# UCLA
## Technology Innovations in Statistics Education

**Title**
An Innovative Approach to Teaching  Online Statistics Courses

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# 1. TEACHING STATISTICS IN AN ONLINE ENVIRONMENT

According to Allen and Seaman (2007), nearly 3.5 million college students were taking at least one online course during the fall of 2006.  Because of the proliferation in distance education, it is crucial that we strive to understand how to design successful online courses in statistics.  Indeed, several educators have described their efforts to teach statistics in an online environment (Chao & Davis 2000; Davis & Chao 2004; Dereshiwsky 1998; Dutton & Dutton 2005; Grandzol 2004; Harrington 1999; Jones 2003; Katz & Yablon 2002; Kennedy & McCallister 2000, 2001; Lawrence & Singhania 2004; Mills & Xu 2006; Prater & MacNeil 2002; Suanpang, Petocz, & Kalceff 2004; Summers, Waigandt, & Whittaker 2005; Tudor 2006; Utts, Sommer, Acredolo, Maher, & Matthews 2003; Ward 2004; Wisenbaker 2003; Zhang 2002).

In many of these online courses, emphasis is placed not only on interaction between the student and the teacher, but on interaction among students.   For example, in some online courses, students are required to work collaboratively during the semester on a group project (e.g., Davis & Chao 2004; Prater & MacNeil 2002; Suanpang et al. 2004).  Often, this work takes place in discussion or chat rooms.  In other courses, students may be required to participate in weekly chat sessions with the instructor in which questions are asked and answered (e.g., Dereshiwsky 1998), or they may be asked to discuss concepts with other students in assigned discussion groups (e.g., Grandzol 2004; Jones 2003; Tudor 2006).  Jones (2003), for instance, describes a course in which an emphasis is placed on understanding the application of statistical techniques and the relevance of statistics.  Students discuss ways in which they can apply the techniques they are learning about in assigned discussions groups, and they respond to instructor questions that are meant to motivate them to think about how they use statistical concepts in their professions.

The literature on instruction in online courses, as well as specific studies of online statistics courses, provides a basis for examining details of two semester-long online statistics courses. One course is for undergraduate liberal arts students, with minimal mathematics background. The other course, almost identical in content, is for beginning graduate students in education and other majors (e.g., Nursing, Mass Communication, Anthropology, etc.).   Both courses assume minimal background in mathematics and no prior knowledge of statistics, and both courses feature a rich, interactive learning environment.  The courses utilize technology to enable students to collaborate and learn from each other, in addition to learning from required course materials and the instructor.  Technology is also used to better illustrate important statistical concepts and provide students with tools to describe and analyze data.

The paper begins with a section on the importance of stimulating and managing student discussions in online courses. Next, there is a description of the way in which current recommendations for teaching introductory statistics at the college level—the Guidelines for Assessment and Instruction in Statistics Education (GAISE) (Franklin & Garfield 2006)—were implemented through the use of collaborate discussion assignments.   The main focus of this

paper will be on the use of discussion in the online courses, and we will attempt to describe the types of discussion assignments that are incorporated into the courses in order to help students develop a more conceptual understanding of statistics.  The methods used to evaluate the courses will be provided, along with details on how the evaluation data has been used to make improvements in the discussion component of the courses.  The paper concludes with a discussion of lessons learned from teaching an online statistics course, and implications for future development of online staiststics courses.

## 2. THE ROLE OF DISCUSSION IN ONLINE COURSES

Providing students with opportunities to work in collaborative discussion groups is an important component of any online course. Discussions appear to help foster a sense of community in the online environment, and they can create a forum where students can share opinions and ideas as they attempt to construct their own understanding of important concepts (Ohlund, Yu, Jannasch-Pennell, &  DiGangi 2000; Young & McSporran 2002).  Although students in the online course cannot see one another as they are engaging in discussion, there are certain advantages to online discussion that might appeal to instructors who are considering using discussion in their own online courses (Smith, Ferguson, & Caris 2002; Groth 2008).  For example, in the online course, if participation in discussion is graded, every student is motivated to participate in the discussion. Shy students or students who may feel uncomfortable talking with peers in a traditional classroom may feel more comfortable with the anonymity of the online environment, and this may increase the likelihood that these students participate in discussion at all.  Since online discussion involves formulating and posting written responses about thoughts and ideas (rather than verbalizing responses), students may reflect more deeply on course material, given the "realization that those thoughts will be exposed semi-permanently to others in the class" (Smith, et. al. 2002 p. 65).

