Curriculum Map for: A.P. Statistics

Revised July 2007 by Misty Palmer

Textbook: Bock, Velleman, and De Veaux. *Stats: Modeling the World*, second edition, Pearson/Addison Wesley, 2007.

Prerequisites: AP Statistics is open to any junior or senior who has successfully completed the IIR mathematics course. Students wishing to take the course should have a TI-83 or TI-83plus calculator for use during class and at home.

Technology: In addition to regular use of the TI-83, students will be provided with the ActivStats and Datadesk programs for classroom and home use. Students will use the technology to produce graphical displays of data collected from simulations or research. The use of technology in this course is essential to promote student understanding through activity.

Scope: AP Statistics consists of a full high school academic year of work that is comparable to statistics courses in colleges and universities. It is expected that students who take AP Statistics will seek college credit, college placement, or both from institutions of higher learning. While AP Statistics is a mathematics course, there is a great deal of emphasis throughout the course on communication and interpretation. This course is designed to incorporate regular activities, which encourage students through discovery learning to construct a critical understanding of statistics. The course focuses on choosing appropriate statistical techniques and how to communicate those techniques effectively through the framework of activities. Class time is highly devoted to decision-making strategies and justification of hypotheses in order to foster critical thinking and effective communication. Students will become proficient at communicating statistical concepts that include how experimental design, results and interpretations of data are valid. Writing complete responses and conclusions is essential and this will be stressed throughout the course. Students will understand that numerical answers alone are not complete.

TIME	CONTENT	STUDENT SKILLS
September (1 Day)	***Introduction to Statistics*** • Format of the textbook • Class expectations • Discussion of "What is Statistics?"	. • Familiarity with the layout of the textbook. • Understand the importance of reading and writing in the course • Understand the importance of technology in the course • Begin to see the impact of statistics on our modern life
(2 Days)	***Data*** • The importance of understanding data • Categorical vs. quantitative	• Be able to communicate the who, what, when, where, why and how of data clearly through written and verbal forms • Classify a variable as categorical or quantitative • Identify the units of any variable STUDENT ACTIVITY-Death Penalty Students will be provided with information about convictions and those receiving the death penalty. Students will be asked to read the given information and using the provided 3-way table, write about what associations they feel exist between the three variables. In class discussions, they will communicate their support of their associations and discuss what associations cannot be inferred from the given information.
(5 days)	***Displaying and Describing Categorical Data*** Frequency tables Bar charts Pie charts The area principle	• Choose an appropriate display for categorical data • Be able to create an appropriate display for categorical data and clearly describe the reasoning for the choice • Be able to read and interpret displays of conditional distributions of one variable for more

TIME	CONTENT	STUDENT SKILLS
	Contingency tables Conditional distributions Segmented Bar Charts Simpson's Paradox	than one group • Identify situations showing Simpson's Paradox
(5days) October (6 days) (7 days)	***<u>Displaying Quantitative Data</u>*** • Histograms • Stem-and-Leaf graphs • Shape, center, and spread • Outliers • Timeplots ***<u>Describing Distributions Numerically</u>*** • Measures of central tendency • Quartiles and interquartile range • Boxplots • Standard Deviation ***<u>The Standard Deviation as a Ruler and the Normal Model</u>*** • Standardizing with z-scores • Shifting Data • Rescaling Data • Parameters of the Normal Model	• Be able to identify an appropriate display for quantitative data and clearly justify the choice • Be able to construct a display for quantitative data • Know how to compare the distributions of groups by comparing their shape, center, and spread (Activstats) • Understand the impact of outliers in the data • Use a graphing calculator to construct a basic histogram • Be able to choose an appropriate measure of central tendency to describe data and communicate the supportive reasoning • Understand the standard deviation tells how the data surrounds the mean • Use a graphing calculator to find a 5-number summary of a variable and create a boxplot • Understand which numerical descriptions resist outliers and which do not • Know how to clearly describe numerical summaries in written form STUDENT IN CLASS ACTIVITY: the caloric content of hot dogs and a comparison of beef, meat, pork. • Recognize when standardization can be used to compare values • Knowing when the Normal model can be used • Be able to calculate the z-score of a situation • Be able to explain the meaning of a z-score calculation

