Course Identifier: (e.g. TLC801) __CEP 933__________________________

Course Name: _____________________________ Quantitative Methods in Educational Research II

Department: __________________  College: __________________

Primary contact name, phone number, and email (normally this will be the lead instructor)

__________________________ Kimberly Maier, (517) 355-8538, kmaier@masu.edu ____________

Faculty and Staff Involved in Developing and Offering the Course please list full name, position
at MSU, email address, and project role for each person

<table>
<thead>
<tr>
<th>NAME</th>
<th>Email</th>
<th>MSU Affiliation</th>
<th>PROJECT ROLE</th>
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<tbody>
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Type of Course:

X_ FULLY ONLINE (no required face to face component)

X BLENDED/HYBRID (some face to face time is replaced by online learning)

X TECHNOLOGY-ENHANCED FACE-TO-FACE (a face-to-face course which uses technology for teaching and learning in an innovative way)

Semester(s) offered in 2010-2011 and number of students enrolled:

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th># STUDENTS</th>
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Please address these categories:

I. Course Description (400 word limit)
(broadly, what does the course teach, how is student performance assessed, what aspects of the course are online or technology-enhanced)

CEP 933 is an applied statistics course that introduces one-way and factorial analysis of variance, multiple comparisons, repeated measures models, and analysis of covariance. This is an applied statistics course with an overall goal of preparing students to be independent quantitative researchers and informed and critical consumers of research. Students are taught about statistical models using actual datasets and analyze data using statistical software. Development of communicating statistical results is also an important competency and students are given opportunities to practice these skills for authentic purposes, including preparing a short conference paper.
The course is fully online and implemented in Angel. The on-line components of the course include course orientation and information materials (welcome videos, calendar, syllabus, etc.), lectures videos, supplementary videos used for clarification or enrichment, lecture slides (a clean and an annotated set), assessments, office hours, student-to-student discussion, student-to-student collaboration, student-produced artifacts (video clips, forum postings, and final project presentation), and instructor feedback to students. There are also spaces for informal & community-building interactions, including a NING, welcome videos for the course and units, and resources meant to convey a more playful and friendly perspective (such as quotes from student responses to "Learning stats is like...", and a weekly rotation of videos on statistical subjects or that illustrate the application of statistics).

There are a number of on-line assessments. These include comprehension checks, team video clips, and Q&A forum postings. A comprehension check follows each lecture (each unit has 10+ lecture videos that range from five to 15 minutes long). They are automatically graded within Angel, provide student with immediate formative assessment of their knowledge and comprehension. This is a low-stakes assessment; students are given an unlimited number of times to retake the check.

Student understanding is also assessed from their required individual and team postings to the Q&A forum within each unit and a team video clip to be produced for each unit. Grouped into teams, students are periodically required to choose and respond to a posted question. Postings are graded with a rubric that assesses originality, degree of complexity, and mechanics (language and statistics content). Teams also develop and produce a video clip on a statistical topic for each unit. While the comprehension checks are intended to assess lower levels of understanding, the postings and clips give students opportunities to demonstrate their understanding through all levels of Bloom’s taxonomy—knowledge, comprehension, application, analysis, synthesis, and evaluation.

II. Learning and Interaction Goals of the Blended Course  
*(what learning and interaction outcomes did you hope to achieve in your use of technology, why is this an award-worthy course)*

In order to address this section, a more detailed description of the course is in order. CEP 933 (like its counterpart CEP 932) is a unique course to teach in terms of its distinct instructional challenges. The students who enroll in this course (for many, it’s a required course) are a diverse population in terms of their attitudes about the subject matter and their level of exposure to statistics (and mathematics). A majority of the students come to the course having varying levels of trepidation and anxiety about a ‘math-focused’ course (which seems to be surprising, given that they have had to complete the first introductory statistics course to enroll). They also have a variety of mathematical skills and statistical interests. A large number of the students hadn’t had a mathematics course since high school before they took CEP 932. There is also a small group of the students from more math-focused programs such Mathematics Education and Measurement and Quantitative Methods who may be more mathematically inclined or have taken a statistics course recently. The students’ attitudes and motivation are incredibly diverse.
and in most cases, quite strong. Furthermore, as with any group of students, they all have varied preferred learning styles. The student diversity presented in CEP 933 provides a big challenge. In an effort to meet these challenges, one has to address content-related concerns but must also attend to the important psychological component of the course. In order to address these important issues, I incorporate a variety of teaching approaches and methods.

