Basics of Descriptive and Inferential Statistics STAT 1380-003 (CRN#13342) August 24, 2009 ¡BIENVENIDOS (WELCOME)! fall 2009

Credit Hours: 3-0  Course Fee: N/A

Description from Undergraduate Catalog: “A course in statistical literacy. Emphasis will be on standard descriptive measures of location, spread, and association. Regression, probability and sampling, and binomial distribution. Interpretation of data which occur in daily life (polls, weather forecasting, surveys, quality control, etc.) will be stressed.” Prerequisite: Math 1319, 1320, 1508 or equivalent or TCCN Math 1314. [In the 2009 proposal to add Stat 1380 to the Core Curriculum, the prerequisite becomes simply “An adequate score on a placement examination or MATH 0311.”]

This course will expose you to typical intro topics but with particular emphasis on and grounding in conceptual understanding and statistical literacy in real life. You deserve, need and will be offered more than a plug-and-chug, memorize-the-recipes experience! You’ll be able to critically evaluate statistics commonly found in the media and in your major field. You’ll become acquainted with what is involved in the collection, interpretation, and communication of real-world data to explore questions of interest. You’ll gain background that will help you answer probability and statistics questions on the TExES/ExCET (http://www.texes.ets.org/prepMaterials/), teach students the probability/statistics TEKS (www.tea.state.tx.us/rules/tac/chapter111/index.html), and make appropriate connections to the NCTM Standards (http://standards.nctm.org/), PreK-8 Curriculum Focal Points (www.nctm.org/standards/content.aspx?id=270), and the GAISE PreK-12 Curriculum Framework (http://www.amstat.org/Education/gaise/).

Course Objectives: Students will be able to….

…. apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations.
Numerical and graphical summaries of one-variable and two-variable datasets are interpreted, produced, and described verbally. We assess the reasonableness of linear models to data sets. We assess the reasonableness of a study’s conclusions based on that study’s qualities (e.g., was randomization used?).

…… represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.
Numerical and graphical summaries of one-variable and two-variable datasets are interpreted, produced, and described verbally.

…… expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments.
Reasoning is used to apply probability rules and to critique statistical studies (and to assess whether a claim of significance is warranted).

….. use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.
Instructors incorporate technology such as spreadsheet software, internet applets/simulations, or graphing calculators.

….. interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them.
Histograms, scatterplots, boxplots, tables, regression lines, etc. are interpreted.

….. recognize the limitations of mathematical and statistical models.
Studies done without random selection and/or random assignment are recognized as limited. Pitfalls and limitations of experiments (e.g., ecological validity), observational studies (e.g., no random assignment), and surveys are discussed. Formulas such as margin of error are recognized not to apply for a volunteer sample, for example.

…. develop the view that mathematics is an evolving discipline, interrelated with human culture, and understand its connections to other disciplines.
Because statistics can be applied to data from virtually all disciplines, it is natural to make clear interdisciplinary connections. Statistics and its tools are much newer field than the mathematics in "other math core classes". The connection to human culture comes into play with the human judgments that go into writing "the best" survey question, or deciding how to handle an outlier value, etc.

Meetings: LART 203 403, MWF 11:30-12:20 am, except Sept. 7, Nov. 27, Dec. 4

Instructor: Assoc. Prof. Dr. Larry Lesser (rhymes with “professor”, spelled like “<”) I began teaching university courses (especially statistics!) in 1988, and I’ve also worked as a state agency statistician and a full-time high school math teacher. More info and education resources are available from: www.math.utep.edu/Faculty/lesser/.

