AP Statistics Syllabus

Course Description

AP statistics further explores the statistical concepts covered in Algebra I and Algebra II as well as a number of newer topics unseen. Students will begin with exploratory data analysis with one and two variables. They will then move on to learn about Linear Regression, Probability, and Testing Claims. Though the most advanced mathematical concepts used in AP Statistics require a basic understanding of Algebra, a majority of the work is explaining the understanding of the use of statistics. In other words, very little of the student's grade depends on the accuracy of the answer, while most depends on the interpretation and explanation of the answer as well as the procedures used to obtain it. All of this learning will be tested in May when students take the cumulative AP Statistics test. Because passing this test is one of the primary goals of the course, the curriculum adheres strictly to the AP curriculum, as well as the AP coordinated textbook.

Course Textbook

The course will adhere primarily to the following textbook:

Starnes, Daren S., Josh Tabor, Daniel S. Yates, and David S. Moore. *The Practice of Statistics*. Fifth ed. New York: W.H. Freeman and Company, 2014.

A classroom set of books will be provided, and students will be allowed to check out a textbook. The AP Statistics test is in May, at which time students will be expected to turn in any book assigned to them. Failure to return the book may result in a charge equal to the value of the book on the student's account.

	Scoring Component
SC1	The course provides instruction in exploring data
SC2	The course provides instruction in sampling
SC3	The course provides instruction in experimentation
SC4	The course provides instruction in anticipating patterns
SC5	The course provides instruction in statistical inference
SC6	The course draws connections between all aspects of the statistical process including design, analysis, and conclusions.
SC7	The course teaches students how to communicate methods, results and interpretations using the vocabulary of statistics.
SC8	The course teaches students how to use graphing calculators to enhance the development of statistical understanding through exploring data, assessing models, and/or analyzing data.
SC9	The course teaches students how to use graphing calculators, tables, or computer software to enhance the development of statistical understanding through performing simulations.
SC10	The course demonstrates the use of computers and/or computer output to enhance the development of statistical understanding through exploring data, analyzing data, and/or assessing models.

Course Curriculum

In continuing with adhering to the textbook, the course will cover the following topics in said order:

Content/Skills	Time	SC
Chapter 01 - Exploring Data The student will: • Identify the individuals and variables in a data set • Identify variables as categorical or quantitative • Make and interpret different types of visual representations of data (bar graphs, pie charts, histograms, stemplots, boxplots, etc.) • Describe a distribution using the shape, center, outlier, variability (SOCV) method • Calculate and provide numerical measures of spread (IQR, Standard Deviation, etc.) and center (mean and median) • Identify and justify outliers • Compare distributions using graphical and numerical methods • Find marginal and conditional distributions using a two-way table • Use a TI-83/84 graphing calculator to support work Activities: • Favorite Toy Activity-students gather categorical data to determine if there is an association between toy choice and gender. Students will create graphical displays and marginal and conditional distributions using a two-way table of the data they collect. Students us stapplet.com to generate various graphical representations of the data. • Boxplot, Histogram, and Summaries Matching Activity- Students will match the boxplot, histogram, and statistical summary (mean, median, standard deviation) together. • Shoe Data-Students generate their own shoe data to then create a box plot from. They also calculate any outliers and compare their box plot to another class's boxplot using the SOCV method.	2 weeks (see calendar below)	SC1 SC10 SC8
Chapter 02 - Modeling Distributions of Data The student will: • Know how to calculate percentiles • Know the effects of changing measurements and linear transformations on summary measures • Know that areas under a density curve represent proportions • Approximate mean, median, mode, and quartiles on a density plot/curve • Recognize and describe the important characteristics of a Normal Distribution • Use the 68-95-99.7 rule to estimate proportions and values • Calculate and interpret z-scores using Table A and the TI-83/84 calculator • Determine whether a distribution approaches normality Activities: • Where do I Stand Activity-Students generate their own height data to create a dot plot and a cumulative relative frequency graph. Students calculate percentiles using this data. • How did I do Activity-Students use test data to generate a dot plot. The use this dot plot to visualize the effects of changing measurements and linear transformations.	2 weeks (see calendar below)	SC1
Chapter 03 - Describing Relationships (Linear Regression) The student will: • Construct, interpret, and describe scatterplots and the relationship between two variables • Identify explanatory and response variables	2 weeks (see	SC1 SC5