In my experience teaching statistics courses face to face, student learning communities addressed a number of student needs. These learning communities functioned as safe places where students could be vulnerable, allowing them forums for discussing not only their confusion about the subject matter, but also their feelings and frustrations about ‘taking a stats course’. By providing these valuable venues, learning communities were a tool in addressing the psychological components of the course along with providing forums for facilitating student understanding as conversations ensued about the subject matter. The need for learning communities is critical, if not even more critical for on-line courses. The design of the course facilitates and scaffolds informal and formal interactions among students, for informal study-group conversation, and for more formal collaboration around doing assignments.

Research on group work by Roseth and colleagues (see Roseth, Garfield and Ben-Zvi, 2008; and Roseth, Johnson, & Johnson, 2008) suggests that not only can cooperative groups increase students’ statistical understanding, but also that the methods of formulating groups can have important implications for learning. Groups can facilitate important, more in-depth discussions that might not otherwise occur. Groups to which members are randomly assigned, as compared to groups with nonrandom assignments, have a different identities and can potentially have quite different looking interactions within them, some of which may encourage more higher level discussions. Groups that are voluntarily formed and allowed to continue without a deadline for disbanding can potentially facilitate more vulnerable conversations. However, it has also been shown that as the group continues, members tend to default to customary roles, and may limit themselves to participation in group activities that they perceive to be ‘not their job’.

This research informed our design of learning communities in the course. Two types of groups are present in the course: student teams and student homework groups. The student teams are groups that were assigned to achieve a mixture of competencies (as evaluated by their instructor for 932), but which appeared to the members to be randomly assigned. The configuration of these student teams change mid-semester. As part of this team, the students are required to create a team supplemental clip and prepare two posts to the Q&A forum for each unit. Students are part of teams that students perceive as being randomly assigned (but were purposely assigned by the instructor as discussed above) and that have a disbanding date of the middle of the semester. The products these teams produce are used to assess students’ higher level understanding of the course. By having them engage in these activities as a team where social ties have not been previously established, it is hoped that conversations within these groups will address high-level content and ideas. Limiting the lifespan of the team was done to help prevent students from settling into nonproductive roles within the team.

Student homework groups are not formally assigned, but the course structure facilitates the formation of these groups by allowing students to work together on homework assignments. Membership in these groups is completely voluntary and managed by the students. These are
groups where students can potentially find opportunities to be vulnerable, to share frustrations and fears, but also to work toward a common goal of completing the homework assignment. While we felt that it was important for students to be provided the opportunity to belong to such a group, we also didn’t want students to feel compelled to join. So by making this a voluntary group, we are able to respect the students’ wishes about their level of participation.

For the culminating assessment, students will prepare a research paper and present their findings at a synchronous class conference. One of the distinct challenges of teaching this course is to provide connections between content and practice. What makes this a particular challenge is that the sort of authentic connections that students talk about desiring (reading empirical studies and evaluating them, analysis of their own data which may require sophisticated models) is not feasible until they have completed a large majority of the course requirements. However, requiring students to demonstrate their understanding by preparing and presenting research is a good compromise. Students are allowed to analyze their own datasets of interest, with the only requirement being that the statistical models must be one of those learned about in class. Students will work in their teams to work through all phases of a research project, including writing a report and presenting their findings. The presentation will take place at the course conference, a synchronous meeting on a weekend day. Faculty and graduate students from outside the course are invited to attend and will be able to participate in a Q&A after the team presentations.

We use a number of on-line applets that illustrate the course concepts. The use of applets is intended to address student motivation and increase their interest in the subject matter. By illustrating the concepts using applets with ‘moving parts’, the concepts come alive in a way that textbook descriptions just can’t provide. These applet are built into the lectures.

Electronic versions of the overheads are provided for each lecture. During lecture, I annotate the slides using Powerpoint and the capabilities of my tablet PC; these annotated slides also posted to angel after the lectures. While this might seem to be a minor consideration, I have found this practice invaluable. Statistics courses are inherently ‘notes-heavy’—providing written overheads reduces the amount of student effort usually expended when they have to “feverishly” write notes while listening to the lectures. This resource allows the students to concentrate more on the big ideas and concepts presented during the lecture rather than to recreate the lecture. I have found this practice has increased student motivation, aided in focused studying, addresses a variety of student learning styles, and helps alleviate a bit of their anxiety. At the end of the course, they will have a complete annotated set of notes for reference.

