

**Internet Resources for Statistics**  
**Educational Transfer Plan 2005**  
**By Andrea Salas**

The main objective for providing this list of resources is to give teachers and students of AP Statistics an abundance of options to supplement the teaching and learning of this college level course. For students who are having trouble with certain concepts, they can turn to the web-based resources for alternative explanations. Teachers can scan the list of sites to find one that will provide additional activities for, and ways of presenting, the course content.

The Student Sites can be shared with students on the first day of school. They should be encouraged to add to this list throughout the year with their own suggestions of sites they found that were helpful. Teachers can use these sites throughout the year for introducing or reinforcing concepts or finding new ways to present a topic. Some sites contain specific activities, others are more general. A list of applets are provided to allow teachers and students to visualize some concepts in a more interactive way.

Students and teachers should evaluate the effectiveness of the sites themselves so that the list can be constantly updated for relevance and usefulness. This is definitely a working document, so more descriptions and resources can be added (or retracted). A Pre survey given at the beginning of the year and a Post Survey given at intervals throughout the rest of the year will help refine this list in subsequent school years. Sample quick surveys are attached at the end of this document.

An idea for future development of this ETP is to file these resource electronically in such a way that their content can be categorized and found via search. This would be preferable to a general internet search since only the resources prescreened by past users for good content would be included. This might be accomplished using Trackstar or some other similar site (see **Miscellaneous** resources).



<http://apcentral.collegeboard.com/article/0,3045,151-165-0-2151,00.html>

AP Statistics Course Home Page from the College Board's AP Central Web Site. The site includes AP Stat course information, Exam information (including released exams), teaching resource materials (including links to other sites), articles, discussion groups, and much, much more!

<http://www.calpoly.edu/%7Ebchance/APReview/errata.html>

Errata for *AP Statistics: Preparing for the Advanced Placement Examination*

<http://www.whfreeman.com/yates1e/>

The home page for the textbook used in most AP Statistics classes, *The Practice of Statistics*, by Yates/Moore. Contains an instructor area for syllabus building, a calendar, quiz tracker, and more. The student side contains a variety of electronic learning tools designed to increase students' understanding of our textbook, including quizzes that can be submitted to the instructor.

<http://www.herkimershideaway.org/apstatistics/ymmsum99/ymm.htm>

Chapter by chapter lecture notes for *The Practice of Statistics* textbook by Yates/Moore. Hosted by Mr. Sanderson Smith at Cate School, a private high school in Carpinteria, CA.

<http://www.woodward.edu/faculty/us/math/apstat/tests.html>

These are chapter tests for *The Practice of Statistics* textbook developed by Paul Myers at Woodward Academy in Georgia.

<http://www.nova.edu/~hammack/stat/>

Bill Hammack's Statistics class page, of Nova Southeastern University. All of his lecture notes are published on this site.

<http://www.starlibrary.net/>

The Statistics Teaching and Resource Library (STAR). Although it is no longer an active journal, the materials are still being hosted by Causeweb.org. STAR's purpose was to "provide a peer-reviewed journal of resources for introductory Statistics teachers that are free of cost, readily available, and easy to customize for the use of the teacher (and) to promote active learning in the introductory statistics classroom." Each activity is

displayed in the form of a short written article that describes the activity in enough detail that a teacher could use it as is or customize it easily to suit their own needs.

[http://chance.dartmouth.edu/chancewiki/index.php/Main\\_Page](http://chance.dartmouth.edu/chancewiki/index.php/Main_Page)

Chance News reviews **current issues in the news that use probability or statistical concepts**. Its aim is to give the general public a better understanding of chance news as reported by the media and to allow teachers of probability and statistics courses to liven up their courses with current news.

<http://exploringdata.cqu.edu.au/histogram.htm>

This is a great site for typical introductory statistical concepts (typically covered in a first chapter). Activities are provided for histograms, stemplots, dotplots, boxplots, scatterplots, and measures of location and spread. Some use applets, but alternatives are provided for those who don't have internet access. I have not yet previewed the other topics on this page, but they include Linear Regression, the Normal Distribution, Probability, Sampling, Confidence Intervals, Hypothesis Testing, and Non Linear Regression

<http://exploringdata.cqu.edu.au/datasets.htm#oscar>

These datasets support the activities, worksheets, assessment and articles in the Exploring Data website. Datasets are available in three formats - Excel 4.0, NCSS Jr. 6.0 and Tab Delimited.

[http://www.bbn-school.org/us/math/ap\\_stats/index.html](http://www.bbn-school.org/us/math/ap_stats/index.html)

This is the AP Statistics course home page for Al Coons, a high school instructor in Cambridge, MA. It is useful for not only its modeling of a great web site design for the classroom, but also for its links to Statistics resources. It is definitely worth spending time to look at.

[http://exploringdata.cqu.edu.au/stu\\_gen.htm](http://exploringdata.cqu.edu.au/stu_gen.htm)

This site has great suggestions from various sources on how students can collect their own data (both univariate and bivariate), instead of working with pre-packaged data sets. There are numerous connections to science. Suggested data collection activities for hypothesis testing and confidence intervals are also included.

[http://media.pearsoncmg.com/aw/aw\\_triola\\_elemstats\\_9/ip/tes09\\_04\\_ip.htm](http://media.pearsoncmg.com/aw/aw_triola_elemstats_9/ip/tes09_04_ip.htm)

This project combines a number of aspects of statistics. Students will use probability distributions to model the possible outcomes of a particular experiment, one with its roots in randomness. Second, students will use the model to estimate or, to a degree, predict the outcome of the experiment. Lastly, this project will employ simulation to replicate the experiment allowing students to compare their estimates with an actual outcome. **Connects to Quincunx applet** (See Applets section). Also see <http://mathworld.wolfram.com/GaltonBoard.html> for a good explanation of the probabilities involved in the Galton or Quincunx board

[http://courses.ncssm.edu/math/Stat\\_inst01/intro.htm](http://courses.ncssm.edu/math/Stat_inst01/intro.htm)

During a weeklong institute in the summer of 2000, seventeen AP Stat teachers gathered on the campus of the North Carolina School of Science and Mathematics (NCSSM) to create materials that would help them teach the sections in the AP course on experimental design. These activities, including the one on Blocking, are teacher friendly and easy to understand. Included are links to the 1999 and 2001 institute materials.

<http://badame.vse.cz/cs/toCP852.cs.cgi/mirrors/introbook/sbk26m.htm>

An explanation of Type I and Type II errors in hypothesis testing using a case study involving SAT scores

<http://www.mste.uiuc.edu/patel/chisquare/keyprob.html>

A great introduction to the **Chi-Square statistic**. The intro starts with the proposal of a real world question, and then moves on to present the topics of Fairness, Expectation, the D-Statistic, and finally the Chi-Square statistic.