It can be argued that another great benefit of teaching online and using online discussions is that the instructor is able to simultaneously monitor all group discussions from start to finish—an opportunity he or she could not possibly have in the classroom (Groth 2008).  In a classroom environment, if discussions are used, the instructor may be able to check-in with each group at least once, and circulate around the room as discussion is underway, but he or she would not be able to listen to every group discussion from start to finish, nor would he or she necessarily be able to observe who is participating in group discussion and who is not.  If any group has a misunderstanding about course material or a misconception, the instructor may never know unless the group explicitly mentions this to the instructor, or the instructor happens to hear it as he or she is circulating around the room.  In asynchronous online discussions, the instructor can view entire discussions for every group, and intervene, when necessary, if students get off track or experience difficulties.  The instructor can determine, based on what is posted, just which students might need extra help, and the instructor can reach out to these students with the offer of extra assistance.  Further, if the instructor grades the discussions, there may be more motivation for each student to participate, and thus all students will have the opportunity to think carefully about their own understanding, share this understanding with their peers, and gain feedback from their peers (or the instructor) that will hopefully allow them to come to a richer understanding of important course material.   As Kear (2004 p. 155) points out, online discussion can benefit students in many different ways:

> *"The student who asks for help benefits by gaining a different perspective—and one that is from a peer rather than a teacher. Those who respond benefit by exploring their own understanding in written forms. Students who observe the dialogue benefit from seeing different kinds of explanations, and may gain help with problems they are experiencing themselves."*

In terms of statistics instruction, it is well-documented that incorporating discussion and active learning in the statistics classroom can help students learn to think and reason about statistical concepts (e.g., Garfield 1995; Garfield & Ben-zvi 2007; Gnanadesikan, Scheaffer, Watkins, & Witmer 1997; Cobb & McClain 2004; Keeler & Steinhorst 1995). However, it has been challenging to bring these important learning approaches to an online course. This paper describes not only how to successfully integrate discussion into an online statistics course, but how discussion can provide the means to align a course with the GAISE recommendations (Franklin & Garfield 2006). These recommendations are presented in the following section and are used to describe a pair of unique, online statistics courses.

# 3. DESIGNING INNOVATIVE ONLINE INTRODUCTORY STATISTICS COURSES

An overarching goal in the development of the two courses described in this paper was to create online learning environments in which the GAISE recommendations could be implemented. As outlined by Franklin and Garfield (2006), the six GAISE recommendations are to:
1. Emphasize statistical literacy and develop statistical thinking;
2. Use real data;
3. Stress conceptual understanding rather than mere knowledge of procedures;
4. Foster active learning in the classroom;
5. Use technology for developing conceptual understanding and analyzing data;
6. Use assessments to improve and evaluate student learning;

The six GAISE recommendations served as a basis for all components of the online courses (see Everson, Zieffler, & Garfield 2008, for more details). The main focus here, however, will be on the manner in which online discussions are used in order to achieve each of these recommendations.

It is first necessary to describe the formation of discussion groups in the two online courses. Enrollment in each online course is generally capped at 30 students. As soon as the course begins, five to six students are assigned to a discussion group to work with during the first half of the semester, and students are re-assigned to new discussion groups for the second half of the semester. This results in the formation of five or six small discussion groups per course. Students are required to complete a series of small-group assignments that take place in assigned discussion areas within the course management system. Students in the undergraduate course complete seven discussion assignments. The graduate course covers an extra topic and has an additional discussion assignment. Students are given a maximum of one week to complete each discussion assignment and receive full credit if they post their own initial response to the

discussion assignment and return to the discussion to post meaningful responses to the thoughts or ideas posted by their peers or by the instructor.   For each group assignment, students elect a leader who will summarize the discussion and submit the summary to the instructor.  The instructor then uses the group summaries to compile notes for the entire class.  The notes provide suggested answers to the discussion questions and also allow students in other groups to learn more about the unique examples some of their peers came up with in response to the different discussion questions.   More information about the nature of the discussion component of the course can be found in the sample guidelines for group discussion in Appendix A.  These are the guidelines shared with undergraduate students at the beginning of the semester, before the first discussion assignment is started.  Similar guidelines are shared with the graduate students.

