# edTPA General Lesson Plan Template

**Grade Level:** Junior/Senior **Number of Students:** 13 **Instructional Location:** Probability and Statistics (Hybrid) **Date:** 11/2/2020

## Lesson Goals

**Central Focus of Lesson:**
To further build on the learners understanding of the properties, advantages and practice sets of density curves and normal distributions.
To connect this understanding to real world applications in nature.
To learn how to apply z-scores to interpret the percentile of a data value.

**Standard(s) Addressed:**
New Jersey Student Learning Standards for Mathematics | High School—Statistics and Probability

(SID) Interpreting Categorical and Quantitative Data: (A) Summarize, represent, and interpret data on a single count or measurement variable

4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

## Lesson Objectives and Demands

**Content Objectives:**
Learners will be able to understand the properties and advantages of relative frequency histograms, density curves, normal distribution and normal curves by explaining these concepts in a guided discussion and writing in an advance organizer..

Learners will be able to understand the connection between finding the proportion of data by intervals and the areas under a density curve over those intervals. They will understand this by shading in the rectangles under the density curve between intervals, using a provided worksheet of a blank normal curve on a grid background. The learner will then use a graphing calculator to see how accurate their estimates are and share their written results on HelloSMART. A real world data set will be used.

Learners will be able to calculate a z-score and determine how many standard deviations it falls from the mean using a real world data set, sharing this with the class over HelloSMART in writing.

**Language Objectives:**
Learners will recall and employ terms related to density curves and normal distribution to identify, describe and analyze visual representations by explaining these concepts in our general discussion and responding to the video questions on HelloSMART in writing.

**Key Vocabulary in Lesson:**
Density curve, uniform distribution, normal distribution, normal curve and 68-95-99.7 rule. Precursor vocabulary: mean, standard deviation, median, symmetry, interval, histogram, population, sample, unimodal.

**Lesson Considerations**

**Materials:**
Advanced Organizer for the Density Curves chapter.
Access to the Annenberg Learner video for Normal Calculations or Normal Curves.
HelloSMART (To collect answers from learners on the Annenberg video questions)
Printouts of a blank normal curve with grid background provided by Annenberg.
TI-Smartview CE Software (PC Emulation of the TI-CE 84 Calculator)
SMART Notebook with Wacom Pencil (For real-time problem solving on whiteboard)
Whiteboard (Backup if Wacom Pencil fails)
Annenberg Chapter 3 video (for struggling learners to view at home. Provides a differentiated opportunity to learn the content.)

**Prior Academic Learning and Prerequisite Skills:**
To develop and analyze a histogram.
To demonstrate Partial Mastery of introduced concepts being reviewed (i.e., density curves, normal curves).
To use a graphing calculator (i.e., TI-84 calculator) to solve normal curve problems.
To know the language or vocabulary used to describe density curves and normal distributions.

**Misconceptions:**
Learners might attempt to calculate the area of a single value, and not an interval, which equates to calculating the area of a line, which is always zero.
Learners might enter a subtraction sign instead of a negative sign into the statistics normal curve function on the calculator.

| **Lesson Plan Details** |
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| **Lesson Introduction/Anticipatory Set:**<br>● *Review of prior week's concepts* – A facilitated classroom discussion guided by an advanced organizer to complete our understanding of the connections, properties and advantages of relative frequency histograms, density curves, uniform distribution, normal distribution and normal curves.<br>● *Discussion of applications of normal distributions in nature* – The discussion will surface what the learners see as being representable by normal distributions in nature. Bird migration patterns, egg weights, lightning thunder strikes and height patterns will be discussed as natural distribution sets. The discussion will lead us to the Beanstalk Tall People Club, an example of a normal distribution set that we will learn about through watching a video and solve normal curve problems in relation to. |
| **Learning Activities/Procedures - "During":**<br>● *Annenberg Video* – A 5-minute portion of the video on normal curves to visit the Boston Beanstalks club for tall people. If there is more interest in bird migration, this alternate Annenberg Video may be used instead.<br>● *HelloSMART Formative Assessment* – Using the 5 questions from the Annenberg video, the learners' understanding will be checked. The learners will have the opportunity to calculate whether they are tall enough to be a Beanstalk (i.e., their height is three standard deviations from the mean height.)<br>● *Using Area to Estimate Area of a Normal Curve* – Using a standard normal density curve provided from Annenberg with a grid background, the learners will try two problems using a more visual, tactile approach of shading in and counting the boxes under the curve. The learners will use their graphing calculator to check the accuracy of their answers. |
| **Lesson Closure - "After":**<br>● *Voice of the Learner* – Ask if the Annenberg approach of using a grid with the density chart helped clarify area under a normal curve calculation, or if it was too simplistic.<br>● Take-Away – Briefly describe the Annenberg Learner Series Against All Odds: Inside Statistics and recommend "The Basic Practice of Statistics" (unit 3), "Normal Curves" (unit 7) and "Normal Calculations" (unit 8) videos and related student packets as resources for learners as they continue to construct their understanding of histograms, density curves and normal distributions outside of the classroom. |