<http://www.amstat.org/index.cfm?fuseaction=main>

[American Statistical Association website](http://www.amstat.org). The premier association for the practice and teaching of Statistics. The vision statement proclaims that the ASA would like to be “a world leader in promoting statistical practice, applications, and research; publishing statistical journals; improving statistical education; and advancing the statistics profession.” The following online version of one of their publications is free and does not require membership.

<http://www.amstat.org/publications/jse/>

The Journal of Statistics Education. Online version of an international journal for the teaching and learning of statistics which contains articles and a data archive with over eighteen data files

[http://www.improvingmedicalstatistics.com/entry\\_high\\_school.htm](http://www.improvingmedicalstatistics.com/entry_high_school.htm)

The focus of this web site is how the use of medical statistics and the interpretation of studies in the medical literature can be improved. The approach employed is to evaluate individual studies where the statistical analyses have been poorly performed or have conclusions that are poorly formulated. Thus, it contains case studies of bad statistical practice. There is a section containing material specifically for high school or introductory college statistics

<http://www.amstat.org/publications/jse/v5n2/ballman.html>

Journal of Statistics Education article on the role of probability in introductory statistics courses. The author states that the objectives of these courses may be better met by emphasizing characteristics of random variation and its role in statistics rather than formal probability. She outlines relevant topics and activities that she teaches to provide an example of a course that emphasizes characteristics of random variation. Although some of the activities describes takes place in a computer classroom, they can easily be modified for use without computers.

<http://www.keypress.com/SIA/instructorResources/CalculatorGuide.html>

Although this calculator guide for the TI83/84 was created as a supplement for *Statistics in Action* (a Key Curriculum Press publication), it is useful for anyone who wants to learn how to use the statistics functions on their calculator. It contains activities in every chapter. **Adobe Acrobat format only.**

<http://www.randomizer.org/form.htm>

Research Randomizer is a free service offered to students and researchers interested in conducting random assignment and random sampling. Allows you to select the number of sets, the amount of numbers per set, the range, whether each number should be unique, and ways to view the output. Then, it downloads to an Excel WS. Integers only.

<http://wise.cgu.edu/tutor.asp>

The Claremont Colleges' "Web Interface for Statistics Education" (WISE) seeks to expand teaching resources offered through Introductory Statistics courses, especially in the social sciences. This project aims to develop an on-line teaching tool to take advantage of the unique hypertextual and presentational benefits of the World Wide Web. This teaching tool's primary application is as a supplement to traditional teaching materials, addressing specific topics that instructors have difficulty in presenting using traditional classroom technologies. The tool serves to promote self-paced learning and to provide a means for advanced students to review concepts. Topics include: Sampling Distribution of the Mean, the Central Limit Theorem, Hypothesis Testing, Power, Correlation and Regression, as well as some other specialized topics.

<http://noppa5.pc.helsinki.fi/links.html#osdm>

This site has too many links to count to statistical resources. Some links may no longer be valid, and the qualities of all the links have not been verified. However, it is a good place to explore from, just not all in one sitting

<http://www.tkk.fi/Units/Departments/F/SAL/Teaching/Resources/ProbStat/table.html>

This resource has [a table of statistical teaching resources](#) with qualities that a book alone can not provide, such as dynamic demonstrations and interactive exercises. These resources have mainly been found from the academic homepages of different statisticians and statistics teachers around the world with some companies also represented. A major criterion is also that the material should be accessible with a normal Web browser, so mainly WWW-based (Java, Perl, Cgi, Active X, VBS...) software is promoted. The better and more extensive a resource, the closer to the top of the table it is.

<http://members.aol.com/johnp71/javastat.html>

This site has hundreds of links to statistical resources from all over the world. It was the starting point for this entire project, and is too large to wade through in a single sitting or day. According

to the administrator, “The web pages listed here comprise a powerful, conveniently-accessible, multi-platform statistical software package. There are also links to online statistics books, tutorials, downloadable software, and related resources. All of these resources are freely accessible, once you can get onto the Internet.”

<http://statweb.calpoly.edu/chance/>

Beth Chance’s Home Page at the Department of Statistics, Cal Poly SLO. Contains links to data sources and useful **JAVA applets**

<http://www.analytictech.com/mb313/regress3.htm> The Least Squares approach to Regression lesson model

[http://www.cdc.gov/epo/dih/MiniModules/sd\\_sem/page01.htm](http://www.cdc.gov/epo/dih/MiniModules/sd_sem/page01.htm) From the Center for Disease Control website. The primary *learning objective* for this training is to evaluate the relationship of a sample mean and sample standard deviation to the population mean. Upon completion of the module, students will be able to

- define mean, standard deviation (SD) and standard error of the mean (SEM);
- describe the relationship and the difference between SD and SEM;
- calculate SD and SEM from samples; and
- describe the distribution of sample means as defined by the Central Limit Theorem.

[http://elsmar.com/pdf\\_files/Degrees\\_of\\_Freedom.pdf](http://elsmar.com/pdf_files/Degrees_of_Freedom.pdf)

An attempt to explain Degrees of Freedom, with a list of different definition perspectives from various sources. For another perspective on degrees of freedom, try

[http://psych.rice.edu/online\\_stat/chapter8/df.html](http://psych.rice.edu/online_stat/chapter8/df.html)

<http://www.stat.ncsu.edu/info/srms/survpamphlet.html>

Information on how to conduct a survey

<http://www.amstat.org/sections/srms/brochures/margin.pdf>

“What is a Survey?” from the American Statistical Association. Information on planning a survey, collecting data, judging quality, pretesting, focus groups, types of surveys, designing a questionnaire, and margin of error.

[http://www.statisticalengineering.com/central\\_limit\\_theorem.htm](http://www.statisticalengineering.com/central_limit_theorem.htm)

An Engineering Statistics website. Gives an example of how the Central Limit Theorem works with a uniform (non-normal) distribution.



## Correlation

<http://www.stat.uiuc.edu/courses/stat100/java/GCApplet/GCAppletFrame.html>

Simple correlation exercises. Four scatterplots appear on screen, along with four correlation coefficients for matching. Students guess the correct matches and afterward can display the correct answer.

<http://noppa5.pc.helsinki.fi/koe/corr/cor1.html>

Another simple applet that asks students to guess the correlation coefficient based on the given scatterplot. A message appears when the guess is correct. Also try <http://noppa5.pc.helsinki.fi/koe/corr/cor.html> to go with the former applet. This applet shows what the scatterplot looks like for a *chosen* correlation coefficient.

<http://www.stat.berkeley.edu/users/stark/SticiGui/Text/ch3.1.htm>

A great applet which allows students to decide the explanatory and response variables for data collected about students in an MBA program, and then looks for correlations.