● Estimate or find the value of *r* and interpret it ● Find and analyze regression lines ● Use the regression line to make predictions and assess the validity of these predictions ● Calculate residuals and use their plots to examine unusual patterns ● Recognize limitations in both *r* and the regression line due to extreme values ● Recognize lurking variables ● Explain the difference between correlation and causality Activities: ● Barbie Bungee Jump-students will find a regression line for barbie and use it to predict a much higher jump. Students will analyze why some of the barbies hit the ground on the higher jump.	calendar below)	SC7 SC9
Chapter 04 - Designing Studies The student will: ● Identify populations in sampling distributions ● Identify different sampling methods, including strengths and weaknesses of each and possible biases ● Recognize the difference between an observational study and experiment ● Design randomized experiments ● Recognize confounding variables and the placebo effect, offering solutions like a blocked design or double blind experiment ● Describe an experiment that would establish a cause-and-effect relationship Activities: ● Does Beyoncé Write Her Own Lyrics?-Students will pick words from Beyonce's song "Crazy in Love" using sampling methods (cluster, systematic, simple random). They will then create dot plots of the average word length selected from each sampling method as a class. The students will analyze which sampling method gives them the best mean word length. ● A Fairy Tale Activity- Students will demonstrate the effectiveness of a census through this activity by taking 3 minutes to circle all g's in a story and providing the total at the bottom of the page. We will discuss everyone's answers and how they may differ. ● Newspaper/magazine/Web Articles-students will find a research article to analyze. They will need to answer questions such as: Why type of study was the experiment, what were the variables, what was the sample size, identify the components of the study (if experiment, how was it run blind? Double blind? Was there a placebo? Etc.)	2 weeks (see calendar below)	SC2 SC3
Chapter 05 - Probability The student will: ● Describe and generate sample spaces for random events ● Apply the basic rules of probability ● Use multiplication and addition rules of probability appropriately ● Identify disjointed, complementary, and independent events ● Use tree diagrams, venn diagrams, and counting techniques to solve probability problems ● Solve probability problems involving conditional probability Activities: ● Smelling Parkinson's- students will simulate if the woman was correct just by guessing who had Parkinson's or not. Students will then calculate the exact theoretical probability to get 11 or more successes in 12 trials when the true probability of success is 0.5. ● Dolphin Therapy-Students will read through an experimental design about dolphin therapy. Then they will simulate to determine if the results of the experiment happened by chance. We will then use an applet to further our simulation. ● The Last Banana- Students will watch a video prompt about a game. The students will guess which player they feel has the better chance of winning (the last banana). Then the students will play the game using dice. They will learn that the probability is equal between two players. We will make this more obvious by simulating the outcomes of the game through Fathom. ● Why Do We Really Buy Cereal?-Students will simulate buying boxes of cereal to get a specific	2 weeks (see calendar below)	SC4 SC9

