

Lesson Plan, Week 3

Lesson: Least Squares Line and Errors

Time frame: 60 minutes of preparation before class, 75 minutes of in-class activities plus another 100 minutes for solving problems which requires time for calculations.

Materials needed:

1. Computer and access to internet
2. Grid paper, Colored pencils, Eraser, Small ruler
3. Graphing Calculator

Objectives:

Basic:

1. To measure how well a straight line fits a collection of data.

Advanced:

1. To construct the least square regression line (The straight line that best fits a collection of data).
2. To learn the meaning of the slope of the least squares regression line.
3. To apply the least square regression line to estimate the dependent variable in terms of the independent variable.

Introduction to Lesson:

Students are supposed to know the concept of slope and y intercept of a line. In this lesson they apply their knowledge of the components of a straight-line equation to create a best fit line passing through scatter plot.

This is a topic that biology students will use in biostatistics course as well. It is very important for them to have a good understanding of this topic, so they can apply it in their more advanced courses.

Procedure

Pre-Class Individual Space Activities and Resources:

Steps	Purpose	Estimated Time	Learning Objective
Step 1: Read the attached document for “Least-Squares Regression” https://www.ck12.org/statistics/least-squares-regression/lesson/Least-Squares-Regression-ADV-PST/ A link for a 5-minute educational video is included in this document.	Introducing the concept of Least Squares line. Learning how to approximate the line of best fit and find the equation of the line.	20 to 30 minutes	To measure how well a straight line fits a collection of data and construct least square regression line.
Step 2: Watching a short video about the Function https://www.youtube.com/watch?v=ioieTr41L24	Helping students who prefer to use videos for learning the topic. This video mainly reinforces what they have seen in step 1.	2 minutes	Learning how to estimate the line of best fit regression
Step 3: Going over powerpoint slides which covers more advance concepts related to the specific topics in application of math in biology.	PowerPoint slides provides visual aids and could serve as students note from the lecture. PowerPoint slides help students to organize the steps for learning the topic.	20 minutes	learning the specific topics related to bio math and applying the concepts into solving simple application problems.

In-Class Group Space Activities and Resources:

Steps	Purpose	Estimated Time	Learning Objective
<p>Step 1:</p> <p>Recap of the topic and the material which was assigned to students as pre-class activity.</p>	Summarizing what the students were supposed to learn before coming to the class.	10 minutes	Connecting the different parts of SLOs together
<p>Step 2:</p> <p>Answering student's questions. If they don't have any questions, then there are questions that they need to answer to measure their understanding from the topic.</p>	Clarifying the concept for the students	10 minutes	Stimulate the cognitive processes and critical thinking for problem solving
<p>Step 3:</p> <p>Showing to students how they can use excel to solve a lengthy problem. Solving problems from this topic usually takes longer time for students and they often end up having errors in calculations. Excel is a great tool which could help to speed up the calculation and reduce the possibility of error in calculations.</p>	Introducing excel	15 minutes	<p>How to:</p> <ol style="list-style-type: none"> 1. Enter and edit the data. 2. Format data and cells. 3. Construct Formulas. 4. Use the built-in functions.
<p>Step 4:</p> <p>Dividing the students in to groups of 4 and sub group of 2. Students start working on the worksheet in group of two and then checking the answers in group of four.</p>	Helping them to become an active learner and apply the concepts that they have recently learned in solving problems in a group helping by each other and discussing the confusions that they may had.	20 minutes	To build team- work skill and taking advantage of group thinking for problems solving.
<p>Step 5:</p> <p>Summarizing the key point from the lesson</p>	Final review to help student fully comprehend the lesson.	10 minutes	Connecting all the key point for more in-depth understanding the lesson and their application in problem solving.
<p>Step 6:</p> <p>Students will write a short summary of the key points that they have learned from the lesson. They need to update their notes on important formulas and concept for the review before exams.</p>	This is students' opportunity to review all the new materials as long as everything is fresh in their mind.	10 minutes	Learning how to consolidate the lesson and create a summary for future references before the exams.

Closure/Evaluation:

❖ *Analysis:*

Through this lesson plan, students initially read an introduction to Least Squares Best Fit Line. This introduction helps them to get familiar with the concept of Least Squares line. They will start learning how to approximate the line of best fit and find the equation of the line.

The in-class activity will follow the learning objectives of the pre-class activity but more in-depth. Through a recap and answering student's questions, their critical thinking will be stimulated. After these steps, students will learn how to use excel to speed up their calculations with less possibility of having an error. Then they have an opportunity to solve some of the problems in their group using excel or calculating it by their calculator.

❖ *Post-Class Individual-Space Activities:*

This lesson will be followed by homework problems from their ebook which give them more opportunity to practice what they have learned in the class.

❖ *Connections to Future Lesson Plans:*

Least squares best fit line is an important concept for biology majors as they need to use it for their biostatistics course (BIOL 3000).