## Regression

<http://www.stat.sc.edu/~west/javahtml/Regression.html>

The applet below is designed to teach students the effect of leverage points on a regression line. Students may add points to the plot by clicking the mouse button. Students should note that adding points close to the existing line barely changes the line. By adding points far from the existing line, the regression line changes considerably. This is particularly true for points added outside the range of the data. This should help students understand the effect of outliers on regression analysis.

## Hypothesis Testing

<http://www.stat.sc.edu/~ogden/javahtml/power/power.html>

This applet illustrates the fundamental principles of statistical hypothesis testing through the simplest example: the test for the mean of a single normal population, variance known (the Z test).

<http://noppa5.pc.helsinki.fi/uudet/testi/onesided.html>

Allows students to visualize the hypothesis testing decision problem

### **Probability**

<http://www.stat.sc.edu/~west/javahtml/LetsMakeaDeal.html>

If you are aware of the popular “Let’s Make a Deal” probability paradox, this applet will help convince students of the correct answer.

<http://mathdemos.gcsu.edu/plinko/>

Plinko! Simulation activity based on the popular Let’s Make a Deal game. The following basic ideas are involved in the analysis of the Plinko game: counting strategies, Pascal's triangle, probability (experimental and theoretical), simulations, tree diagrams, and expected value. This demo can be used as an activity to introduce/motivate these topics and then can be revisited as an interesting application of the topics that are appropriate for your course. JAVA or TI83 required.

### **Mean and Median**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This applet demonstrates basic properties of the mean and median including (a) the effect of skew on the relative size of the mean and median, (b) the mean deviation from the mean is zero, and (c) the mean squared deviation from the mean is less than or equal to the mean squared deviation from the median (or any other number).

Concepts: central tendency, mean, median, skew, least squares.

### **Sampling Distribution Simulation**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This applet estimates and plots the sampling distribution of various statistics. You specify the population distribution, sample size, and statistic. An animated sample from the population is shown and the statistic is plotted. This can be repeated to estimate the sampling distribution.

Concepts: sampling distribution, standard deviation, standard error, central limit theorem, mean, median, efficiency, fluctuation, skew, normal distribution.

<http://www.jcu.edu/math/iseq/Quincunx/Quincunx.html> This is a Quincunx, or Galton Board simulation. A quincunx board starts with 1 pin on the first row, 2 pins on the second rows, 3 pins on the third row, and so on. Multiple balls are then dropped onto the top pin. As the balls fall to the bottom, they will land into bins which are placed below the last row of pins. When counting

the number of balls in each bin, one notices that there are more balls in the center bins than there are in the outer bins. Mathematically, we can notice that this distribution is a normal distribution.

<http://teacherlink.org/content/math/interactive/flash/quincunx/quincunx.html>

Another Quincunx applet. This one also has an option to show Pascal's triangle overlay

### **Confidence Intervals**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Confidence intervals on the mean are generated for simulated experiments. The confidence level and sample size can be manipulated.

Concepts: confidence interval, mean, standard deviation.

### **Normal Approximation to the Binomial Distribution**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This demonstration allows you to view the binomial distribution and the normal approximation to it as a function of the probability of a success on a given trial and the number of trials. It can be used to compute binomial probabilities and normal approximations of those probabilities.

Concepts: binomial distribution, normal distribution, central limit theorem, correction for continuity.

Also see **Sampling Distribution Simulation** above

### **Confidence Interval on a Proportion**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

The effect of violating the assumption that the sampling distribution of  $p$  is normal can be investigated by varying  $N$  and  $P_i$ .

Concepts: binomial distribution, normal distribution, central limit theorem, confidence interval.

### **Components of $r$**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports Java.

The slope, standard error of the estimate, and the standard deviation of  $X$  can all be manipulated independently to see the effect on the scatterplot and on  $r$ .

Concepts: Correlation, slope, standard error of the estimate, variance, restriction of range, proportion of variance explained.

### **Regression by Eye**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

A scatterplot is displayed and you draw in a regression line by hand. You can then compare your line to the best least squares fit. You can also try to guess the value of Pearson's correlation coefficient.

**Concepts:** Correlation, regression line, mean squared error.

### [Restriction of Range](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

The range of X can be manipulated to investigate its effect on Pearson's r and other aspects of the relationship between X and Y.

**Concepts:** Correlation, restriction of range, slope, standard error of estimate.

### [Repeated Measures](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This applet lets you investigate differences between correlated and independent t tests.

**Concepts:** t test, within-subject variable, between-subject variable, power, repeated measures.

### [A "Small" Effect Size Can Make a Large Difference](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports Java.

This applet demonstrates that even a "small" effect can be important under some circumstances.

Applicants from two groups apply for a job. The user manipulates the difference between groups on the variable on which selection is made and the cutoff for hiring. The effects on the proportion of hired applicants from each group are displayed. A related phenomenon is discussed in the article:

Martell, R., Lane, D. M., & Emrich, C. (1996) Male-female differences: A computer simulation. *American Psychologist*, 51, 157-158.

**Concepts:** normal distribution, selection ratio, effect size, omega squared, proportion of variance explained.

### [Chi Square Test of Deviations from Expected Frequencies](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

You can specify whether you wish to sample from a uniform or a normal distribution. The applet does the sampling and tests the significance of deviations from these two distributions.

**Concepts:** goodness of fit, chi square, normal distribution, uniform distribution.

### [2 x 2 Contingency Tables](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Simulates experiments using 2 x 2 contingency tables. You specify the population proportions and the sample size and examine the effects on the probability of rejecting the null hypothesis.

**Concepts:** chi square, correction for continuity, normal approximation.

### Reliability and Regression Analysis

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates how the reliability of X and Y affects various aspects of the regression of Y on X.

**concepts:** reliability, standard error of estimate, slope, correlation.

### Histograms, Bin Widths, and Cross Validation

[http://www.gen.umn.edu/faculty\\_staff/delmas/gc\\_1454\\_course/distribution\\_files/distribution.html](http://www.gen.umn.edu/faculty_staff/delmas/gc_1454_course/distribution_files/distribution.html)

Histogram applet that will give 3-4 examples for each type of the following types of distributions: Bell shaped, skewed, bimodal, uniform, and skewed/bimodal

[http://www.ruf.rice.edu/~lane/stat\\_analysis/histogram.html](http://www.ruf.rice.edu/~lane/stat_analysis/histogram.html)

Use your own data to generate a histogram. Allows you to explore how bin width can change the histogram's appearance.

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates how a histogram is affected by bin width and starting point of first bin. Illustrates cross-validation criterion for assessing histograms.

**concepts:** histogram, bin width, cross validation, density estimation.

### Transformations

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates how transformations affect the relationship between two variables.

**concepts:** transformation, correlation, regression, exponential growth.

### Regression to the mean

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

A simulation illustrating the regression toward the mean phenomenon.

**concepts**: regression, correlation, reliability, error, luck

### Comparing distributions

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Your response times on a simple motor task are recorded under two conditions. Various statistics and graphs used to compare the distributions are presented. **Concepts**: central tendency, spread, mean, median, skew.