| **Acknowledgments** |
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| **Sources:**<br>Annenberg Learner – Against all Odds: Inside Statistics. Normal Calculations (https://www.learner.org/series/against-all-odds-inside-statistics/normal-calculations/) or Normal Curves (https://www.learner.org/series/against-all-odds-inside-statistics/normal-curves/). Histograms (https://www.learner.org/series/against-all-odds-inside-statistics/histograms/) for struggling learners to view at home.<br>Overall content structure based on the teacher's outline and class textbook (The Practice of Statistics - Chapter 2.2). |

| **Rubric as the Assessment Component** | | | |
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| | 0 = No Mastery | 2 = Partial Mastery | 4 = Complete Mastery |
| I describe the properties and advantages of histograms, density curves, uniform distributions and normal curves. | I have difficulty understanding how each distribution is related and what differentiates them from each other. | I differentiate each distribution and describe how they are related if provided with guidance. | I describe to a peer each of these distributions, their properties, how they are interconnected, and each type's strengths and weaknesses. |
| I draw a uniform distribution and normal curve provided with the mean and standard deviation. | I can attain with guidance or use of a graphics organizer. | I identify the components and draw this. | I describe to a peer how the mean and standard deviation define the curve and how to draw this. |
| I estimate the area under a curve from the interval provided and using the 68-95-97.7 rule. | I can estimate the area when provided guidance with a graphics organizer. | I estimate simple intervals that directly align with symmetry or the 68-95-97.7 rule. | I estimate any interval given using symmetry, the 68-95-97.7 rule, and summing the rectangle and triangle of the interval. |
| I calculate the area under a curve or the percentile using a graphing calculator. | I can attain when provided guidance, such as what needs to be input into a graphing calculator. | I identify the values to input but do not always use the correct formula or values. | I consistently solve for area under a density curve or for percentile using a graphing calculator. |

## Re-engagement Statement

In a follow-up lesson to the second observation, a central part of the lesson plan would continue to involve surfacing and sharing real-life examples that illustrate the role statistics plays in the world around us. The use of an engaging real-world scenario was equally appreciated by the learners, the Cooperating Teacher and the Supervisor, with all agreeing that the real-life distributions help students make connections to why we are learning the content for the day. I would continue to use trusted providers of real statistics distribution sets and activities (e.g., Annenberg Learner, Resourceaholic and Wolfram Probability and Statistics.) and carefully select an engaging distribution set and activity that is directly relevant to the lesson objectives.

The feedback from each constituent on the introductory warm-up review differed widely and so I plan to use data points from all perspectives. The warm-up review was a summative assessment, posed as a game, to press the learners to turn on their cameras and microphones and collaborate as remote and in-class teams. An advance organizer provided the learners with additional structure and hints and could be filled in as the review progressed. However, students showed significant deficiencies in remembering vocabulary and content. My follow-up lessons would use spiral learning to reteach these topics and improve the learners' skill level, as recommended by my Cooperating Teacher. I would continue to use the warm-up game as a review where appropriate, but I would leave time for an immediate reteaching

moment for the struggling learners as recommended by my Supervisor, and plan to provide individualized instruction in the follow-up lesson.

Lastly, I would continue to build on the strengths of my hybrid lesson planning and repair what did not work, providing full-accessibility. While the students were asked if all could clearly hear the video, I found that the sound for the remote students was too low. In the follow-up lesson, my plan is to trust the learners but also verify that the technology is functioning, through asking questions that would test what the remote learner is actually seeing and hearing.