As discussion gets underway in each group, the instructor carefully monitors each discussion and attempts to participate at various times in order to let each group know that she is aware of what they are discussing, and to model how to think and reason about the statistical content in the course.  How the instructor chooses to participate depends in large part on what goes on in each group.  For example, if the group is on the right track and posting appropriate answers to discussion questions, the instructor may post a message in which she cheers the group on and highlights the great answers they are coming up with.  If misconceptions or misunderstandings are voiced in a group and other students in that group do not appear to notice or attempt to correct these issues, the instructor will intervene and point out these misconceptions or misunderstandings.  Many times, the instructor will question students on their understanding of different ideas and concepts in an effort to get them to elaborate on or clarify their thoughts.  The instructor will also attempt, when necessary, to answer questions that come up and to point out additional resources for students to consult.  If there are ever times when discussion is stalled in a particular group, the instructor often posts messages in that group in order to find out if students are confused about the assignment or if they need extra help.

When each discussion assignment was created, the instructor thought carefully about ways in which the GAISE recommendations could be implemented in the class through small-group discussion.  It soon became apparent that there are several ways in which this can be done, and we have attempted to illustrate how we accomplished this in the following sections.

## 3.1 Emphasize statistical literacy and develop statistical thinking

The main goals of the online courses are to help students become statistically literate and to learn how to think and reason about statistical information. This is accomplished by readings in the text book, assignments, and activities. Online discussions are structured around each of these course elements to encourage students to explain their reasoning and thinking, and to develop practice using the statistical language.  In many discussion assignments, students are asked to talk about their understanding of different terms and concepts, such as sampling, bias, center, variability, distribution, and significance testing.  They are often asked to think about and discuss the appropriateness of using different techniques, and attention is paid to the way in which they use important statistical terms.  As an example, one discussion assignment was designed to help students better understand the difference between the paired t-test and the two-sample t-test.  As part of this assignment, students are asked to come up with examples of research questions and to argue about which analysis technique (the paired t-test or the two-sample t-test) would be the

appropriate one to use with their chosen questions (and why).  As this discussion unfolds, students also spend time talking about their understanding of terms such as the null and alternative hypotheses, statistical and practical significance, and Type 1 and Type 2 errors.

## 3.2 Use real data

Real data sets are incorporated in many different ways in the online courses.  At the beginning of the semester, students are invited to complete an online survey.  The survey includes questions that relate to many of the different activities used in the class (e.g., number of states and countries visited, average number of hours spent sleeping on weeknights, average number of minutes spent on the Internet each day, etc.).  Almost all students in class take time to complete this survey, and the instructor is then able to compile the data and import it into the statistical software program used in the course.  Students are then able to come back to this data set often to complete different activities.   Students spend time talking about appropriate ways to graph and describe variables in the student survey data set, and they talk about issues related to how the data was gathered and possible bias that may result if efforts are made to take the class data and generalize to a larger population.  In one discussion assignment, students are asked to make conjectures—before looking at the data—about which variables they would expect to have the most and the least amount of variability and why.  Students then explore the data in order to determine if their initial predictions were correct, and they discuss possible reasons why certain predictions were or were not supported.

Students are also sometimes presented with real data sets gathered elsewhere, and they are asked to explore this data and discuss questions about the data.  For example, in one  assignment, students are presented with a data file that contains several college admissions variables (e.g., high school GPA, high school percentile, first-semester college GPA, ACT score, etc.) gathered from a sample of students from the College of Liberal Arts at the University of Minnesota.  Students are asked to discuss how this data set could be used to predict success in college.  Students discuss with their group how they explored the data and try to determine the appropriate analysis to use to make an accurate prediction of college GPA.  In another assignment, students are asked to explore a set of data related to junk food preference and personality type.  Students are told about a survey the course instructor used to gather this data from other sections of the class, and through discussion, it is hoped they will discover that the chi-square technique is needed to analyze the data.  Students use chi-square to analyze the data and they discuss conclusions that can be drawn based on the results of the analysis.  They also spend time critiquing the manner in which the data was originally collected, and they attempt to come up with a better design to explore the relationship between junk food preference and personality type.

