


Lesson Title: Show Me How To Solve It!

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Major Sections	Content	Suggestions
<p>Lesson Overview</p>	<p>Overall Purpose:</p> <p>Topic: Binomial Probability Distribution</p> <ol style="list-style-type: none"> 1. Students will finding probability of a Binomial problem using the formula and technology. *This should be new information to the students. 2. Students will analyze the results from Range Rule given and probability calculations to determine significance. *Students should have been exposed to these concepts already. <p>Estimated Timeframe: (For lecture, practice, and activity for topic)</p> <p>Instructional Time: ½ class session **The instructor can provide the lecture with detailed examples, software demos, and provide opportunity for class practice before the activity within this time.</p> <p>Student Work Time (Activity Completion): The actual calculations and work for the activity in this lesson can be done by the students within 10 minutes comfortably. The students can complete all calculations in class and can be will be given the typically amount of time for homework completion for the submission of the activity.</p> <p>Courses for Implementation: MAT 152 Statistics</p> <p>Format: (Seated, Online, Hybrid) Any</p> <p>Key Terms: Interpret, explain, apply, probability, discrete probability distribution, Range rule of thumb, statistical significance</p>	<p>*This lesson is a standard lesson covered in MAT 152 with an added bonus of the small low-stakes activity described below in scenario format.</p> <p>*Instructor can cover Binomial and Poisson distributions in the same class session.</p> <p>* Putting the information in presentation form may take students a little time since they are explaining how to do it. By providing a few days for completion, the students will have time to reflect and modify their presentation as needed.</p> <p>* This class is a gateway math class and is used as an elective or math option for a degree. A typical class contains students with diverse career plans.</p>

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	<p>Standards/Skills Addressed:</p> <p>Academic Computation skills: Practice computations using a calculator and following formulas. Software skills: Practice using the chosen course software for key calculations. Communication skills: Practice writing detail steps for numerical calculations and drawing conclusions based on the calculations. Written and/or Oral Communication Skills (Assignments): Practice explaining written and/or verbal work. Apply Statistical concepts to a real world application.</p> <p>Technical Data analysis Presentation Practice (presenting information visually) General Computer Skills</p> <p>21st Century/Employability Critical/Analytical thinking Effective communication Basic technology/software proficiency</p> <p>Learner Outcomes/Student Learning Objectives: Learners will be able to calculate the probability of a Binomial problem and interpret results.</p>	
<p>Equipment/Materials</p>	<p>List of Materials/Equipment/Texts:</p> <p>Paper and writing utensil</p> <p>Calculator (any scientific calculator will be sufficient) *Required item for the class.</p> <p>StatCrunch (or any calculating software like Excel, StatDisk, etc.). *No added fee.</p> <p>etext</p> <p>Laptop (home or borrow one from the school). *SPCC offers laptops for students borrow if needed.</p>	<p>*Only expected items that they need for the course anyway.</p>

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<p>Discussion</p>	<p>Industry/Real-world Scenario:</p>  <p>Activity Options.docx</p> <p>Synopsis of Options: Biology – Mendel’s Theory (Hybrid Peas—foundations of genetics) Student role: Hired by a botanist to analyze results. Criminal Justice - Whitus v. Georgia (jury selection) Student role: Working for a young lawyer to analyze results. Sociology - Social Media impact on job opportunities Student role: Working with the non-profit organization who prepares young adults to enter the workforce to analyze results. Political Science – Cheating with voting ballots Student role: Working with the NJ Secretary of State to analyze results.</p> <p>Integrated Content - Possible Knowledge/Skills Overlap: English, Communication, Social/Natural Science based on option.</p>	<p>*All options for this activity were inspired from my current adopted text (Elementary Statistics, Edition 14, Triola, Pearson, Section 5.2). The numbers are taken from exercises, but the additional questions were added to prompt the analysis.</p>
<p>Instructional Strategies</p>	<p>Proposed Teaching Strategies: Lecture, calculator/software demonstrations, student practice (could be in the form of think-pair-share)</p> <p>Calculation:</p> <ol style="list-style-type: none"> 1. Practice using the Binomial probability distribution formula with a scientific calculator and using software. 2. Practice calculating the Range Rule of Thumb bounds. <p>Analysis</p> <ol style="list-style-type: none"> 1. Practice analyzing probabilities for significance. 2. Practice analyzing the results of the Range Rule of Thumb bounds. <p>Teamwork: Activity can be done in a group of two or individually.</p> <p>Creative License (Choice/Discovery/Reflection): Choice: Students may choose the delivery method (short video, PowerPoint Presentation, or written report) *Instructor can assign, or the student may choose a scenario assignment to address.</p>	<ul style="list-style-type: none"> •