color toy using a dice (each side represents a colored toy). Students will then calculate the average of how many rolls it takes to get a certain color and how many rolls it takes to get all of the colors. This will lead into teaching geometric probability.		
Chapter 06 - Random Variables The student will: ● Recognize and define discrete and continuous variables ● Find probabilities related to normal random variables ● Calculate the mean and standard deviation of a discrete random variable ● Use simulation methods and technology to approximate the mean of a distribution ● Describe the resulting distribution when two or more distributions are added, subtracted, or multiplied and identify this new distribution's mean and standard deviation ● Verify the four conditions of a binomial distribution ● Calculate means, standard deviations, cumulative functions, and histograms for binomial distributions ● Use a normal approximation to the binomial distribution to estimate probabilities ● Verify the four conditions of a geometric distribution ● Calculate means, standard deviations, cumulative functions, and histograms for geometric distributions Activity: ● Modeling Binomial and Geometric Distributions using M&M's- First students will model binomial distribution by randomly selecting 10 M&M's and recording the number of blue's. They will do this 10 times. Second students will model geometric distribution by randomly drawing 1 M&M at a time and doing so until they get a red. They will record the number of draws it takes to get a red and will do this process 10 times. For each model, students will determine if the observed distribution seems to follow the hypothesized distributions and compare the mean and standard deviation of the class distribution to the theoretical distribution.	3 weeks (see calendar below)	SC4 SC9
Chapter 07 - Sampling Distributions The student will: ● Identify parameters and statistics in a sample ● Interpret a sampling distribution, including bias and variability and how to influence each ● Recognize when a problem involves a sample proportion ● Analyze problems involving sample proportions, including using the normal approximation to calculate probabilities ● Recognize when a problem involves sample means ● Analyze problems involving sample means and understand how to use the Central Limit Theorem to approximate a normal distribution Activity: ● Sampling Distributions with Skewed Parent Data-Students will go through 5 trials of selecting 2, then 5, then 8 numbers from 3 different bins. They will take the average value from each trial and create 3 different dot plots for each of the 3 different bins. Students will discuss what happens to the graphs as they selected more numbers from each bin. Last, the students will determine which bin had skewed parent data, normal parent data, and uniform parent data.	2 weeks (see calendar below)	SC4 SC5 SC9
Chapter 08 - Estimating With Confidence The student will: ● Describe confidence intervals and use them to determine sample size ● Successfully construct and interpret a confidence interval given a data set of means ● Successfully construct and interpret a confidence interval given a data set of proportions Activity: ● Confidence Interval Worksheet- Write interpretations of confidences intervals in context.	2 weeks (see calendar below)	SC6 SC7
Chapter 09 - Testing a Claim		

The student will: ● Identify and state the null and alternative hypotheses in a testing situation with a mean ● Identify and state the null and alternative hypotheses in a testing situation with a proportion ● Calculate one-sample z-statistics and p-values for both one-sided and two-sided tests about a population mean or proportion ● Verify hand calculations for hypothesis testing with a calculator ● Assess statistical significance by comparing values ● Analyze and interpret the results of statistical tests ● Explain Type I and Type II errors as well as the power of a test in significance testing Activity: ● Hershey's Kisses and Confidence Intervals-Students will estimate a confidence interval for the proportion of times a Hershey's kiss lands on its base. Students will compare their confidence interval and their interpretation of what it means with peers.	2 weeks (see calendar below)	SC5 SC8
Chapter 10 - Comparing Two Populations or Groups The student will: ● Recognize when inference about a mean or comparison of two means is necessary ● Determine if a one-sample, two-sample, or matched pairs situation is present ● Perform and analyze a two-sample t-test to compare the difference between two means ● Perform and analyze a two-sample z-test to compare the difference between two proportions ● Use a graphing calculator to verify results done by hand and construct a hypothesis test Activities: ● What Percentage of The Earth's Surface is Water?- Students will us a 1 proportion z-test to determine if 71% of the Earth's surface is water. They will construct their null and alternative hypothesis, test the statistic, identify the conditions of the experiment, and last make a conclusion based on their sample data and test. ● Pool Noodle Javelin-Students will go through an experiment of throwing a pool noodle with the wind and against the wind. They will then take the difference in those distances and calculate the mean. Students will determine if a matched pair t-test or interval is more appropriate to determine if there is a difference between throwing pool noodles into the wind or with wind and the distance the pool noodle travels.	2 weeks (see calendar below)	SC5
Chapter 11 - Distributions of Categorical Data The student will: ● Choose the appropriate chi-square test for a given situation ● Perform the appropriate chi-square test and calculate its different components ● Interpret chi-square tests and results from computer output	2 weeks (see calendar below)	SC6 SC7 SC10

Calendar

An outline of the course calendar, highlighting when topics are covered, when assignments are due, and when assessments are to be taken can be found on Mrs. Walker's website.