TIME	CONTENT	STUDENT SKILLS
(4 days)	***Scatterplots, Association, and Correlation*** • Outliers • Correlation coefficient • Causation • Association vs. Correlation	• Be able to use the Normal model to estimate observations falling within certain standard deviations of the mean • Know how to find the percentage of data falling below a given value in a Normal model • Use technology to create a Normal model(Activstats) • Recognize patterns in a scatterplot • Know how to describe a given scatterplot in detail • Draw conclusions about the value of the correlation coefficient be able to defend the strength of the value • Be able to distinguish between correlation and causation • Be able to distinguish between correlation and association • Know how to create a scatterplot by and hand and with technology(Activstats) Computer Lab: Web sites for Java Applets on correlation and scatter plots.
(6 days)	***Linear Regression*** • Linear Model • Residuals • Best Fit • R-squared	• Be able to explain independent and dependent variables • Recognize when linear regression can be used to describe a relationship between two variables • Know how to find a regression equation by hand and with technology • Know how to use regression to predict values by hand and with technology • Be able to write an explanation of the relationship between variables in a regression equation using appropriate terms and units • Understand how the regression slope and correlations coefficient are related
November	***More relationships between variables*** • Nonlinear relationships	• Be able to use logarithmic transformations to linearize exponential data • Understand that the correlation coefficient and the

TIME	CONTENT	STUDENT SKILLS
(9 days)	• Correlation and regression	regression line can be very influenced by outliers • Find marginal distributions • Be able to describe a summary or display of a re-expressed variable making clear how it was re-expressed

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Nov-Dec (22 days)	***Samples and Experimentation*** • Methods of collecting data • Planning and conducting surveys • Random sampling • Stratifying • Designing questionnaires • Planning and conducting experiments	• Be able to identify the population in sampling • Be able to recognize bias • Know how to use a calculator to select a simple random sample • Recognize the difference between an observation study and an experiment • Be able to identify bias • Identify all elements of an experiment • Design a randomized experiment • Explain in writing why a randomized comparative experiment can give good evidence for cause and effect relationships STUDENT PROJECT Students will conduct an independent experiment of their own design. The purpose of the project is to investigate survey bias. The student may chose their own topic for the project, but it must be submitted as the initial proposal and approved before the final report is submitted. The initial proposal should include the topic of the experiment as well as a clear justification of why the topic was shown and how the student intends to investigate bias. The final report should describe how the experiment was conducted and clearly describe results. Results should be displayed graphically and conclusions should include effectiveness of the design and possible improvements. • Know how to determine sample space

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January-Feb. (24 days)	***Randomness and Probability*** • Properties of probability • Law of Large numbers • Compound probability • Conditional probability • Independent and mutually exclusive events • Discrete and continuous random variables • Means and variances of variables • The binomial distribution • The geometric distribution • The Normal distribution	• Know how to apply the rules of probability to specific situations • Know how to find conditional probabilities of events • Understand and apply the concept of union and intersection of events • Use diagrams to organize events • Recognize a discrete or continuous random variable • Use technology to find probabilities of events as areas(Activstats) • Calculate the mean and variance of a discrete random variable • Use technology or the formula to calculate binomial and geometric probabilities (Activstats) • Construct cumulative distribution tables and histograms
Feb. - March (8 days)	***Sampling Distributions*** • Sampling distribution models • Assumptions and conditions • Central Limit Theorem • Standard error	• Understand that dependency of variability on size of sample • Be able to demonstrate a sampling distribution by simulation • Be able to draw conclusions about the distribution of the mean by using the sampling distribution model • Be able to interpret a sampling distribution model and describe it.
(10 days)	***Confidence Intervals***	• Explain what is meant by 95% confidence • Calculate a confidence interval for the mean of a normal population • Recognize when the confidence interval formula can not be used • Find appropriate sample sized to obtain a confidence interval of specified margin of error • Determine what Type I and Type II errors are in the context of a
		STUDENT PROJECT Students will provide analysis of a research article from a peer-reviewed research journal. Students will submit a rough draft and a final version.

TIME	CONTENT	STUDENT SKILLS
	• Margin of error • Sample size • Confidence levels • z-intervals	situation • Understand the connection between sample size and power • Explain the meaning for the p-value • Calculate the z statistic and p-value for one-sided and two-sided tests • Recognize when you can use the z test • Determine statistical significance
March-April (10 days)	***Hypothesis Tests*** • p-values • Type I and Type II errors • One and Two sided tests • Power	STUDENT PROJECT-Testing a Hypothesis (Bock) Students will decide on a specific sports team and gather information about the teams wins while playing at home. Using the information, the student should devise a plan, create a hypothesis, determine a model, work out the mechanics, and form conclusions. The plan should be clearly stated and define the variables. The model should account for appropriate conditions including the independence assumption and randomization condition. The mechanics should include graphical displays. The conclusion should be clear, concise and in context.
(6 days)	***Comparing Two Proportions*** • Standard Deviation of the Difference between two Proportions • Two-proportion z-tests	• Be able to state the null and alternative hypothesis for testing the difference between two proportions • Know how to determine when making inference about the difference between two population proportions would be invalid • Know how to find a confidence interval for the difference between two proportions • Understand that failing to reject the null hypothesis does not mean accepting it