would be nice to have a platform for presenting the project within the department. Other departmental courses could benefit from the methods used in this project, but neither coordinator for the other large introductory courses has inquired about the project. Perhaps if all faculty and teaching staff knew about the efforts of this project, there would be more interest in and appreciation for the methods.

### Unanticipated Risks that Negatively Impacted Project Success

The biggest problems arose as a result of heavy reliance on technology. While many problems were anticipated and mitigated through testing, technical problems nevertheless happened. Without the dedication of the Statistics technical support staff these problems would have been much more obstructive. The technical issues experienced included (in order of frequency):

- Wireless microphone problems, causing a choppy audio feed.
- Lack of (consistent) compatibility between Poll Everywhere and Microsoft PowerPoint.
- Login and grading malfunctions with online homework modules (a recurring problem, outside the control of the project team).
- Adobe Connect crashing in the middle of lecture.

Specifically, the original microphone purchased was one with a receiver that had to be installed in the lecture room. This meant the microphone could only be used in the room with the receiver. Later, it was discovered that a microphone could be purchased and set to the same frequency as that which the university uses. This will allow for flexibility in any classrooms to be used in the future. Additionally, the interface between Poll Everywhere and PowerPoint did not always work, so Tom Marker installed a macro to permit toggling back and forth to a web browser within the PowerPoint presentation.

Finally, students in the classroom did not participate in the polls as much as expected. The reasons for this trend are quite mysterious and are still under investigation.

Of course, some of these problems were expected and could not reasonably be avoided, and for the most part any issues encountered were dealt with quickly, on the fly. However, other problems were deemed much more concerning and will impact the choice of technology used for future terms (see Tom Marker's comments below; many other choices are available).

(Comments from Tom Marker) "Coming from an environment where web streams are expected to be perfect, I was often frustrated with small technical issues involving hardware—specifically relating to audio problems, occasional network issues, and computers crashing. While I assure myself from time to time that pilot programs will encounter bumps in the road, I was unsatisfied with the frequency of problems encountered at the beginning. Looking at winter quarter, it seems that most of these problems have been addressed or sufficiently worked around. The general frustrations of working with Poll Everywhere, together with the frustrations of Flash, Office, and Connect, were probably the biggest disappointments that felt beyond my control. I would gladly use any other product for backchannel needs."

(Comments from Staci White) “Although I don't have any personal experience with the Lecture Review Quizzes, my sense is that the TAs aren't utilizing the information they provide to maximize the efficiency of recitation.”

### Key lessons learned:

True to its nature as a pilot study, this project experienced its fair share of problems, which required continual adaptation but also provided valuable learning for moving forward in a positive way.

In addition to technical problems discussed above, a primary issue encountered was the collection of attendance data from students. All of the previous analysis was conducted based on incomplete (not every student responded to every quiz), self-reported survey responses—not the most valid source of information. In general, the LRQs had a response rate of about 75-85% (120-140 out of approximately 160 total students). On the first day of class and in the syllabus, students were encouraged to honestly report their attendance and were promised anonymity with respect to attendance information affecting grades. However, one of the course TAs reported the following comment from a student:

*“I know Dr. Miller said my responses won't affect my grade, but I'm still not sure I feel comfortable honestly reporting how I attend class.”*

This comment confirms what was expected: students were commonly misreporting how they attended class. Accurate counts of how many students synchronously watched the lecture through Adobe Connect were available and partway through the term a headcount was discretely taken of how many students attended face-to-face, so some checking of self-reported data was possible. Nonetheless, doubting the integrity of the attendance data makes true analysis difficult and somewhat meaningless.

While attendance is consistent with previous terms, we note one student comment from the end-of-term survey: “The online recordings...made it too easy to skip class.” An important question to address as this project moves forward is: what is the best way to motivate students to experience the lecture, either through physical attendance or online?

Student feedback confirmed that neither online polling nor Adobe Connect truly work to build community in the classroom, despite Miller and Risser's hopes that this would happen and efforts to make it so. Students attending via Adobe Connect miss out on the physical experience of being in the classroom, while students who do not have laptops in the classroom cannot truly participate in backchannel discussion. Finding other ways to better develop the desired classroom community will be a priority in moving forward with this curriculum.