## 3.3 Stress conceptual understanding rather than mere knowledge of procedures

Efforts are made in the online courses to provide students with a safe environment in which they can feel comfortable wrestling with complex ideas by making conjectures or asking questions.  Students are rarely asked to work through formulas or engage in a series of procedures to solve problems.  Instead, attention is focused on providing students with multiple opportunities to use technology to solve problems —like applets or statistical software—so that attention can be

focused not on the details involved in analyzing a data set, but on the resulting output and how it should be interpreted.  In one particular discussion assignment, students are provided with information about two statistics instructors—Dr. X and Dr. Y—and how each instructor assigns final exam grades in his or her course.  Students learn that grades in each course fall along a normal curve, and they talk about what this means and why it is important to know.  They are then asked to use a normal distribution applet to determine the proportion of A's and F's that would be observed on the final exam in each course.  Students then discuss what they know (and don't know) about the instructors and their courses in order to come up with arguments for and against taking a course from either instructor.

Through discussion, students also have multiple opportunities to generate their own unique examples in order to better understand course content.  Thus, rather than giving students examples of  research questions that would lend themselves to particular analysis techniques, students are asked to generate their own questions and critique the questions generated by their peers.  Students are also often asked to explain their understanding of concepts by coming up with examples to illustrate these concepts.  For example, when discussing the concept of variability, students are asked to come up with their own examples of quantitative variables they would expect to have a little, a lot, or no variability.   As discussions unfold, students come to realize that variability is all around us, thus making it difficult to think of a variable that would have no variability at all.  They are also prompted to speculate on different causes of variability.

## 3.4  Foster active learning in the classroom

Because activities are an important part of the online courses, they are frequently topics of discussion.  One challenge in an online course is to determine ways to revise activities used in a face-to-face course so they may be used successfully in the online environment.  An activity we commonly use to introduce sampling and experimental design is a cookie taste test (see Everson 2008, for more details).  Students talk about how they might design a cookie taste test, and they actually participate in a taste test and then critique the results.   Of course, in the online environment, students cannot actually conduct a cookie taste test, but they can work in discussion groups to design an experiment in order to test a particular hypothesis, and they can talk with their peers as they attempt to critique the results of an experiment conducted by another researcher.   The first discussion assignment students complete in our online courses involves working as a group to design an experiment in order to determine if individuals can tell the difference between regular and reduced fat cookies.  As students discuss this experiment, they talk about many of the important elements of experiments, such as control, randomization, and replication. Another activity has students make and test conjectures about the behavior of sampling distributions. This time students conduct the activity on their own but discuss the results in their groups.

## 3.5 Use technology for developing conceptual understanding and analyzing data

Several online instructors mention using programs such as Excel, Minitab, and SPSS in their online courses (e.g., Chao & Davis 2000; Davis & Chao 2004; Dutton & Dutton 2005; Grandzol 2004; Jones 2003; Lawrence & Singhania 2004; Mills & Xu 2006; Prater & MacNeil 2002; Zhang 2004).  In their hybrid course, Utts et al. (2003) used an online textbook called *CyberStats*

that contains interactive applications and practice problems. Zhang (2004) described a course in which students used Minitab in order to complete activities from the textbook *Workshop Statistics* (Rossman & Chance, 2001).  In an online course for graduate students in a Social Work program, Harrington (1999) described the use of the CD-ROM *ActivStats* (Velleman 1998) and the accompanying data analysis program, Data Desk.

In our online courses, students learn to use either Fathom (in the undergraduate course) or SPSS (in the graduate course).   They are also introduced to statistical applets at different times during the semester, and they spend two weeks working with the Sampling SIM program (delMas 2001) in order to gain a better understanding of sampling distributions.  Many discussion assignments revolve around the use of these different tools.  For example, as mentioned earlier, when learning about the normal distribution, students are presented with details about two professors whose scores on a comparable final exam fall along a normal distribution.  Students are asked to use a normal distribution applet in order to determine the probability of getting an A or an F on the final in each of these classes.  They then use this information to generate arguments for and against taking a course from each professor.  When learning about sampling distributions, students spend time working through a lab activity where they use Sampling SIM.  They proceed then to discuss their understanding of sampling distributions with their peers and to work with their peers to solve a series of problems that require them to apply what they have learned about sampling distributions.  Other activities, as mentioned earlier in this paper, involve presenting students with data sets to explore and discuss as a group, using either Fathom or SPSS.