(FYI: you can even access the syllabus there by clicking “SCHEDULE”)

How to reach me: my Bell Hall 213 office hours will start off as M 9:30-10:20, MW 1:30-2:20, and by appointment with additional hours and changes to be announced/posted; also, feel free to ask me (or leave me) questions by phone (747-6845; “SIR-OUIJA”) or email (Lesser (at) utep.edu; when you email, please include “11:30 class” as part of the subject line). It’s my job and privilege to serve you and provide guidance so no need for you to wait a week until our next class meeting to get a question answered. (In fact, I may send an email to the whole class in between some meetings to offer additional information or materials, so check your email regularly.) For your protection, emailed inquiries about confidential information such as grades must be from your UTEP account and accompanied by your 800 number.

Textbook (required): Jessica Utts’ Seeing Through Statistics (3rd ed.; 2005) Duxbury Press. Subject to change based on timing, resources and interest, here’s the main material we plan to (un)cover: chapters 1-11 then 16. The instructor will provide some supplementary material via handouts that you will also be responsible for on topics such as simulation, sample space, counting rules, the binomial distribution, and the geometric distribution. You are expected to read each chapter and do the selected HW problems for that chapter (see below) before the class meeting we discuss that chapter (so that you are able to understand more and offer more) and to bring your book to each class. The exercises will often be assessed with similar ones on a quiz; I will give you advance notice when I will be asking you to turn in the exercises or other written work.

Ch. 1 (1, 3-5, 7,9,10,15,17,19); Ch. 2 (6,7,11,14,15), Ch. 3 (1-9,13,16,18-20,24,25a,26a), Ch. 4 (1,2,4-6,9,11,12,15,17,21,24,26), Ch. 5 (1-3,5,8-10,12,17,19,20,22,25a,27), Ch. 6, Ch. 7 (1-7, 9,12-16,19,21,25,28), Ch. 8 (2-
Technology: BRING CALCULATOR TO EACH CLASS because you’ll be allowed to use it on virtually all activities and assessments (but it really has to be a separate calculator, though, because you aren’t allowed to use devices such as a laptop or cell phone on tests). You’ll still have to write out enough of your work so I can follow your process. Example: when finding the mean of \{3, 4, 5, 5, 8\}, don’t just say “5”, but write out \((3 + 4 + 5 + 5 + 8)/5 = 5\). I will often demonstrate things with a TI-73/83/84 graphing calculator, but if you don’t already own one, you can certainly get by with a scientific calculator or even a simple calculator that can do basic arithmetic such as square roots. There are websites to help you get the most out of whatever your calculator is, such as: www.geocities.com/calculatorhelp/. As logistics and interest allow, I’ll facilitate explorations to expose you to how statistics are computed with web applets, graphing calculator, software (Excel or Minitab), etc.

Grades: after any rescaling needed for all components to be on the 0-100 scale, the grade is determined by the usual cutoffs of 90, 80, 70, 60, based on these parts:
- 10% Written Reflection(s) – details will be provided in advance
- 12% Quizzes (often unannounced on recent assigned reading or HW, so be prepared)
- 24% Test #1 currently set for Sept. 28; see comment for “Test #2”
- 24% Test #2 currently set for Nov. 18; at least a week or two in advance, I’ll confirm the exact material covered and the date; on tests, you’ll be provided formulas that are in the textbook, but without annotation
- 30% Project – project writeup (12-point Times New Roman double-spaced, APA style, checked for spelling/grammar; aim for 5-10 pages, not counting bibliography or appendices) will be due (and you must be prepared to give a short oral presentation) during the time UTEP has scheduled for our “final exam” meeting (Wed., Dec. 9, 1-3:45). If you have a pre-approved reason not to be able to present during this time, you will need to arrange with me as soon as possible to turn in and present your project earlier. Have any appropriate output/graphics electronically pasted into the document. Sections should be clearly marked, assembled in order, and stapled (not put into a folder or sleeve) with an identification coverpage on top (that includes your name, section, date, and a title that makes clear which option you chose and what your topic/theme was). For the project, you have a choice of ONE of 2 options listed at the end of this syllabus.