Finally, through the process of comparing results from this project with other similar projects, it was discovered that this project is much more advanced pedagogically. As a result, the technology required to reach a particular goal does

not always exist. Thus, it is important to think creatively about how use of the available technology can be optimized.

#### **Suggestions for future recipients:**

- If the discipline lead has not taken the Course Development Institute with the University for the Center of the Advancement of Teaching (UCAT), it is suggested that he or she does.
- Technology is not always trustworthy; it is advised to have a robust backup plan.

#### **A-ha moment of the grant process:**

This may seem like a strange “a-ha” moment, but through this project Dr. Miller learned how to ask for help, and furthermore that it is okay to ask for help. She reflected, “Sometimes others can do as good a job (or better) of completing tasks relating to the success of the project.”

Additionally, after reflection on the pilot section, both Miller and Risser had no idea how the technology would work going into the project! Surprisingly, the technology worked quite well, and the mostly positive comments from students were a nice validation of all the hard work that went into this project.

#### **Next steps:**

As the new Stat 145 begins its second term in Winter 2012, several tangible changes will be made in the way Miller and Risser manage the classroom. For example, Dr. Miller will be monitoring the “backchannel” while lecturing, trying to address any questions/comments that are submitted during class. Also, Risser will be phased out of the classroom (more so in Spring 2012) as it is not feasible to have a second person in the room for lecture each day. The primary issue this will cause is having a way to check that the audio is working throughout the lecture; hence the proposed purchase of iPad 2s (or equivalent) in the budget list at the beginning of the report. Having an additional wireless-enabled device will allow for a quick check of audio at the beginning of (and throughout) class, as well as the ability to monitor the backchannel.

The question of motivating attendance (see “Lessons Learned,” above) in a hybrid or hybrid-flexible course is indicative of more general changes under consideration for future sections of Stat 145. First, assessments and required activities for students can be streamlined. Last fall, students in the pilot section were required to complete recitation exercises, daily LRQs, 12 homework assignments (throughout the quarter), and 4 major assessments (2 quizzes, a midterm, and a final). All of this was done on top of attending lecture 3 times a week and recitation 2 times a week. Some of these assignments were only graded for completion, but the list of expectations is lengthy, and student feedback strongly suggested that many items seemed tedious to the students. Integrating these requirements into more cohesive assessments might lead to a higher completion rate. For Autumn 2012, Stat 145 will switch to a new textbook and therefore a new online homework module, StatsPortal. One exciting capability of StatsPortal is the availability of “Learning Curve,” a pre-made

customizable quiz tool that will likely replace daily LRQs with full-chapter review assessments.

Secondly, time in recitation can be reformatted more formally. As mentioned previously, this project involved transitioning lecture review out of recitation, but TAs apparently did not completely eliminate lecture review from their recitations. It is possible that students intentionally skipped lecture because they knew they could still get the content in recitation. Furthermore, spending a lot of time on lecture review in recitation was unfair to the students who did attend lecture. In the future, it will be more clearly communicated to both students and TAs that lecture review will be completely removed from recitation. As a result, more time will be allotted for practice problems and concentration on social construction and conceptual understanding.

Finally, the actual content covered in class is under review. The first few weeks of Stat 145 are spent with somewhat basic content (displaying and describing data), and as a result students traditionally do quite well on the midterm. As can be expected, high scores on the midterm cause students to reduce their effort, which then happens just when the more difficult material (confidence intervals, hypothesis testing, and sampling distributions) is introduced. It might be possible to leave some of the earlier material for individual study (via online materials or the aforementioned Learning Curve) as most early material is mandated to be covered in the K-12 education setting. A more accurate tone for the difficulty level of the course might then be set right away.