## 3.6 Use assessments to improve and evaluate student learning

The collaborative group assignments used in the online courses provide the instructor with many opportunities to assess and evaluate student learning.   By requiring students to write about their own understanding of course material, the instructor can better gauge whether students have misunderstandings or misconceptions about different ideas or concepts, and measures can then be taken in order to try to correct these misunderstandings or misconceptions.  The instructor can question students in order to prompt them to reflect more and re-examine their initial thoughts, or the instructor can ask students to clarify if certain ideas are confusing, or if they are lacking in detail or substance.  The instructor can reach out, if necessary, to students who are obviously struggling, and this might make a big difference when it comes time to work through exams or other course assignments.

# 4. EVALUATING AND IMPROVING DISCUSSION

Each time the online courses are taught, changes are made in the way in which discussion assignments are structured and used.  In large part, these changes have been motivated by student feedback and instructor observation of the patterns of interaction that occur within different discussion groups.

Each semester, an anonymous Midterm Feedback Survey invites students to reflect on what they are learning in the course and which components of the course they perceive to be most and least helpful when it comes to learning statistics.   Responses to the survey have led to significant changes in the way in which the courses are structured and administered.    For example, the

instructor became more involved in student discussions as a result of student comments that they often questioned whether they were on the right track when discussing concepts with peers, and felt more interjections from the instructor during group discussions would be helpful.  The instructor now makes it a point to post at least one time in each discussion group during each small-group assignment.  Sometimes, this involves letting the group know they are doing a good job, or elaborating on a point made by one particular group member.  By participating more in discussions, the instructor has learned many ways to be involved without necessarily "giving away" any answers.

Students also complete an end-of-semester course evaluation, and overall, student responses on these course evaluations have been positive.  Many times, these responses have supported and extended the kind of feedback the instructor typically receives on the Midterm Feedback Survey. For example, students often note that communication with the course instructor exceeded their expectations, and they are appreciative of the organization of the course site and the usefulness of different course assignments and assessments.

Another important source of evaluation information is student attainment of desired learning outcomes. A careful examination of the student assessments reveals that student performance, an indicator of learning outcomes, has been consistent with performance in face-to-face sections of the same course.  However, the instructor has additional information in the online course, when compared to the face-to-face course, in that she may review <u>all</u> discussions carried on by students; in a face-to-face course, an instructor is only able to listen in on samples of group discussions. This type of information has enabled the instructor to gain a new perspective on the types of difficulties students might have learning important concepts and ideas, and it has led to additional teacher comments and suggestions to students, as well as modification to assignments and discussion questions.

Other observations on the part of the instructor have also led to changes in the basic structure of discussion assignments.  For example, when the courses were first offered online, the instructor noticed that several students waited until almost the last minute (e.g., two days before the assignment deadline) to even begin working on each discussion assignment, and this resulted in little discussion on the part of students.  This led the instructor to require that students post their initial thoughts about each discussion assignment by mid-week in order to provide ample time for the entire group to read, reflect on, and respond to the thoughts and ideas posted by their peers.

# 5. DISCUSSION AND SUMMARY

The goal of this paper was to describe two online introductory statistics courses that are aligned with the GAISE recommendations.  The tool to implementing these recommendations was the use of carefully structured discussion assignments and the managing of these discussions.   In each course, an effort was made to create an online community where students can learn from a variety of sources, and where support and encouragement from the instructor are evident to students.

Teaching an online course can be time-consuming given the amount of reading and writing involved (both for students and for the instructor), and the online environment can pose unique challenges to the instructor.  For instance, within a classroom setting, an instructor can often make announcements to the class, or answer questions, and it is evident that everyone hears what is being said.  The instructor can rely on body language in the classroom to better assess whether students understand important material.   If students look very confused, the instructor might question them in order to see what the problem is, or he or she might attempt a new way of trying to explain a topic.  In an online course, the instructor is never quite sure if all students are checking e-mail on a regular basis and keeping up with important announcements about the course.   When questions are asked and the instructor attempts to reply, generally via e-mail or by posting a response in a discussion room, it is not always clear if the explanation given by the instructor makes sense to the student.  The student might say it makes sense, but the instructor might not know for certain until he or she witnesses how the student performs on different assessments.