Supplemental electronic material is also was provided. This material, while incredibly important for doing quantitative studies, doesn’t have a place in the formal course. The posting of this material is intended to support the development of students as researchers, beyond this course. S

Over the years of teaching statistics face to face, I have learned that teaching style and attitude can make or break you. Given that some students experience fear and anxiety about the course even before they enroll, it’s extremely important to recognize and attend to these attitudes. I have found that it’s important to establish a good rapport with the students and make them feel comfortable asking questions and offering up issues and problems. And, I think it’s important
for me to communicate my enthusiasm and love for the subject matter to the students. These concerns had an important impact on the design of this course. We provide on-line office hours to accommodate availability of students from East Lansing to Dubai. Students have an option of how they would like to communicate: Ning, Skype with video or without, and Google chat to name a few. Students appreciate extreme organization and ease of navigation and the course was designed with this requirement in mind. Students want to be put at ease and maybe laugh a little, we post a weekly rotation of student responses to “Learning statistics is like…” These help them feel like they are not alone, their classmates are experiencing similar feelings. We sent weekly emails to students, ‘just checking in’ emails to let them know that yes, we are here, and we’re interested in their learning, even though they can’t see us.

We feel that our online version of CEP 933 meets the goals and intentions of the face to face version, but in several areas, we feel that it addresses students need much better. For instance, because all lectures are delivered via flash, students can quickly find and re-listen to part of a lecture. Students can also contribute a question to a Q&A Forum and get feedback from peers and from the instructor before the next class session. Office hours can be attended much more easily & effortlessly than in face to face versions. With the comprehension checks, students can quickly check their understanding at regular intervals, without getting stressed out about it. If students are stuck on a topic, they have a library of supplementary videos to peruse, or alternatively, they can request a video to be made that would address the issue. Team clips and Q&A forum postings are public. These public repositories can alert the student that there might be something they skimmed over, thought they understood, but that it is actually a bit more complicated than that and deserves further study. Finally, the course has provided spaces for informal & community-building interactions that contribute to student learning in a way that a face to face lecture course does not.

References


III. Points of Interest and Innovation
(Please discuss course highlights and including URLs and/or screen shots of key components of the course you want to bring to the attention of the judges. Possible outstanding aspects of the course might include student interaction, rich media content elements, interactive learning objects, assessment, effective incorporation of polling and surveys, facilitated teamwork, peer review, portfolio creation, etc.)

There are several components that were described above that we would like to highlight here. The first is the welcoming front page of our course. The components here are meant to convey a welcoming tone and provide interesting supplements with the weekly rotation of videos and student quotes:
We talked about organization and ease of navigation, here’s how the Lessons page is set up:

Some students are used to on-line courses, others are not. Regardless of their experiences, we thought it was important to provide them with a detailed user’s guide for the on-line implementation of the course. This user’s guide has a welcome video at the beginning and has the sections that cover the architecture and organization of the course, covers the key recurring instructional components, describes the formulation and function of student teams, gives tips for watching lectures, and provides information on office hours and off-line course materials (e.g., textbook, statistical software):
Lectures are delivered as videos of powerpoints that the instructor narrates and annotates. In addition there are videos that demonstrate analyzing data using statistical software. Here is an example of a narrated powerpoint lecture:

http://storemedia.vudat.msu.edu/public/display_package.php?src=download/kmaier/cep933/&name=LEC_Regression_10_PC_and_SPC_121510

Here is an example of a statistical analysis demonstration:

http://storemedia.vudat.msu.edu/public/display_package.php?src=download/kmaier/cep933/&name=LEC_Regression_3_SPSS_2_Correlation_tables_and_scatterplots_for_Regression_salary_dataset_110910

Here’s a sample of the rich conversations that have occurred on the Q&A forums:

Rubin, I am struggling a bit, too, so I am just going to quote you and respond to help clarify my own thinking. Hoping any misconceptions I have don’t mess you up!

On 1/22/2011 at 1:48 PM, Rubin wrote:

Hi all,

Lecture 6 left me with a couple of questions... any help is appreciated!

1) I understand that a model with a huge $R^2$ (especially as that $R^2$ approaches 1) can lead to a model with a great fit, whether or not the $r^2$s are the “right” ones. I don’t understand, though, mathematically or theoretically, why that’s so. If I’m trying to create a model for our cohort, with height as the $X$, and I plug in $24$ $Y$s (making them up: age in months, # of Adam Sandler movies we’ve seen, # of publications, etc), it sure doesn’t seem like $X^2$ is a great fitting model. What’s happening mathematically to force that?

I don’t know if this is right, but I picture all those points in a crazy multidimensional plot. Now, as I try to draw the lines that fit those individual points, with so many, my line might intersect (or predict) points that have nothing to do with the variables line in attempting to show a relationship between. The model, by virtue of its line-ness, is predicting things that are not related.