Attendance/Makeup Policy/Military Statement: Attendance is required and taken each meeting using a sign-in sheet and is very important considering that much of this course involves beyond-the-book group activities or discussions that are virtually impossible to recreate. The instructor may count late arrival, early departure, or blatant nonparticipation as a half-absence or even a full absence, depending on what is missed. With quizzes, I generally will count only the top \(n-1\) or \(n-2\) out of the \(n\) we have, so if you miss one of the days where we have a quiz, you won’t get a 0 quiz score, it will simply be not counted. In general (out of fairness and logistics), late work will not be accepted, and may be subject to a penalty in the rare borderline cases that it is accepted at the instructor’s discretion. A makeup exam is
possible ONLY if it is taken at the earliest opportunity and ONLY if missing the scheduled class exam date was unavoidable for a serious reason (verifiable by documentation like a doctor’s note) that was relayed to me (preferably by email) within 24 hours or the earliest (medically) possible opportunity; otherwise the exam score will be a 0.

It’s **your responsibility** to…

1. Sign the attendance sheet each day you attend
2. Let me know by email (Lesser (at) utep.edu) or voicemail (747-6845) or daytime math dept. fax (747-6502) at the earliest opportunity if you have a situation which may affect a test, major assessment deadline, or multiple regular class meetings.
3. Give me a written note or email by the 15th day of the semester (Sept. 14) if you will have absence for religious holy days (which are excused, of course).
4. Give me a written note or email as soon as possible if you are or may be called to military service and/or training during the semester.
5. Have a classmate give you copies of notes, handouts and announcements if you miss a class; write down at least 2 classmates’ contact information right here for this purpose:

   classmate #1 name_____________________ phone__________ email__________
   classmate #2 name_____________________ phone__________ email__________
   classmate #3 name_____________________ phone__________ email__________

As the UTEP Catalog says, “When in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of “W” before the course drop deadline [Oct. 30] and with a grade of “F” after the course drop deadline.” In practical terms, this will certainly mean a student may be dropped for more than 4 absences (unless there has been a reason I have approved. On a positive note, a strong record of attendance will be taken into account if your final average is a few tenths of a point below a letter grade cutoff.

**Academic Integrity:** As teachers, you especially appreciate that cheating, plagiarism and collusion in dishonest activities are serious acts which erode the university’s purpose and integrity and cheapen the learning experience for us all. Don’t resubmit work completed for other classes without specific acknowledgment and permission from me. It is expected that work you submit will represent your own effort (or your own group’s effort, if it is a group project), will not involve copying from or accessing unauthorized resources or people (e.g., from a previous year’s class). You must cite references that you do consult, using APA style (American Psychological Association, 5th edition or the brand-new 6th edition) with complete citations even for websites and people you consult: [http://libraryweb.utep.edu/db/citing.cfm](http://libraryweb.utep.edu/db/citing.cfm). Violations of the UTEP policy ([http://academics.utep.edu/Default.aspx?tabid=23785](http://academics.utep.edu/Default.aspx?tabid=23785)) may lead to disciplinary action from the Dean of Students (see course #20004 at [compliance.utep.edu/training/reviewing.aspx](http://compliance.utep.edu/training/reviewing.aspx)).

For Group Work: Within a group, members are allowed to divide up subsets of the project for which individuals will take the initial responsibility for coordinating efforts, but it is assumed that by the time a group turns in a writeup that all members have read, discussed, and understand all parts of what is being turned in. Group members may even discuss general ideas and strategies with members of other groups, but NOT share parts of actual written work. At a minimum, to be safe, put away all written...
notes and writing materials and recording devices before having any intergroup conversations. And if you still see a “gray area,” play it safe and ask the instructor!