Although teaching an online course can sometimes be challenging, there are definitely benefits to consider as well.   An instructor can grow in many ways when he or she is put into a situation in which adaptations have to be made in the way in which material is presented to students.  For example, in the classroom, an instructor can teach students how to use SPSS or how to use a particular applet by physically demonstrating how to use these tools.  He or she can draw pictures on the board if students appear to have difficulties visualizing certain concepts.  In the online environment, the instructor may have to express, in writing, what he or she normally expresses in other ways in the classroom.  Something that may take two minutes to demonstrate in the classroom could take a page (or more) of notes to explain in the online environment.   The instructor needs to anticipate any problems students might have understanding how to use a particular tool or how to work through a particular problem, and he or she needs to somehow incorporate instructions or explanations in handouts and notes that will be comprehensible to as many students as possible.

An additional benefit of teaching online—as noted earlier in this paper—is that when discussion rooms or collaborative exercises are used, the instructor can observe the evolution of a group discussion in ways that are not possible in the classroom.  An instructor might ask students in a classroom setting to break into groups and discuss a particular concept, or work through a particular problem, but the instructor cannot view each group's discussion from start to finish.  In addition, the instructor may never know if certain misunderstandings or misconceptions are discussed in a particular group unless the group shares the contents of their entire discussion with the class.  If these misunderstandings or misconceptions are not voiced, the instructor may not have the opportunity to attempt to clarify or correct them.  In the online environment, the instructor is provided with a window in which to peer into each discussion room, and he or she can follow the length of all discussions that occur among all discussion groups.  This can help the instructor better understand how students reason through different kinds of problems, and it can highlight misunderstandings or misconceptions that might otherwise remain unidentified in the classroom.

An important goal of the online courses described in this paper was to align them with the GAISE recommendations.  Based on our experiences and observations, structuring our online

courses in this manner has resulted not only in student learning but in student satisfaction. While some aspects of face-to-face classes are missing, such as talking in person, getting to know students on a more personal level, and being able to engage students in hands-on group activities, there are other benefits to a well-designed online course. For example, by having students write their comments, the instructor can see what every student is thinking—not just those who raise their hands to talk in class. In addition, some students respond better to the flexibility of an online course despite the additional demands made on them to communicate their learning in writing.  We believe that with careful planning, collaboration, an emphasis on discussions, and ongoing evaluation and revision, an innovative online statistics class can be a beneficial and positive experience for many students.

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Appendix A

**Guidelines for Working on Small-group Assignments**

An important component of this online course is collaboration with your peers. To encourage discussion of statistical concepts with your classmates, seven small-group assignments were created (with an eighth optional extra credit discussion assignment that will occur at the end of the semester). These assignments were designed to give you an opportunity to learn from your peers and talk about your own understanding of different concepts (or lack of understanding). The following guidelines were created to help you better understand just how to approach these assignments and work through them with your peers.

**1. Spend the first week of the semester getting acquainted with your group**

During Week 1 of the semester, I strongly encourage you to (a) post an introduction about yourself in your assigned discussion group, in addition to posting an introduction to the WHOLE CLASS in the Introductions discussion room, and (b) spend a little time talking with your group about how you think you'd like to approach the assignments each week. At the beginning of each week in which a group assignment is due, it is important that a group leader be assigned. This group leader will be responsible for managing the discussions in the group, summarizing the discussions, and submitting the small-group assignment summary to the instructor by the deadline. The group leader should try to set deadlines for the group discussion to end in order to leave enough time for him/her to summarize this discussion and submit it to the instructor. All small-group assignment summaries are due no later than **MIDNIGHT** on **Monday** and the assignment should include the names of all group members who participated during the week. Example summaries can be obtained from the instructor if anyone would like to see a model of a summary.

If an assignment summary is late, or if no summary is submitted by the group, all group members will lose 1 participation point. Therefore, it is important that a group leader be selected for EVERY group assignment and that he/she is able to submit the assignment on time. You might look over the course calendar to see when each group assignment is due and then try to select all the group leaders ahead of time, just so you do not have to worry from week to week about who will lead the next assignment.

Ideally, each group member should be given a chance to be the group leader. However, being a group leader is not mandatory, so if any student is willing to lead more than once over the course of the semester, this is fine. As an extra incentive, the group leader will receive 1 point of extra credit if the group assignment summary is submitted by the deadline.

Note that around Week 8 of the course, we will be changing the discussion groups to give you opportunities to work with other students in class. When the new discussion groups are formed, you will be notified via WebVista e-mail.