### Unequal n ANOVA and Types of Sums of Squares

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Illustrates types of sums of squares in a 2 x 3 ANOVA are presented. **Concepts**: Confounding, unequal n, unweighted means, commonality analysis, hierarchical partitioning.

### Robustness of t test and ANOVA

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Simulates t-test/ANOVA with normality and homogeneity of variance assumptions violated.

**Concepts**: Assumptions, robustness, type I error rate, homogeneity of variance, normality.

### One-way ANOVA

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates partitioning of variance. **Concepts**: ANOVA, sums of squares, partitioning variance.

### Two-way ANOVA

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates partitioning of variance. **Concepts**: ANOVA, sums of squares, partitioning variance, interaction.

## Central Limit Theorem

<http://www.stat.sc.edu/~west/javahtml/CLT.html> This is a great applet for demonstrating the central limit theorem using simulated dice-rolling experiments. An "experiment" consists of rolling a certain number of dice (1-5 dice are available in this applet) and adding the number of spots showing. This experiment is "performed" repeatedly, keeping track of the number of times each outcome is observed. These outcomes are plotted in the form of a histogram. According to the Central Limit Theorem, if the number of dice rolled is not too small, the histogram's shape should resemble that of the "bell-shaped curve" when the experiment is repeated many times.

Also see [Sampling Distribution Simulation](#) above

For Students

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<http://www.whfreeman.com/yates1e/>

The home page for the textbook used in most AP Statistics classes, *The Practice of Statistics*, by Yates/Moore. Contains an instructor area for syllabus building, a calendar, quiz tracker, and more. The student side contains a variety of electronic learning tools designed to increase students' understanding of our textbook, including quizzes that can be submitted to the instructor.

<http://www.collegeboard.com/student/testing/ap/about.html>

From the people who bring you the SAT, this site contains all of the information you will ever need about AP courses, including AP Statistics. Topic outline, course description, exam practice, and other resources available.

<http://www.statsoftinc.com/textbook/stathome.html>

This is an electronic textbook for overall supplementation. The text contains the standard elementary topics as well as more sophisticated topics in Statistics that go beyond an introductory course. When you get to this site, you can either search for the topic or click on the buttons in the window on the right.

<http://calculators.stat.ucla.edu/>

Statistical calculators for when you've forgotten yours

<http://www.keypress.com/SIA/instructorResources/CalculatorGuide.html>

Although this calculator guide for the TI83/84 was created as a supplement for another textbook, it is useful for anyone who wants to learn how to use the statistics functions on their calculator. It contains activities in every chapter. **Adobe Acrobat format only.**

<http://www.amstat.org/index.cfm?fuseaction=main>

[American Statistical Association website](#). The premier association for the practice and teaching of Statistics. The vision statement proclaims that the ASA would like to be “a world leader in promoting statistical practice, applications, and research; publishing statistical journals; improving statistical education; and advancing the statistics profession.” Student membership is \$20 for 2 years and provides subscription to STATS: The Magazine for Students of Statistics, access to publications, and scholarship opportunities.

# Miscellaneous

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<http://www.itl.nist.gov/div898/handbook/pri/section5/pri55.htm>

Engineering Statistics handbook

<http://www.statsoftinc.com/textbook/stexdes.html#2g>

Industrial Design of Experiments from the Statsoftinc electronic textbook. More in-depth than an elementary Statistics book

<http://www.learner.org/resources/series65.html>

“Against All Odds” video series description page. Can view through Video on Demand. Also, to go with this site, try <http://www.statsci.org/class/aao.html> which provides timings of the vignettes used in the videos

[http://www.keypress.com/fathom/pages/community\\_exchange/fun\\_and\\_interesting\\_links/quotes.php](http://www.keypress.com/fathom/pages/community_exchange/fun_and_interesting_links/quotes.php)

Math and statistics quotes

<http://www.google.com/search?hl=en&q=statistics+filetype%3Appt>

The search results for typing in “statistics filetype: ppt” in a Google search. Links for powerpoints that other people have created. One of them is a game called Statistics Jeopardy, a fun way to review concepts, based on the popular game show format.

<http://members.fortunecity.com/jonhays/quincunx.htm>

Build a Quincunx board (also known as a Galton or “Bell Curve” board) activity. Suggested extra credit activity for students who are good with their hands.

[http://courses.ncssm.edu/math/Stat\\_Inst2001/Intro/Introduction.htm](http://courses.ncssm.edu/math/Stat_Inst2001/Intro/Introduction.htm)

Contains a series of JMP lab activities to introduce the students to the software. (JMP is a statistical software program from the creators of SAS that is used extensively by engineers).

[http://socrates.berkeley.edu/~glaserj/%20Contribs&Contracts\\_PolicyMatters\\_2004.htm](http://socrates.berkeley.edu/~glaserj/%20Contribs&Contracts_PolicyMatters_2004.htm)

Funny article by Jack Glaser, Asst. Professor in the Goldman School of Public Policy at UC Berkeley. Demonstrates the affect of over-reliance on p values (an example from the NY Times), their incorrect usage, and laments the pervasiveness of the .05 standard.

<http://trackstar.4teachers.org/trackstar/index.jsp>

TrackStar is your starting point for online lessons and activities. Simply collect Web sites, enter them into TrackStar, add annotations for your students, and you have an interactive, online lesson called a Track. Create your own Track or use one of the hundreds of thousands already made by other educators. Search the database by subject, grade, or theme and standard for a quick and easy activity. There is a fun Track already made for each day of the year, too!

## **Internet Resource Survey Fall**

1. Do you have access to a computer at home?
2. Do you have access to the internet at home?
3. If you answered Yes to #2, what type of connection do you have (Dial-up, DSL, or Broadband)

Use the following scale to answer each question below:

1=Not at all                      2 = A few times a month                      3=A few times a week  
4=Daily

4. During the school year how often do you use the computer to do the following:
  - a. Word process
  - b. Create a PowerPoint
  - c. Use EXCEL
  - d. Surf the Net to help with your school work, complete assignments, or do course related research
5. If you have used EXCEL, have you ever done any of the Statistical Add-in features?
6. Look at the Internet Resources list provided. Are there any that you have already been to?
7. Pick 3 sites from the Internet Resources list that interest you or that you might look at or use.

**Internet Resources for Statistics**  
**Educational Transfer Plan 2005**  
**By Andrea Salas**

The main objective for providing this list of resources is to give teachers and students of AP Statistics an abundance of options to supplement the teaching and learning of this college level course. For students who are having trouble with certain concepts, they can turn to the web-based resources for alternative explanations. Teachers can scan the list of sites to find one that will provide additional activities for, and ways of presenting, the course content.