2) On the computation check, the first question asks for ways to assess the predictive power of $R^2$ in a regression. Even though the syntax of the question suggested “all of the above” must be the right answer, I picked “adjusted $R^2”’cuz the other two both have contexts in which they are invalid. I think it seems to me that $R^2$ isn’t a good method of assessing the predictive power of the $X$’s; $b_1$’s in the controlled case where there is no variation in my $X$, my $R^2$ would be 0 and the $b_0$ would still have 100 predictive power. I also thought that “it’s a good answer b/c of the context where, with a huge # of $X$’s (explained above) and lots of many obvious $R^2$ would be big and the $b_0$ would still have no predictive power…” I’d picked “adjusted $R^2”, as my only answer. It wasn’t the answer $X$. It was looking for, though, I guess my question here is a little bit being more realistic and saying, even though there are exceptions, all three of these are typically five ways to assess the predictive power of the $X$’s. Or am I wrong? Are the exceptions (your notes, especially)

Rubin, I get trapped up sometimes by the syntax of the questions, too. The way I understand it, though, is that with so many options for a model, we want multiple lenses by which to judge its model. There may be times when the adjusted $R^2$ is square / too conservative, but as you get further into your analysis, you might have rejected a model that would actually have done you good. This is the way I imagine it to myself as my head: wonder if anyone else may want to weigh in?
IV. Accessibility

(It is not a requirement that winning entries be accessible to learners with visual, auditory, mobility, and cognitive disabilities. However, if your course content is accessible, or if it incorporates an innovative approach to accessibility, please describe.)

Plans are in place for incorporating closed captioning/subtitles for future versions of the course.

V. Evidence of Effectiveness with Students

(Please include evidence such as comparative test scores, SIRs results, short student letters of support, your own observations of project or group performance, etc.)

Here are several letters of support from current students (copied from emails):

From Amira Khattab:

I am greatly enjoying this advanced statistics for the following reasons:
- the way lectures are recorded to explain content (similar to f2f lectures. However with recordings, students can rewind and repeat sections)
- the annotations the professors are adding to the slides have been very helpful (similar to f2f annotations to traditional blackboard)
- the beginning of every lecture, the instructor summarizes previous concepts and relates them to new content
- every abstract idea is illustrated by output SPSS tables AND graphs to add meaning to the whole picture (multimedia components are more easily accessible when working on computer)
- organized, sequential and structured assignments and clear timeline
- flexible due dates that are adaptable to content and students needs
- synchronous and asynchronous communication to support student learning (accommodates working professionals schedules)
- timely feedback and fast response rate to students concerns and questions
- emails to support students personalized queries
- content available 24/7 (great with different time zones)
- content and learning accessible through the net. Very useful when living in the United Arab Emirate.
team work allows students to feel that they are part of a community of learners (especially that they are on different continents)
-extra resources and websites to enrich learning

From Robin Fowler:
CEP 933 ("Quantitative Methods in Educational Research II") is the fifth class I've taken that meets entirely online, and it's so far proven to be the most effective for me as a learner.

Dr. Maier has been able to create a community of learning in this course that encourages students to work with classmates on projects. Some of the groups have been instructor-driven, others have been student-driven. All group work so far has contributed to my understanding.

Specific "little touches" that have been added to the course are improving my student experience:
-a weekly "to do" list, which helps me to organize my work and make sure I'm following the intended course schedule
-highly usable lectures: The interface (Camtasia?) allows us to clearly see the instructor's slides and hear her commentary on the topics. We can skip forward and backward in the lecture by clicking on specific slides, which would allow me to return to topics that were confusing or that I want to revisit when doing a particular assignment.
-clear instructor presence/voice: Dr. Maier's voice on the lectures, face in videos for the introduction and for supplemental topics, and quick responses to email and on the discussion board (as well as her presence via Skype or chat during office hours) make this class have a much stronger instructor presence than other online courses
-intentional student groupings: group tasks encourage us to be in contact with our classmates, helping us feel like we are a community of learners rather than learning in a vacuum. I have actually found the students I'm grouped with have been as much emotional support (taking classes while teaching full time and going through major review at work, too much stress) as academic support-- and I'm grateful for both types.

From Tracy Russo:
To whom it may concern:

I am writing in regards to an online course I am currently taking at MSU, CEP 933 taught by Kimberly Maier. As the instructional designer at Northwestern Michigan College, I see online courses daily. The first time that I opened up Kim's course, I was excited to see that not only was it extremely well organized, it was engaging as well. There are many strategies that she uses that go far beyond what many instructors typically use.