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	<p>Bloom's: Comprehend – Students are to explain the process of their calculations Synthesis – Students are to choose a way to deliver their results in an organized way. Analysis/Evaluation – Students are to use their calculations to determine statistical significance.</p> <p>REACT: Relating – Students will build on their pre-existing knowledge of using their personal tools (laptop/phone) to create a presentation format of their choice. Experiencing – Students will be completing all calculations and analysis after seeing it done within the instructor's lecture containing many examples. Applying – Students are to apply the concepts learned in class using a real-world situation. *Cooperating – Students could complete this assignment in a group of 2. Transferring – Students will build upon a prior exposed concept (determining statistical significance) using a new type of problem (Binomial distribution problem).</p>	
<p>Activities/Lesson Procedure</p>	<p>Activity Preparation: Instructor – Instructor will need to prepare a mini-lecture to introduce the students to the new material: mean, standard deviation, and probability formulas for the Binomial distribution. Also the instructor needs to prepare a demo of how to use the chosen software to calculate probability for the Binomial distribution.</p> <p>Learner – It would be helpful if students review statistical significance based on the range rule of thumb from the past unit. Students will need to bring materials listed above.</p> <p>Activity Steps/Lesson Procedure:</p> <ol style="list-style-type: none"> 1. Students will take notes on a mini-lecture. 2. Students will practice using the formulas and practice using the software for calculating probability. Students will practice analyzing statistical significance. 3. Students may begin the activity assignment in class. The students can complete the assignment outside of class to have adequate time to clean up presentations and/or create videos. 	<p>*SPCC offers laptops and calculators that students may borrow if they need them.</p> <p>* Prior to the students starting the activity, they will have seen, heard, and practiced with a calculator and software on how to calculate mean, standard deviation, probability, and determine statistical significance.</p>

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	<p>Expected Results/Learner Products: (Observations, data collection, calculations, products, wrap-up/conclusions, etc.)</p> <p>Students should provide a detailed explanation of the requested calculations and analysis. The students should provide the results in a presentation format of their choice. The students should assume that they are explaining it to an audience/reader that has not been exposed to the concept.</p> <p>Extension Options: (Options for expanding lesson, modifying it to meet local interests, deepening its complexity.)</p> <p>Students could look up recent data on any topic based on their career goal or a topic that is meaningful to them and analyze it in a similar way.</p>	<p>*For this optional extension, the instructor will need to provide a demo of how to search up the information and view the characteristic researched as a Binomial situation.</p>
<p>Faculty Resources</p>	<p>Background Material:</p> <p>Concepts to discuss in lecture: Binomial probability distribution formula, mean and standard deviation formulas for Binomial problems, Range Rule of Thumb for significant values (review), Probability of significant value Theorem (review).</p> <p>Handouts and Supplemental Materials: (Worksheets, PowerPoint or video presentations, explanatory materials, lab report templates, glossary, quizzes, etc.)</p> <p>Instructors are encourage to use supporting materials provided by the publisher of adopted textbook and may use MS Excel for software calculations.</p> <p>Answer Keys: Answers to each option are located within to the activity options document.</p> <p>Suggested Website Links:</p> <ol style="list-style-type: none"> 1. Binomial Distribution concept explained using authentic, real world examples https://www.learner.org/series/against-all-odds-inside-statistics/binomial-distributions/ 2. Introduction of Binomial formulas (probability, mean, standard deviation) https://youtu.be/rvg9oUHtX50 	<p>*I currently use a Pearson textbook and the publisher provides supporting instructional material (like PowerPoints for the topic) and statistical software (StatCrunch) that is used.</p>

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	3. Binomial Calculator Applet Calculator (University of Iowa): https://homepage.divms.uiowa.edu/~mbognar/applets/bin.html	
Assessment	<p>How will students demonstrate what they have learned? (Determine the criteria by which you will evaluate student achievement of the lesson’s learning objectives.)</p> <ol style="list-style-type: none"> 1. Standard homework from textbook or homework platform. 2. Proposed activity. 3. Check in survey (described below) given prior to formal assessments. *Based on survey results, instructor may need to revisit the topic to increase understanding. 4. Concept will also be assessed with other concepts on a unit quiz and unit test. <p>Any instructor can use the adopted book for homework and to inspire problems to use on quizzes and tests. It is suggested to provide the assignments and due dates in advanced in the syllabus.</p> <p>Instructors could provide a short survey to quickly access students feelings about how well they are understanding. (For an example, a quick survey can be created in MS Forms with the prompt: How well do you believe that you understand the Binomial distribution calculations and how to check for statistical significance? Select the option that best describes your feelings. 1= feel lost, 2 = understand some, 3= understand completely). This is a quick informal way to gauge how the class feel about the material.</p> <p>Learner Products/Assessment Tools or Processes: The following assessment tools are appropriate to consider:</p> <ul style="list-style-type: none"> • Rubric (for activity) • Informal observations as the students work through the class practice (examples) and activity calculation. • Quizzes, tests • Individual presentation submitted in the learning management system. <p>*Sample Rubric for activity included in the activity options document.</p>	<p>*I currently use a Pearson textbook which comes with MyLab & Mastering Statistics platform for homework, quizzes and tests. I use the textbook to inspire problems to use for informal/low stakes assignments similar to the proposed activity.</p> <p>*I typically provide a schedule in the syllabus with the list of assignments and due dates throughout the term.</p>