The Student Sites can be shared with students on the first day of school. They should be encouraged to add to this list throughout the year with their own suggestions of sites they found that were helpful. Teachers can use these sites throughout the year for introducing or reinforcing concepts or finding new ways to present a topic. Some sites contain specific activities, others are more general. A list of applets are provided to allow teachers and students to visualize some concepts in a more interactive way.

Students and teachers should evaluate the effectiveness of the sites themselves so that the list can be constantly updated for relevance and usefulness. This is definitely a working document, so more descriptions and resources can be added (or retracted). A Pre survey given at the beginning of the year and a Post Survey given at intervals throughout the rest of the year will help refine this list in subsequent school years. Sample quick surveys are attached at the end of this document.

An idea for future development of this ETP is to file these resource electronically in such a way that their content can be categorized and found via search. This would be preferable to a general internet search since only the resources prescreened by past users for good content would be included. This might be accomplished using Trackstar or some other similar site (see **Miscellaneous** resources).



<http://apcentral.collegeboard.com/article/0,3045,151-165-0-2151,00.html>

AP Statistics Course Home Page from the College Board's AP Central Web Site. The site includes AP Stat course information, Exam information (including released exams), teaching resource materials (including links to other sites), articles, discussion groups, and much, much more!

<http://www.calpoly.edu/%7Ebchance/APReview/errata.html>

Errata for *AP Statistics: Preparing for the Advanced Placement Examination*

<http://www.whfreeman.com/yates1e/>

The home page for the textbook used in most AP Statistics classes, *The Practice of Statistics*, by Yates/Moore. Contains an instructor area for syllabus building, a calendar, quiz tracker, and more. The student side contains a variety of electronic learning tools designed to increase students' understanding of our textbook, including quizzes that can be submitted to the instructor.

<http://www.herkimershideaway.org/apstatistics/ymmsum99/ymm.htm>

Chapter by chapter lecture notes for *The Practice of Statistics* textbook by Yates/Moore. Hosted by Mr. Sanderson Smith at Cate School, a private high school in Carpinteria, CA.

<http://www.woodward.edu/faculty/us/math/apstat/tests.html>

These are chapter tests for *The Practice of Statistics* textbook developed by Paul Myers at Woodward Academy in Georgia.

<http://www.nova.edu/~hammack/stat/>

Bill Hammack's Statistics class page, of Nova Southeastern University. All of his lecture notes are published on this site.

<http://www.starlibrary.net/>

The Statistics Teaching and Resource Library (STAR). Although it is no longer an active journal, the materials are still being hosted by Causeweb.org. STAR's purpose was to "provide a peer-reviewed journal of resources for introductory Statistics teachers that are free of cost, readily available, and easy to customize for the use of the teacher (and) to promote active learning in the introductory statistics classroom." Each activity is

displayed in the form of a short written article that describes the activity in enough detail that a teacher could use it as is or customize it easily to suit their own needs.

[http://chance.dartmouth.edu/chancewiki/index.php/Main\\_Page](http://chance.dartmouth.edu/chancewiki/index.php/Main_Page)

Chance News reviews **current issues in the news that use probability or statistical concepts**. Its aim is to give the general public a better understanding of chance news as reported by the media and to allow teachers of probability and statistics courses to liven up their courses with current news.

<http://exploringdata.cqu.edu.au/histogram.htm>

This is a great site for typical introductory statistical concepts (typically covered in a first chapter). Activities are provided for histograms, stemplots, dotplots, boxplots, scatterplots, and measures of location and spread. Some use applets, but alternatives are provided for those who don't have internet access. I have not yet previewed the other topics on this page, but they include Linear Regression, the Normal Distribution, Probability, Sampling, Confidence Intervals, Hypothesis Testing, and Non Linear Regression

<http://exploringdata.cqu.edu.au/datasets.htm#oscar>

These datasets support the activities, worksheets, assessment and articles in the Exploring Data website. Datasets are available in three formats - Excel 4.0, NCSS Jr. 6.0 and Tab Delimited.

[http://www.bbn-school.org/us/math/ap\\_stats/index.html](http://www.bbn-school.org/us/math/ap_stats/index.html)

This is the AP Statistics course home page for Al Coons, a high school instructor in Cambridge, MA. It is useful for not only its modeling of a great web site design for the classroom, but also for its links to Statistics resources. It is definitely worth spending time to look at.

[http://exploringdata.cqu.edu.au/stu\\_gen.htm](http://exploringdata.cqu.edu.au/stu_gen.htm)

This site has great suggestions from various sources on how students can collect their own data (both univariate and bivariate), instead of working with pre-packaged data sets. There are numerous connections to science. Suggested data collection activities for hypothesis testing and confidence intervals are also included.

[http://media.pearsoncmg.com/aw/aw\\_triola\\_lemstats\\_9/ip/tes09\\_04\\_ip.htm](http://media.pearsoncmg.com/aw/aw_triola_lemstats_9/ip/tes09_04_ip.htm)

This project combines a number of aspects of statistics. Students will use probability distributions to model the possible outcomes of a particular experiment, one with its roots in randomness. Second, students will use the model to estimate or, to a degree, predict the outcome of the experiment. Lastly, this project will employ simulation to replicate the experiment allowing students to compare their estimates with an actual outcome. **Connects to Quincunx applet** (See Applets section). Also see <http://mathworld.wolfram.com/GaltonBoard.html> for a good explanation of the probabilities involved in the Galton or Quincunx board

[http://courses.ncssm.edu/math/Stat\\_inst01/intro.htm](http://courses.ncssm.edu/math/Stat_inst01/intro.htm)

During a weeklong institute in the summer of 2000, seventeen AP Stat teachers gathered on the campus of the North Carolina School of Science and Mathematics (NCSSM) to create materials that would help them teach the sections in the AP course on experimental design. These activities, including the one on Blocking, are teacher friendly and easy to understand. Included are links to the 1999 and 2001 institute materials.

<http://badame.vse.cz/cs/toCP852.cs.cgi/mirrors/introbook/sbk26m.htm>

An explanation of Type I and Type II errors in hypothesis testing using a case study involving SAT scores

<http://www.mste.uiuc.edu/patel/chisquare/keyprob.html>

A great introduction to the **Chi-Square statistic**. The intro starts with the proposal of a real world question, and then moves on to present the topics of Fairness, Expectation, the D-Statistic, and finally the Chi-Square statistic.

<http://www.amstat.org/index.cfm?fuseaction=main>

[American Statistical Association website](#). The premier association for the practice and teaching of Statistics. The vision statement proclaims that the ASA would like to be “a world leader in promoting statistical practice, applications, and research; publishing statistical journals; improving statistical education; and advancing the statistics profession.” The following online version of one of their publications is free and does not require membership.