Civility and Professionalism: Along with basic standards of civility and citizenship (e.g., “Student Conduct” and “Disruptive Acts Policy” in the UTEP Catalog), students in this course are required to exhibit professionalism and to support a constructive, collegial, collaborative classroom culture where critique is focused respectfully on the intellectual merit of a position, not on the person expressing it. (A good question or incomplete answer can advance discussion better than a “right answer”. Wrong answers are simply opportunities to learn.) You are also expected to use great discretion with cell phones and pagers during class time—if you are truly expecting an urgent call, please let me know and sit near the door to minimize disruption (and have your phone on “vibrate” instead of loud music, and have it handy so you don’t have to dig through a backpack for it). Or you could give your family member or child-care provider the phone numbers for an academic office or lab (e.g., LACIT 405: 747-5375) near our classroom. That way, you can keep your phone off during class, knowing that staff can quickly get you for a true emergency. Sustained talking with neighbors during presentations is not acceptable.

Finally, be open to local opportunities for professional growth or service. For example, consider helping/attending ABC or GEPCTM conferences (Sept. 26 and Oct. 17, respectively). Also, encourage K-12 students to enter ASA Poster Competitions. And consider joining (at cheaper student rates!) stat/math ed professional organizations at local (GEPCTM), state (TCTM), or national levels (NCTM or ASA).

Disabilities: If you have or believe you have a disability that will require accommodations or modifications, you may wish to self-identify by contacting the Disabled Student Services Office (DSSO; 747-5148; East Union Building room 106; dss@utep.edu; www.utep.edu/dsso/) to show documentation or register for testing and services. DSSO will ask you to discuss needed accommodations with me within the first 2 weeks of the semester or as soon as disability is known, and at least 5 working days before an exam. You are responsible for making sure I receive any DSSO instructions and letters of accommodation. DSSO provides note taking, sign language, interpreter, reader and/or scribe services, priority registration, adaptive technology, diagnostic testing for learning disabilities, assistance with learning strategies/tutoring, alternative testing location and format, and advocacy. Information provided to DSSO is kept confidential.

English Language Learner Awareness: I know that many of you are/were English language learners or will soon be teaching them. You may already know that being able to have everyday English conversation is not enough to guarantee success with technical language in a specific academic subject. Therefore, I will be modeling strategies that help ELLs (and others, too!) and incorporate awareness of some issues and resources specific to the context of probability/statistics. Recommendations from the literature include multiple representations, connections to etymology and everyday language, advance organizers, real-world and cultural connections, and group work. Note which statistics terms (e.g., nominal) are “cognates” in Spanish and what words may be more challenging because they have different meanings between English and Spanish and/or between statistics/mathematics and the everyday world. Please let me know if you think
of additional ways I might support your learning and feel free to ask for a pause so that I (or a classmate) can clarify question wording or rephrase or illustrate important ideas in class discussion that go by quickly.

Resources include
www.tsusmell.org/images/MELL_SpanishResforTeachers2007.pdf,
www.tsusmell.org/images/MatthewWinsor.pdf, isi.cbs.nl/glossary/index.htm,
www.tsusmell.org/images/MELL_MathTerms.pdf,
www.tea.state.tx.us/curriculum/biling/elpsi.html.

The ELPS requires language acquisition and academic success in all content areas for students at different levels (beginning, intermediate, advanced, and advanced high) in the domains of listening, speaking, reading and writing. (I offer some communication tips at http://www.math.utep.edu/Faculty/lesser/reading.html and http://www.math.utep.edu/Faculty/lesser/speaking.html.)

And finally, consider that the grade level readability of any subject’s curriculum you use is from a statistical model based on average number of syllables per word and average number of words per sentence. (See “Display readability statistics” in MS Word Help) Note: Development of this class was supported in part by the U.S. Department of Education-funded grant (PI: J. Tinajero) Project LEAP-UP: Learning, Encouraging, and Planning to Uplift Performance: http://www.academics.utep.edu/leapup.