Based on feedback from the end-of-term survey and personal pedagogical philosophy, another next step for this project is continued development of the backchannel, specifically with respect to building a sense of community within the class. Providing ways for students to feel socially connected with their classmates becomes particularly important within the HyFlex model, and the survey results indicate that students are not feeling these connections. The first strategy for fixing this will involve experimentation with Piazza, an educational social media site. Piazza provides a private course website where students can ask and answer questions. The site is highly customizable, well-organized, and most importantly highly controllable, giving course coordinators administrative privileges to manage content.

Piazza offers some exciting capabilities, many of which will be explored in future Stat 145 sections. Tying in with its promise to build student community, Piazza enables online collaboration among members of the class. Students can submit questions about lecture content or a homework exercise, and questions can be tagged appropriately so that students can quickly navigate to the content they're looking for. Questions can be made private or public, and both students and instructors are able to respond to the questions (student responses are clearly labeled as such, and instructors have the option to "endorse" a student solution). Instructors can host online office hours, multiple instructors can all edit the same response (Wikipedia-style), and the site even allows LaTeX input (especially helpful



for mathematical content). Even if Piazza is not specifically utilized in future terms, the site has many overall qualities to be looked for in alternative options.

In addition to building community, further development of the backchannel will continue to be a priority. The backchannel is not currently in its optimal form: a real-time, in-class forum for students to ask questions, answer other students' questions, and host relevant discussion on lecture content. A primary reason for this shortfall is the technology being used: Poll Everywhere doesn't really provide this service. Furthermore, students are not currently required to bring a laptop to class, which would be necessary for the ideal backchannel. While Poll Everywhere and Adobe Connect will continue to be used in the short-term, additional exploration of the available technology is motivated by this problem.

However, as a result of research on similar projects happening around the country, many components of this project are working extremely well and will be continued. For example, Miller's video streams are purposefully chatty and lo-fi, and it is intentional that she never appears on screen (although streaming higher resolution video is limited by bandwidth considerations). In this way, Miller achieves a low-pressure, conversational presentation of the material. Additionally, making lecture recordings available for students provides opportunity for remediation, but in a private way. As a result, the "embarrassment factor" is removed for students—a student need not feel bad about reviewing a topic they really should already know. The feedback received indicated that students were indeed taking advantage of this resource. To enhance this service, it would be nice to find a technology that allows important concepts to be bookmarked within the recorded videos (like Elluminate, an Adobe Connect alternative previously considered) while also allowing smooth tablet PC writing (unlike Elluminate).

One final "next step" to discuss is the exciting ways this project will be advertised and presented over the coming months. For example:

- A presentation by Miller and Risser on the HyFlex model will be shared at
  1. the eMerge Conference in Cleveland, OH on March 14.
  2. the Ohio State University OCIO's Innovate! conference in Columbus, OH on April 12.
- Dr. Miller will be presenting at the Joint Statistical Meetings (JSM) in San Diego, CA, in August (and hopefully at the Lilly Conference in Oxford, OH, in November).
- During spring, Risser and Miller will
  1. work on preparing a paper for publication in various Statistics Education journals.
  2. start preparations for semesters and Stat 1450 with a new textbook.
- During spring, Dr. Miller will begin expanding this model to implementation in Stat 427 (Probability and Statistics for Engineering and the Sciences I), as this is a 200-person course.

*Additional feedback from the project team:*

(Comments from Tom Marker) “This project has the ability to evolve along with the available software and its capabilities, and must do so. For example, we can either explore ways to utilize more features in Adobe Connect without alienating in-class users or be content with different ways of attendance providing a different class experience. Also, we need to find a way to make Adobe Connect a truly portable solution with minimal sacrifices to audio quality.”

(Comments from Staci White) “Decisions need to be made on how to offer the course as a hybrid model (this will involve support from the registrar’s office), and we need to figure out the best way to integrate the backchannel feedback seamlessly, with as little interruption as possible. As stated before, I think we need to figure out the best way to use Lecture Review Quizzes, especially for when we switch to semesters.”