<http://www.amstat.org/publications/jse/>

The Journal of Statistics Education. Online version of an international journal for the teaching and learning of statistics which contains articles and a data archive with over eighteen data files

[http://www.improvingmedicalstatistics.com/entry\\_high\\_school.htm](http://www.improvingmedicalstatistics.com/entry_high_school.htm)

The focus of this web site is how the use of medical statistics and the interpretation of studies in the medical literature can be improved. The approach employed is to evaluate individual studies where the statistical analyses have been poorly performed or have conclusions that are poorly formulated. Thus, it contains case studies of bad statistical practice. There is a section containing material specifically for high school or introductory college statistics

<http://www.amstat.org/publications/jse/v5n2/ballman.html>

Journal of Statistics Education article on the role of probability in introductory statistics courses. The author states that the objectives of these courses may be better met by emphasizing characteristics of random variation and its role in statistics rather than formal probability. She outlines relevant topics and activities that she teaches to provide an example of a course that emphasizes characteristics of random variation. Although some of the activities describes takes place in a computer classroom, they can easily be modified for use without computers.

<http://www.keypress.com/SIA/instructorResources/CalculatorGuide.html>

Although this calculator guide for the TI83/84 was created as a supplement for *Statistics in Action* (a Key Curriculum Press publication), it is useful for anyone who wants to learn how to use the statistics functions on their calculator. It contains activities in every chapter. **Adobe Acrobat format only.**

<http://www.randomizer.org/form.htm>

Research Randomizer is a free service offered to students and researchers interested in conducting random assignment and random sampling. Allows you to select the number of sets, the amount of numbers per set, the range, whether each number should be unique, and ways to view the output. Then, it downloads to an Excel WS. Integers only.

<http://wise.cgu.edu/tutor.asp>

The Claremont Colleges' "Web Interface for Statistics Education" (WISE) seeks to expand teaching resources offered through Introductory Statistics courses, especially in the social sciences. This project aims to develop an on-line teaching tool to take advantage of the unique hypertextual and presentational benefits of the World Wide Web. This teaching tool's primary application is as a supplement to traditional teaching materials, addressing specific topics that instructors have difficulty in presenting using traditional classroom technologies. The tool serves to promote self-paced learning and to provide a means for advanced students to review concepts. Topics include: Sampling Distribution of the Mean, the Central Limit Theorem, Hypothesis Testing, Power, Correlation and Regression, as well as some other specialized topics.

<http://noppa5.pc.helsinki.fi/links.html#osdm>

This site has too many links to count to statistical resources. Some links may no longer be valid, and the qualities of all the links have not been verified. However, it is a good place to explore from, just not all in one sitting

<http://www.tkk.fi/Units/Departments/F/SAL/Teaching/Resources/ProbStat/table.html>

This resource has [a table of statistical teaching resources](#) with qualities that a book alone can not provide, such as dynamic demonstrations and interactive exercises. These resources have mainly been found from the academic homepages of different statisticians and statistics teachers around the world with some companies also represented. A major criterion is also that the material should be accessible with a normal Web browser, so mainly WWW-based (Java, Perl, Cgi, Active X, VBS...) software is promoted. The better and more extensive a resource, the closer to the top of the table it is.

<http://members.aol.com/johnp71/javastat.html>

This site has hundreds of links to statistical resources from all over the world. It was the starting point for this entire project, and is too large to wade through in a single sitting or day. According

to the administrator, “The web pages listed here comprise a powerful, conveniently-accessible, multi-platform statistical software package. There are also links to online statistics books, tutorials, downloadable software, and related resources. All of these resources are freely accessible, once you can get onto the Internet.”

<http://statweb.calpoly.edu/chance/>

Beth Chance’s Home Page at the Department of Statistics, Cal Poly SLO. Contains links to data sources and useful **JAVA applets**

<http://www.analytictech.com/mb313/regress3.htm> The Least Squares approach to Regression lesson model

[http://www.cdc.gov/epo/dih/MiniModules/sd\\_sem/page01.htm](http://www.cdc.gov/epo/dih/MiniModules/sd_sem/page01.htm) From the Center for Disease Control website. The primary *learning objective* for this training is to evaluate the relationship of a sample mean and sample standard deviation to the population mean. Upon completion of the module, students will be able to

- define mean, standard deviation (SD) and standard error of the mean (SEM);
- describe the relationship and the difference between SD and SEM;
- calculate SD and SEM from samples; and
- describe the distribution of sample means as defined by the Central Limit Theorem.

[http://elsmar.com/pdf\\_files/Degrees\\_of\\_Freedom.pdf](http://elsmar.com/pdf_files/Degrees_of_Freedom.pdf)

An attempt to explain Degrees of Freedom, with a list of different definition perspectives from various sources. For another perspective on degrees of freedom, try

[http://psych.rice.edu/online\\_stat/chapter8/df.html](http://psych.rice.edu/online_stat/chapter8/df.html)

<http://www.stat.ncsu.edu/info/srms/survpamphlet.html>

Information on how to conduct a survey

<http://www.amstat.org/sections/srms/brochures/margin.pdf>

“What is a Survey?” from the American Statistical Association. Information on planning a survey, collecting data, judging quality, pretesting, focus groups, types of surveys, designing a questionnaire, and margin of error.

[http://www.statisticalengineering.com/central\\_limit\\_theorem.htm](http://www.statisticalengineering.com/central_limit_theorem.htm)

An Engineering Statistics website. Gives an example of how the Central Limit Theorem works with a uniform (non-normal) distribution.



## Correlation

<http://www.stat.uiuc.edu/courses/stat100/java/GCApplet/GCAppletFrame.html>

Simple correlation exercises. Four scatterplots appear on screen, along with four correlation coefficients for matching. Students guess the correct matches and afterward can display the correct answer.

<http://noppa5.pc.helsinki.fi/koe/corr/cor1.html>

Another simple applet that asks students to guess the correlation coefficient based on the given scatterplot. A message appears when the guess is correct. Also try <http://noppa5.pc.helsinki.fi/koe/corr/cor.html> to go with the former applet. This applet shows what the scatterplot looks like for a *chosen* correlation coefficient.

<http://www.stat.berkeley.edu/users/stark/SticiGui/Text/ch3.1.htm>

A great applet which allows students to decide the explanatory and response variables for data collected about students in an MBA program, and then looks for correlations.

## Regression

<http://www.stat.sc.edu/~west/javahtml/Regression.html>

The applet below is designed to teach students the effect of leverage points on a regression line. Students may add points to the plot by clicking the mouse button. Students should note that adding points close to the existing line barely changes the line. By adding points far from the existing line, the regression line changes considerably. This is particularly true for points added outside the range of the data. This should help students understand the effect of outliers on regression analysis.

## Hypothesis Testing

<http://www.stat.sc.edu/~ogden/javahtml/power/power.html>

This applet illustrates the fundamental principles of statistical hypothesis testing through the simplest example: the test for the mean of a single normal population, variance known (the Z test).