Equity and Service Learning Awareness:
Note: Development of this class was supported in part by Project ACE (PI: J. Tinajero), funded by the Women’s Education Equity Act of the U.S. Department of Education, and many statistics examples we will discuss involve or are applicable to gender equity. A great gender equity resource person is Project ACE coordinator Estella Vallès (EDB 206, 747-6368, elvalles@utep.edu) and she always appreciates volunteers for Project ACE events (e.g., mother-daughter/father-son program).

UTEP’s Project ACE (ACtion for Equity): eduprojects.utep.edu/projectace/
UTEP’s Center for Civic Engagement academics.utep.edu/cce (contact Benedict Hall 103; cce@utep.edu; 747-7969 for service learning opportunities)
UTEP’s Women’s Resource Center: studentaffairs.utep.edu/wrc
Other related resources: http://www.math.utep.edu/Faculty/lesser/equity.html

Also, note that the world’s largest math teacher organization declared this past school year to have a major focus on equity (http://www.nctm.org/profdev/content.aspx?id=15589) and has resources (e.g., http://www.nctm.org/profdev/content.aspx?id=15591) specific to the grade level of the students you will teach!

Statistics Resources: (Please let me know of others you find that I may not know about)
Website for our textbook: www.duxbury.com/cgi-wadsworth/course_products_wp.pl?fid=M20b&product_isbn_issn=0534394027&discipline_number=17
Applets/virtual manipulatives:
http://www.shodor.org/interactivate/activities/tools.html (click “probability” or “statistics”)
http://illuminations.nctm.org/swr/list.asp?Ref=2&Std=4
http://illuminations.nctm.org/WebResourceList.aspx?Ref=2&Std=4&Grd=0
and some examples at http://standards.nctm.org/document/eexamples/index.htm
http://nlvm.usu.edu/en/nav/topic_t_5.html
FAPP applets for simple random sample, normal curve, correlation and regression, probability
Calculation pages: http://statpages.org/
Classroom connections: http://www.amstat.org/education/stn/ (e.g., check out issue #64)
(1) High-quality original TEKS-based teacher-ready lesson plan utilizing data (some of which must be quantitative) to explore a question of interest (contexts involving social justice or equity are especially encouraged for exploration). The lesson must include some statistics concepts that are in our textbook – it can’t simply be arithmetic. You will do this as a team of 2 or 3 and there must be a single writeup submitted for the entire team. Even though time constraints mean you will share only an excerpt with the class on presentation day, the writeup you give me must include the following IN THIS ORDER:

Title of the Lesson (should be a meaningful title that makes clear the main point)
Number and length of Class Periods for this Lesson/Unit
Grade Level or Course that is targeted
Objectives (What students should be able to do or demonstrate by the time the lesson is done)
What levels of Bloom’s taxonomy are in this lesson and where in the lesson they occur
Specific content misconceptions that your students might have and how you will address those
How and where this connects to TEKS (citing section # and verbal summary of relevant part(s))
How and where this connects to the NCTM Standards
How and where this connects to the NCTM Curriculum Focal Points
How and where this connects to the K-12 GAISE Guidelines (see Framework Table 1; describe which Process Components are involved in your lesson and describe any parts of your lesson that may be aimed to go beyond Level A)
How your lesson will include accommodations for learners at each level (beginning, intermediate, advanced, advanced high) with respect to listening, speaking, reading and writing, as described in Texas’ English Language Proficiency Standards
Other accommodations or adaptations for students with diverse learning styles or learning disabilities
If possible, state how this connects to the curriculum or scope & sequence used by a school district in El Paso
Prerequisite experiences/knowledge/reading
Materials (manipulatives/technology/A-V, etc.) needed
Outline of instructional activities (if this is a multi-day unit, break it down day-by-day)
Opening activity/vignette
How groups will be formed and structured (if group work will be used)
Classwork or Homework assignment
Closing activity
Extra activity/extension, if time remains
Assessment (How you will know if objectives were accomplished; include the actual assessment item you would use and a rubric for grading/scoring)
References (while the lesson must be mostly your own ideas, if part of it does include your adaptation of a particular published source or idea from a colleague, you must cite it fully in APA style)