**Working with LT staff:**

In three words:

1. Educational
2. Challenging
3. Fun

**Evaluation of working with LT staff during the grant project (Strongly Agree to Strongly Disagree):**

Please indicate how strongly you agree or disagree with the following statement:

1. I am satisfied with the communication I received from the LT staff.  
**a. Strongly Agree**
2. I am satisfied with the project contributions I received from the LT staff.  
**a. Strongly Agree**
3. I have learned the skills necessary to continue related work on my own.  
**a. Strongly Agree**
4. I found the LT staff approachable.  
**a. Strongly Agree**
5. The lessons learned during this pilot will guide future course design.  
**a. Strongly Agree**



*Additional comments or feedback:*

The IG team members from the Department of Statistics have been continually impressed by the hard work and contributions from Learning Technology team members. The LT staff has shown itself to be hardworking and dedicated to the success of our project, which has been extremely helpful throughout the pilot study. Rob Griffiths was particularly impressive, especially as he stepped in to fill an additional role after the departure of one Statistics team member in March 2011. Griffiths went above and beyond in his contribution to and personal investment in the success of our Impact Grant project. We look forward to continued interaction with Griffiths and other LT staff.

**Chair Statement of Impact**



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Statement of the Chair of the Department of Statistics

Date: February 27, 2012

Re: Comments on the Learning Technology Impact Grant Innovation Project:

From: Professor Mark Berliner   
(Phone: 247-4075; e-mail: [berliner.1@osu.edu](mailto:berliner.1@osu.edu))

Speedy Feedback: Blended Classroom Models to Set Students up for Success

I believe that the Project has been a success. I understand from student evaluations and discussions with the faculty/staff participants that HyFlex has positively affected the attitudes of both students and instructors. The learning outcomes appear to have been significantly enhanced due to flexibility in student choices of teaching approaches. The approach also increases efficiency in that instructors can serve larger numbers of students than possible in traditional approaches, though instructor time and effort remain constant. Further, we will be able to deliver improved educational experiences for students with fewer class sections because of the flexibility available to students in how and when they access lecture material. We will continue to use this approach and apply it in several of our large service courses. We also believe that a HyFlex group of instructors will soon develop at OSU, indicating that this project will have important and wide-ranging impact on education at OSU.

## LT Involvement

### LT Project lead

Robert Griffiths

### Approximate time spent by LT staff on the revision project:

180 hours

### Reflections on the grant process – what went well:

Jackie Miller and her team in Statistics were truly great collaborators. They were communicative about their needs, held regularly scheduled meetings, shared their experiences frequently on the blog, and became champions for a new instructional model.

The level of local support for Statistics was amazing. Without a doubt, having a strong team really paid off during brainstorming and problem solving discussions.

Everyone associated with the project was passionate and personally invested in producing the best experience possible, which made it a joy to work on the project and with the team members every week during the year-long collaboration. Additionally, the focus on assessment and experience sharing helped us learn far more about the HyFlex model than originally expected.

### Reflections on the grant process – what did not go well:

There were some technical glitches with Adobe Connect and Poll Everywhere that lasted longer than we had hoped. Working with a third party vendor that doesn't have a terms of service agreement with Ohio State (Poll Everywhere) certainly provided a different level of support (i.e., were less helpful) than with those organizations with a formal agreement with OSU. When adding compatibility issues with Microsoft Office, we ultimately couldn't make it work as we thought it should, but did determine enough work-arounds to achieve functionality.

### Working with the Statistics team:

In three words:

1. Rewarding
2. Collaborative
3. Fun

### Changes to OCIO processes from this grant experience:

We built expertise and experience around the HyFlex instructional model. In this regard, we have an opportunity to resolve some pressing needs on campus, such as limited space in the face of increased enrollment, and increasing student engagement and preference. Providing three choices of how to attend a lecture on any given day contributes to both. We are in the process of building a learning community around HyFlex and getting to word out for others who may be looking for a solution to a common problem on campus. We have more to learn and look to continue our investigation.

We also learned a lot about what technologies are necessary to make HyFlex successful. Jackie used her own computer, so in this particular instance, Learning Technology determined what cords were necessary to feed into the house audio and the computer recording, as well as ensure two microphones worked and were integrated into the overall system. We also got a sense of what was necessary in terms of computing power and overall setup, so we are in a better position to use this model in other instructional spaces at OSU and beyond.