<http://noppa5.pc.helsinki.fi/uudet/testi/onesided.html>

Allows students to visualize the hypothesis testing decision problem

### **Probability**

<http://www.stat.sc.edu/~west/javahtml/LetsMakeaDeal.html>

If you are aware of the popular “Let’s Make a Deal” probability paradox, this applet will help convince students of the correct answer.

<http://mathdemos.gcsu.edu/plinko/>

Plinko! Simulation activity based on the popular Let’s Make a Deal game. The following basic ideas are involved in the analysis of the Plinko game: counting strategies, Pascal's triangle, probability (experimental and theoretical), simulations, tree diagrams, and expected value. This demo can be used as an activity to introduce/motivate these topics and then can be revisited as an interesting application of the topics that are appropriate for your course. JAVA or TI83 required.

### **Mean and Median**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This applet demonstrates basic properties of the mean and median including (a) the effect of skew on the relative size of the mean and median, (b) the mean deviation from the mean is zero, and (c) the mean squared deviation from the mean is less than or equal to the mean squared deviation from the median (or any other number).

Concepts: central tendency, mean, median, skew, least squares.

### **Sampling Distribution Simulation**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This applet estimates and plots the sampling distribution of various statistics. You specify the population distribution, sample size, and statistic. An animated sample from the population is shown and the statistic is plotted. This can be repeated to estimate the sampling distribution.

Concepts: sampling distribution, standard deviation, standard error, central limit theorem, mean, median, efficiency, fluctuation, skew, normal distribution.

<http://www.jcu.edu/math/iseq/Quincunx/Quincunx.html> This is a Quincunx, or Galton Board simulation. A quincunx board starts with 1 pin on the first row, 2 pins on the second rows, 3 pins on the third row, and so on. Multiple balls are then dropped onto the top pin. As the balls fall to the bottom, they will land into bins which are placed below the last row of pins. When counting

the number of balls in each bin, one notices that there are more balls in the center bins than there are in the outer bins. Mathematically, we can notice that this distribution is a normal distribution.

<http://teacherlink.org/content/math/interactive/flash/quincunx/quincunx.html>

Another Quincunx applet. This one also has an option to show Pascal's triangle overlay

### **Confidence Intervals**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Confidence intervals on the mean are generated for simulated experiments. The confidence level and sample size can be manipulated.

Concepts: confidence interval, mean, standard deviation.

### **Normal Approximation to the Binomial Distribution**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This demonstration allows you to view the binomial distribution and the normal approximation to it as a function of the probability of a success on a given trial and the number of trials. It can be used to compute binomial probabilities and normal approximations of those probabilities.

Concepts: binomial distribution, normal distribution, central limit theorem, correction for continuity.

Also see **Sampling Distribution Simulation** above

### **Confidence Interval on a Proportion**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

The effect of violating the assumption that the sampling distribution of  $p$  is normal can be investigated by varying  $N$  and  $P_i$ .

Concepts: binomial distribution, normal distribution, central limit theorem, confidence interval.

### **Components of $r$**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports Java.

The slope, standard error of the estimate, and the standard deviation of  $X$  can all be manipulated independently to see the effect on the scatterplot and on  $r$ .

Concepts: Correlation, slope, standard error of the estimate, variance, restriction of range, proportion of variance explained.

### **Regression by Eye**

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

A scatterplot is displayed and you draw in a regression line by hand. You can then compare your line to the best least squares fit. You can also try to guess the value of Pearson's correlation coefficient.

**Concepts:** Correlation, regression line, mean squared error.

### [Restriction of Range](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

The range of X can be manipulated to investigate its effect on Pearson's r and other aspects of the relationship between X and Y.

**Concepts:** Correlation, restriction of range, slope, standard error of estimate.

### [Repeated Measures](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

This applet lets you investigate differences between correlated and independent t tests.

**Concepts:** t test, within-subject variable, between-subject variable, power, repeated measures.

### [A "Small" Effect Size Can Make a Large Difference](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports Java.

This applet demonstrates that even a "small" effect can be important under some circumstances.

Applicants from two groups apply for a job. The user manipulates the difference between groups on the variable on which selection is made and the cutoff for hiring. The effects on the proportion of hired applicants from each group are displayed. A related phenomenon is discussed in the article:

Martell, R., Lane, D. M., & Emrich, C. (1996) Male-female differences: A computer simulation. *American Psychologist*, 51, 157-158.

**Concepts:** normal distribution, selection ratio, effect size, omega squared, proportion of variance explained.

### [Chi Square Test of Deviations from Expected Frequencies](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

You can specify whether you wish to sample from a uniform or a normal distribution. The applet does the sampling and tests the significance of deviations from these two distributions.

**Concepts:** goodness of fit, chi square, normal distribution, uniform distribution.

### [2 x 2 Contingency Tables](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Simulates experiments using 2 x 2 contingency tables. You specify the population proportions and the sample size and examine the effects on the probability of rejecting the null hypothesis.

**Concepts:** chi square, correction for continuity, normal approximation.

### Reliability and Regression Analysis

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates how the reliability of X and Y affects various aspects of the regression of Y on X.

**concepts:** reliability, standard error of estimate, slope, correlation.

### Histograms, Bin Widths, and Cross Validation

[http://www.gen.umn.edu/faculty\\_staff/delmas/gc\\_1454\\_course/distribution\\_files/distribution.html](http://www.gen.umn.edu/faculty_staff/delmas/gc_1454_course/distribution_files/distribution.html)

Histogram applet that will give 3-4 examples for each type of the following types of distributions: Bell shaped, skewed, bimodal, uniform, and skewed/bimodal

[http://www.ruf.rice.edu/~lane/stat\\_analysis/histogram.html](http://www.ruf.rice.edu/~lane/stat_analysis/histogram.html)

Use your own data to generate a histogram. Allows you to explore how bin width can change the histogram's appearance.

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates how a histogram is affected by bin width and starting point of first bin. Illustrates cross-validation criterion for assessing histograms.

**concepts:** histogram, bin width, cross validation, density estimation.

### Transformations

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates how transformations affect the relationship between two variables.

**concepts:** transformation, correlation, regression, exponential growth.

### [Regression to the mean](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

A simulation illustrating the regression toward the mean phenomenon.

**concepts**: regression, correlation, reliability, error, luck

### [Comparing distributions](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Your response times on a simple motor task are recorded under two conditions. Various statistics and graphs used to compare the distributions are presented. **Concepts**: central tendency, spread, mean, median, skew.

### [Unequal n ANOVA and Types of Sums of Squares](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Illustrates types of sums of squares in a 2 x 3 ANOVA are presented. **Concepts**: Confounding, unequal n, unweighted means, commonality analysis, hierarchical partitioning.

### [Robustness of t test and ANOVA](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Simulates t-test/ANOVA with normality and homogeneity of variance assumptions violated.