## 2. Try to work with your group to actually "discuss" the group assignments

It is important that <u>all</u> group members attempt to participate in group discussions, and participation should involve posting not only your own thoughts about an assignment, but responding to what your peers have to say. I encourage everyone to begin thinking about the group assignment and posting responses to the group assignment EARLY in the week to allow enough time for you to each to read and reflect on what your group members have to say. For each assignment, I expect every group member to first post his/her own thoughts about the assignment (i.e., work through the assignment individually at first and post your own answers to the assignment) no later than **Wednesday** at **MIDNIGHT**.  Then, we would like you each to return to the discussion at least two more separate times to <u>respond</u> in a meaningful way to comments/questions posed by your group members or by the instructor.

Again, it is up to each individual group to decide upon the best way to work on these assignments, and I encourage you to discuss this during the first week of the semester. For example, if you know that you might be the last one to post your thoughts each week given other obligations you have, please do not hesitate to let your group members know this. What is most important is that the group leader set the schedule for the week so that he/she has ample time to compile the group summary.

If you worry that you will not be able to make a unique contribution to group discussion (because, perhaps, your thoughts about the assignment are the same as what others have already posted), please don't let this hold you back. You never know when your way of wording things or explaining things can really help one of your peers, even if what you are saying is quite similar to what someone else has posted. I strongly encourage you to take a stab at writing your initial answers to discussion questions in a Word document BEFORE you read what anyone else has posted in the discussion room. When you are ready then to post your initial thoughts, just copy what you have written in Word and paste it into the discussion room. This way, you will hopefully not be influenced by what others have written as initial responses to the assignment. Also, it's good to get into the habit of typing your thoughts and responses in Word first so you can SAVE YOUR WORK. Sometimes, you may spend much time typing things directly into the discussion room only to have your computer suddenly crash (in which case you may then have to start all over if your work was not saved).

## 3. Keep in mind just how participation in discussion will count toward your course grade

As stated in the syllabus, you will each receive up to 49 points for participation in small-group discussions (this is 7 points per discussion assignment). Remember that the purpose of these small-group assignments is for you to **work collaboratively with your peers and to learn from each other**. Therefore, it is important that you attempt to actually <u>discuss</u> concepts with your peers, not merely post your own thoughts without reflecting on and/or responding to the comments made by your classmates. **Your participation grade will be based not only on your**

**own contributions to the group, but on your reflections and responses to the contributions made by your group members**. Therefore, for each group discussion, you should anticipate posting comments in your small-group discussion room more than once during the course of the week. Your first posting will always be your own initial thoughts about the assignment (or answers to discussion questions) and then you want to return more than once to the discussion to reflect on what other group members have said or on comments made by the instructor or teaching assistant.  Note that reflection involves going beyond statements like "I agree with everything Sally said" or "I think the same thing."  As you attempt to respond in a meaningful way to your peers, think about the following questions. These may help you form a reflective response, and may help you think more critically about the discussion questions.

- Do the thoughts posted by your peers make sense to you? Does it seem as if your fellow group members really understand the material, or do any group members appear to have misconceptions about the material that should be corrected? If the postings made by your group members do not make sense to you, tell your group and ask for clarification, or try to re-phrase postings in own words in order to see if your understanding matches what your peers were trying to say. If you are in agreement with what your peers have posted, think about why you are in agreement, and attempt to provide your peers with some feedback (e.g., "I really like the way you used an example from your own field of study, Bob. This helped me see how we could apply this theory to a real-world problem").
- If you disagree with anything your peers say, don't be afraid to tell them so, or ask them for more clarification. If you have thoughts about a topic that are quite different than one of your group members, bring this up. This kind of discussion will surely help all group members reflect more about the content of the course and think critically about statistics.
- Think about whether the thoughts posted by your peers are convincing to you. Do you feel the discussion in your group is helping you form a better understanding of a particular concept, or is it hindering your progress? If you feel the discussion is helpful, or is confusing in any way, tell your group!
- If you feel that everyone in the group is arriving at the same basic answers to the discussion questions, and you do not have much to comment on beyond your own initial answers, try to summarize what your group members have said in your own words. **There is always SOMETHING that can be discussed, and if I see that any group is having problems with discussion, I will definitely jump in with some of my own questions, just to give you more things to reason about!**

You will receive 1 point if the group assignment summary is turned in by the deadline, 3 points for posting your own initial thoughts about the assignment by Wednesday at MIDNIGHT, and 3 points for returning at least twice to the discussion and responding to what other group members or the instructor have posted. In addition, as mentioned earlier, the student who agrees to be group leader will receive 1 point of extra credit for compiling the summary and submitting it to the instructor.