(2) Data collection and analysis involving at least 2 categorical and at least 2 measurement variables on a topic of interest. The “data collection proposal” sheet (see www.math.utep.edu/Faculty/lesser/1380proposal.html) must be fully approved by me BEFORE you collect any data or you get no credit. This rule is to make sure that no one attempts
to do something with an inappropriate topic/design or unrealistic scope, as well as models the process that researchers have to go through before they can begin a study. The sooner you submit your proposal form, the sooner I’ll give you ungraded feedback (usually at or by the very next class), and the more time you’ll have to do your project (or make adjustments to your proposal and resubmit it, if required). I recommend you start thinking about it now and turn in your proposal form on or by October 16. There should be appropriate use of technology and contexts involving social justice or equity are especially encouraged for exploration. You will do this as a team of 2 or 3 with a single writeup submitted for the entire team. Feel free to bounce more sophisticated ideas off of me, but the most common project here will be a survey of adults (attempt to get as many as 100, so that even if some refuse to participate, you’ll still have a decent number). You must stay within these 4 rules:

a) Data must be collected openly and recorded in such a way that respondents cannot be identified or linked to their answers if someone were to read your report or stumble upon your files.

b) All individuals must be informed. For example, if you do a written questionnaire or telephone survey, you should start with something like, “Good afternoon -- my name is _______ and I’m a student in Dr. Lesser’s Stat 1380 class at UTEP. Are you willing to participate in a 1-minute survey as part of my class project? The survey will not be published, your participation and responses will be confidential, and your name or other identifying information will not be recorded. Your participation is completely voluntary and you are free to withdraw at any time. Do you have any questions? Are you willing to participate?”

c) In selecting people for your survey, you must avoid settings where you work and avoid choosing: co-workers, relatives, animals, significant others, close friends, significant others of close friends, minors (people under the age of 18), prisoners, and representatives of any other “vulnerable” population (e.g., individuals who cannot read/understand informed consent).

d) Your topic must avoid issues which could reasonably be expected to be highly personal, controversial or sensitive, such as sexual behavior, drug usage, or underage drinking. But while you CANNOT ask about someone’s sensitive personal behavior (e.g., “How much beer do you drink?”), you might be able to ask about the topic from a society or current events perspective (e.g., “Do you think the drinking age in Juárez should be raised, lowered, or kept the same?”).

The first page after the coverpage should be titled “Background” and should describe the general question of interest and explain why it is significant or important to you. There should be a statement of what population you chose (and why) and describe what random sampling procedure was used (or why one was not or could not be used and what specific things you did to help make the sample as representative as possible of the population of interest). The next page or two of the report should be titled “Results” and should include the results of your survey, with appropriate numerical and graphical summaries included. (Graphs must be appropriately drawn, sized, with axes labeled.) The next page or two of the report is titled “Discussion”, in which you make any interpretations or conclusions you can from your data, discuss any limitations of your data or method, discuss any difficulties or judgment calls you encountered and how you handled them, discuss what you might do differently next time. The next page should be titled “References” where you acknowledge whatever help you may have obtained from any people or print references to do this project. (If you had none, then omit the References page.) The final page is called “Appendix” which should include a numerical summary or table of the data you collected. It should be in enough detail that I could recreate a graph from it if I wanted to, but it should not have any names of people that were surveyed.

PROJECT ACE asks that everyone take the fall 2009 Pre-Test online.

Step 1) Go to http://eduprojects.utep.edu/projectace/ and choose "surveys" from the left-hand menu, or simply go to https://mspace.utep.edu/bghiza/web/projectace.htm

Step 2) Print out the “Consent Form”, fill it in (You can fill in “Dr. Lesser” on the consent form where it says “Professor.” You sign your name where it says “research informant”), and return it to the instructor.

Step 3) Click on the link to take the survey itself.