**Concepts**: Assumptions, robustness, type I error rate, homogeneity of variance, normality.

### [One-way ANOVA](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates partitioning of variance. **Concepts**: ANOVA, sums of squares, partitioning variance.

### [Two-way ANOVA](#)

[http://www.ruf.rice.edu/~lane/stat\\_sim/index.html](http://www.ruf.rice.edu/~lane/stat_sim/index.html)

Requires a browser that supports [Java 1.1](#).

Demonstrates partitioning of variance. **Concepts**: ANOVA, sums of squares, partitioning variance, interaction.

## Central Limit Theorem

<http://www.stat.sc.edu/~west/javahtml/CLT.html> This is a great applet for demonstrating the central limit theorem using simulated dice-rolling experiments. An "experiment" consists of rolling a certain number of dice (1-5 dice are available in this applet) and adding the number of spots showing. This experiment is "performed" repeatedly, keeping track of the number of times each outcome is observed. These outcomes are plotted in the form of a histogram. According to the Central Limit Theorem, if the number of dice rolled is not too small, the histogram's shape should resemble that of the "bell-shaped curve" when the experiment is repeated many times.

Also see [Sampling Distribution Simulation](#) above

For Students

For Students

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<http://www.whfreeman.com/yates1e/>

The home page for the textbook used in most AP Statistics classes, *The Practice of Statistics*, by Yates/Moore. Contains an instructor area for syllabus building, a calendar, quiz tracker, and more. The student side contains a variety of electronic learning tools designed to increase students' understanding of our textbook, including quizzes that can be submitted to the instructor.

<http://www.collegeboard.com/student/testing/ap/about.html>

From the people who bring you the SAT, this site contains all of the information you will ever need about AP courses, including AP Statistics. Topic outline, course description, exam practice, and other resources available.

<http://www.statsoftinc.com/textbook/stathome.html>

This is an electronic textbook for overall supplementation. The text contains the standard elementary topics as well as more sophisticated topics in Statistics that go beyond an introductory course. When you get to this site, you can either search for the topic or click on the buttons in the window on the right.

<http://calculators.stat.ucla.edu/>

Statistical calculators for when you've forgotten yours

<http://www.keypress.com/SIA/instructorResources/CalculatorGuide.html>

Although this calculator guide for the TI83/84 was created as a supplement for another textbook, it is useful for anyone who wants to learn how to use the statistics functions on their calculator. It contains activities in every chapter. **Adobe Acrobat format only.**

<http://www.amstat.org/index.cfm?fuseaction=main>

[American Statistical Association website](#). The premier association for the practice and teaching of Statistics. The vision statement proclaims that the ASA would like to be “a world leader in promoting statistical practice, applications, and research; publishing statistical journals; improving statistical education; and advancing the statistics profession.” Student membership is \$20 for 2 years and provides subscription to STATS: The Magazine for Students of Statistics, access to publications, and scholarship opportunities.

# Miscellaneous

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<http://www.itl.nist.gov/div898/handbook/pri/section5/pri55.htm>

Engineering Statistics handbook

<http://www.statsoftinc.com/textbook/stexdes.html#2g>

Industrial Design of Experiments from the Statsoftinc electronic textbook. More in-depth than an elementary Statistics book

<http://www.learner.org/resources/series65.html>

“Against All Odds” video series description page. Can view through Video on Demand. Also, to go with this site, try <http://www.statsci.org/class/aao.html> which provides timings of the vignettes used in the videos

[http://www.keypress.com/fathom/pages/community\\_exchange/fun\\_and\\_interesting\\_links/quotes.php](http://www.keypress.com/fathom/pages/community_exchange/fun_and_interesting_links/quotes.php)

Math and statistics quotes

<http://www.google.com/search?hl=en&q=statistics+filetype%3Appt>

The search results for typing in “statistics filetype: ppt” in a Google search. Links for powerpoints that other people have created. One of them is a game called Statistics Jeopardy, a fun way to review concepts, based on the popular game show format.

<http://members.fortunecity.com/jonhays/quincunx.htm>

Build a Quincunx board (also known as a Galton or “Bell Curve” board) activity. Suggested extra credit activity for students who are good with their hands.

[http://courses.ncssm.edu/math/Stat\\_Inst2001/Intro/Introduction.htm](http://courses.ncssm.edu/math/Stat_Inst2001/Intro/Introduction.htm)

Contains a series of JMP lab activities to introduce the students to the software. (JMP is a statistical software program from the creators of SAS that is used extensively by engineers).

[http://socrates.berkeley.edu/~glaserj/%20Contribs&Contracts\\_PolicyMatters\\_2004.htm](http://socrates.berkeley.edu/~glaserj/%20Contribs&Contracts_PolicyMatters_2004.htm)

Funny article by Jack Glaser, Asst. Professor in the Goldman School of Public Policy at UC Berkeley. Demonstrates the affect of over-reliance on p values (an example from the NY Times), their incorrect usage, and laments the pervasiveness of the .05 standard.

<http://trackstar.4teachers.org/trackstar/index.jsp>

TrackStar is your starting point for online lessons and activities. Simply collect Web sites, enter them into TrackStar, add annotations for your students, and you have an interactive, online lesson called a Track. Create your own Track or use one of the hundreds of thousands already made by other educators. Search the database by subject, grade, or theme and standard for a quick and easy activity. There is a fun Track already made for each day of the year, too!

**Internet Resource Survey  
FALL**

1. Do you have access to a computer at home?
2. Do you have access to the internet at home?
3. If you answered Yes to #2, what type of connection do you have (Dial-up, DSL, or Broadband)

Use the following scale to answer each question below:

1=Not at all                      2 = A few times a month                      3=A few times a week  
4=Daily

4. During the school year how often do you use the computer to do the following:
  - a. Word process
  - b. Create a PowerPoint
  - c. Use EXCEL
  - d. Surf the Net to help with your school work, complete assignments, or do course related research
5. If you have used EXCEL, have you ever done any of the Statistical Add-in features?
6. Look at the Internet Resources list. Name 3 sites that either interest you or that you think you might look at or use in the coming year.

7. Are there any sites you have already been to? List them here.

## Internet Resource Survey Spring

1. Do you have access to a computer at home?
2. Do you have access to the internet at home?
3. If you answered Yes to #2, what type of connection do you have (Dial-up, DSL, or Broadband)

Use the following scale to answer each question below:

1=Not at all                      2 = A few times a month                      3=A few times a week  
4=Daily

4. During the school year how often do you use the computer to do the following:
  - a. Word process
  - b. Create a PowerPoint
  - c. Use EXCEL
  - d. Surf the Net to help with your school work, complete assignments, or do course related research
5. If you have used EXCEL, have you ever done any of the Statistical Add-in features?

Look at the Internet Resources list. Which of these sites have you been to this year? List them below and use the following scale to rate each site:

1=Not helpful/useful                      2 = Somewhat helpful/useful                      3=Very helpful

- a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_