I have taken online statistics in the past, and originally was not looking forward to this course. However, Kim's use of short, effective videos to welcome and engage us as learners made me feel comfortable continuing rather than taking a course elsewhere to meet the requirement. She also set us up into groups, so I have a support network within the class which has been helpful. Some of the extra resources she has added have actually been so interesting that I have passed them on to others in my personal environment outside of class.

Her lectures combined with the use of advanced technology have helped me to understand the material in a way that was not possible in my previous class. I appreciate all of the time she has
taken with her preparation and am enjoying the learning process in her class. Additionally, she has pushed us to contribute as well to our learning of the material through technology, so I will be equipped at the end of the course not simply to use the material, but to share it with others.

Sincerely,
Tracy Russo

From Christopher Sloan:
I first have to talk about the whole program. For years, I'd been looking for a place to do my doctorate while still being able to teach full time in my research base - my classroom. I inquired all over the world, actually. I contacted universities all over the U.S., Europe and Australia. I wrote for advice from the educational researchers I admired. But I was amazed to learn that no doctoral program existed that would allow me to continue to teach while using my classroom as my research base. Even the university a mile away from me wasn't willing to work with me; they told me I would need to quit my job and be a teaching assistant - that would mean a substantial cut in pay and vacating the very place that I've been doing classroom research for years. I commend Michigan State for their forward thinking.

I'm aware that there are more online degree granting institutions every day, but I also wanted to attend an established program that has the capacity to put together a strong traditional research doctoral program in a way that honors the practitioner. The program at MSU has exceeded my expectations.

For example, one of the areas that I needed to improve as an educator was data analysis. I have a lot of anecdotal, qualitative data documenting my students' successes, but I don't have much quantitative data to inform my teaching. The stats course that I'm taking at MSU right now is taught by a master teacher and is giving me the knowledge that I was looking for. I have success with my own students, but how can it be replicated without analyzing data more objectively? That's what I'm learning from Kim Maier right now.

The particular online education that I'm experiencing at Michigan State is more than just a traditional program reformatted for the Internet; the difference is the collaborative learning community of experts that supports the online component. For instance, Kim has recorded lectures and there are the typical features that are built into platforms like Angel and Blackboard. But one of the things the people involved in this program excel at is the wise use of all of the communication tools available. Here's an example. My study group is currently analyzing multiple regressions. We conduct discussions and coursework in the class space in Angel, but we also work collaboratively in tools like Google Docs, Google Voice, and Vidyo just to name a few. This program pushes us to find the best solutions to go beyond boundaries of distance (I'm 1,000 miles away from my group members) and time (we use a combination of synchronous and asynchronous tools) to work on real, complex studies that are rooted in our own teaching. The affordances of various technologies allows us to have the kind of quality discussions and collaborations that happen in the best of traditional educational psychology and educational technology doctoral programs.

Clearly, there will be more programs like MSU's once other universities build the capacity. Until
then, I don't know of another program like Michigan State's. Believe me, I've looked.

From Angela Johnson:
Dr. Maier,
As a student in your online CEP 933, I appreciate the thorough organization of the course and the care with which you have designed the lessons and assignments. You have clearly spent a great deal of time putting together the lectures and the course site for optimal learning. Thank you for your work.
Sincerely,
Angela Johnson

From Karen Bedell:
Professor Maier,
I just wanted to take a moment to thank you for going above and beyond my expectations in our online CEP 933 course. The video lectures, accompanying slides, Think Aloud Clips and YouTube videos are very effective tools for increasing my understanding of the course material. In fact, I can say without reservation, that my experience in this online statistics course far exceeds the quality and clarity of all of the face to face statistics courses I've had in my academic career (this is my fifth course). Specifically, I appreciate the clarity and brevity of the lectures and I truly find it helpful to revisit them anytime I need to. Even though I'm a working mother with a very hectic schedule, I can confidently say I have learned more about statistics in this course that I did when I took face to face courses years ago. I attribute this greater learning to both the format of this course and the thorough examples provided.
I tell everyone who asks how much I enjoy you as an instructor and I thank you for being the role model that you are.
--Sincerely,
Karen Bedell

VI. Plans for Sustainability
A large bulk of the course content is reusable. Lectures will be rerecorded as students provide feedback via their comments on Q&A forums and other communication. Student formal and informal interactions are an important component of this course and each semester will begin anew, generating even more content that can be incorporated into course content or will help inform further refinements of the course design.