Types of Grades

A percentage system is used to calculate a given student's grade for AP Statistics. Listed below are the different ways a student will be assessed throughout each semester:

Chapter Tests—Tests will be given at the end of most chapters, and will include 50% weight on multiple choice, 50% weight on free response (short answer). Because the AP test is weighted, these tests may be weighted at the teacher's discretion. The weighted scores would only increase the original scores. (*weight of coursework grade = 60%)*

Quizzes—Quizzes will be given periodically throughout the semester. *(weight of coursework grade = 15%)*

Homework—Homework will be assigned on a chapter basis when a sufficient amount of material has been taught. Homework is a necessary step in the process to mastery, and success is not guaranteed without quality, independent practice on the students' part. Homework will be collected for a grade, and it is expected students complete the homework when it is assigned. *(weight of coursework grade = 10%)*

Project— There will be one project per semester. These projects require students to design surveys and experiments, gather data, analyze the data numerically and graphically, and apply inferential statistics to draw conclusions for a population. Students write formal reports on their projects using statistical language. **[SC 6]**
 (weight of coursework grade = 15%)

The coursework described above will comprise a total of 80% of the semester grade.

Semester Exam

In addition to tests, quizzes, homework, and projects, a student's final grade will also be determined by a semester exam. A semester exam will only be administered in the first semester of the course for those who take the AP Stats test in May. For those who do not take the AP Stats test in May, a second semester exam will be administered as well.

The semester exam will comprise a total of 20% of a student's semester grade.

Final Grade

Using the weights described above to determine a student's final grade, the following grading scale will be used to determine a student's GPA:

Letter Grade	Percentage	Grade Point
A	95-100%	5.0
A-	90-94%	4.7
B+	87-89%	4.3
B	83-86%	4.0
B-	80-82%	3.7
C+	77-79%	3.3
C	73-76%	3.0
C-	70-72%	2.7
F	0-69%	0.0
INC	Incomplete Coursework	N/A

Missing Work

Communication will occur frequently between teachers, students, and their families to determine an action plan if missing work is prevalent.

If an assessment is not turned in on time, a zero will be used as a placeholder until the assessment is submitted or the unit has ended. This zero will be accompanied in the grade book with a "missing" marker so that the reason for the zero is evident.

Late homework may be completed for up to 80% of the original credit.

After a chapter has been completed, no late work will be accepted for that chapter.

Character

Additionally, students will be evaluated on their character choices for each course. The character evaluation will reflect student mastery of WMAA's critical character expectations: be respectful, be responsible, and do your personal best.

3—Exceeding Expectations
2—Meeting Expectations
1—Currently Not Meeting Expectations

Gradebook Online

Students can view their grades online at http://ps.westmichiganaviation.org/public/

Necessary Materials

Students are strongly encouraged to have the following materials in class every day:

1) Pen or pencil
2) 1-1/2 or 2 Inch Three ring binder (we have A LOT of hand outs in this class)
3) AP Statistics approved graphing calculator
   ● TI-84 is recommended by the course instructor
   ● Though there is a classroom set of 30 calculators, students are not permitted to take them home. Purchasing a calculator is highly recommended.
   ● Calculators will be provided for the AP exam.

Attendance and Tardies

Absence: It is very important to be in class, as each day's content builds on the previous day's work. When absent, it is the student's responsibility to obtain and complete all missing work. If necessary, it is also the student's responsibility to set up a meeting with the teacher to clear up any confusion. For each day of class missed, students are allowed one day to make up the missed work. Any time a student misses class, it is encouraged that he/she check the course calendar and resource folder to see what was done in class.

Tardiness: All students are expected to be in their assigned classroom before the bell rings. Any student that comes to class after the bell, will be marked tardy for the class period. Habitual tardiness will be dealt with between the teacher, student, and his/her family. If the problem persists, further conversations will involve the Dean of Students. A plan of action may then be developed.

Academic Dishonesty

Academic dishonesty will not be tolerated. If a student is found guilty of academic dishonesty, a zero will be entered into the gradebook for that assignment with no exceptions. The student will not have the opportunity to retake that assignment. Academic dishonesty includes, but is not limited to:

- Plagiarism
- Looking at another student's assessment for answers
- Using someone else's answers as your own
- Sending or receiving electronic documents and using them to complete assignments.
- Using forbidden materials to complete an assignment
- Using the internet or instructor resources to obtain answers without permission

Further disciplinary action will be taken as laid out in the student handbook.