**4. Don't be afraid to take risks or to let your group members know if you are struggling with material**

As you think about your own role in your discussion group, please keep in mind that I am not expecting you all to be experts in statistics. I understand that most of you are learning about statistical concepts for the first time, and because of this, you may not be confident in your own understanding. This is okay! **Your participation grade will not be based on whether your understanding of the concepts is correct, but it will be based on your willingness to take risks and try to make sense of the different concepts you will be studying (and to try to help one another understand these concepts).** It is okay to tell your group members that you do not understand a certain topic, but you should attempt to reason through the topic nonetheless in an effort to understand it, and group members who do have an understanding of the topic should try to help those who do not. By collecting these group assignments, I will be better able to determine what the class as a whole understands and does not understand, and I will then be able to more effectively focus my lecture notes on those concepts that are confusing or misunderstood.

### 5. Be aware of the instructor role in group discussions

I understand that as you are discussing concepts with your peers, it is important for you to receive feedback about your own understanding, just so you can be confident you are on the right track. Therefore, I continuously monitor your discussions throughout the week, and I occasionally post my own comments in your discussion groups and try to answer questions if it appears that there is confusion about particular topics. I am willing to participate in your discussions as much or as little as you want me to, so please don't hesitate to post questions for me directly as you are discussing your assignments if you want me to offer some feedback. I want these assignments to be opportunities for you to learn from your peers and help each other, but I do understand it may be necessary for me to jump into your discussions from time to time to correct misunderstandings, or to question you about the course material. So, please don't worry about the discussion ever getting stalled or about running out of things to talk about! We will be sure to jump in and prompt you if we see that this is happening.

### 6. Try to keep your discussion rooms organized

As you work on different discussion assignments this semester, we want you to keep your discussion rooms as organized as you can. This will help you when it comes time to going back to discussions and reviewing the different posts submitted by your group members (and summarizing the discussion if you are the group leader), and it will help the instructor in terms of assigning appropriate grades for participation in group discussion. **By keeping your groups organized, I mean that I would like you to try to keep all messages related to a particular discussion together under one thread.** To do this, the FIRST person who posts a comment about a particular group discussion should give this comment a title such as "Small-group discussion #1." All other group members who post after this should not create a new message (or a new thread), but should RESPOND to the message the first person posted (by clicking on that message and then just clicking on the reply button. This will keep all messages related to this particular assignment in one thread. If each person logs on and then creates a new message, this then creates several threads in the discussion room, and it can take a lot of time to go back and forth among these different threads in order to read what each person has to say. If all messages related to the same assignment or topic are kept in one thread, it will be easier for the group

leader to summarize the discussion, and it will be easier for everyone to review all the comments related to that particular assignment.

### 7. Keep in mind the asynchronous nature of the discussion rooms

Note that the discussion rooms do not allow for "real-time" communication (unless all group members happen to be on the computer at the same time and can respond to postings immediately). Instead, you will post your thoughts in your discussion room, and your group members can join the discussion any time they want throughout the week. We chose to use discussion boards because we wanted to offer you this kind of flexibility. **If any group desires to chat in real-time, let the instructor know. We do have chat rooms available on the WebVista site and it's certainly fine for any group to make use of these chat rooms if they want to.** The nice thing about the discussion rooms is that students can visit them when it's convenient and spend some time reflecting on what other group members have said before posting responses. With chat rooms, you can get immediate feedback, but everyone needs to be online at the same time, and unfortunately, the chat log disappears once the group has logged off (although the log can be obtained by the instructor once the discussion has ended and then e-mailed to the group).

### 8. Be respectful of your peers as you work through assignments together

One last thing to remember is that it is important for everyone in class to feel comfortable discussing their understanding of material (or lack of understanding) with others. Therefore, please be respectful of each group member and try to treat your group members in the way that you expect them to treat you. If you feel that it is not working for you to be in a particular group, do not hesitate to talk to the instructor about this.

If you ever have questions or concerns about small-group assignments, or about your own role in your discussion group, please contact the instructor or the teaching assistant.