DOINGWHATWORKS

Slideshow

FULL DETAILS AND TRANSCRIPT

Application of Linear Equations

Legend High School, Colorado • November 2008

Topic: National Math Panel: Major Topics of School Algebra

Practice: Topics of Algebra

Highlights

- Collection of real two-variable data
- Use of scatterplots for two-variable data
- Determine relationships between variables using scatterplots
- Trend lines for two-variable data
- Interpretation of scatterplots and trend lines
- Students make posters for and write about two-variable data
- Progression of topics for an Algebra I class

About the Site

Legend High School

Castle Rock, CO

Demographics

2008-09 data, for 9th grade only:

90% White

5% Hispanic

3% Asian
2% Black
3% Free or Reduced-Price Lunch

Legend High School is in its first year of operation in Douglas County School District (Colorado). The mathematics staff has developed mathematics curriculum, instruction, and assessments that emphasize 21st Century skills and learning. Mathematics content is made interesting, motivating, and meaningful through relevance. Features of mathematics instruction at Legend High School are:

- Academic rigor and relationships are emphasized;
- Technology accelerates deeper understanding of algebra topics; and
- Integrated curriculum applies mathematics knowledge to other courses and out-of-classroom experiences.

Full Transcript

Presentation Title: Application of Linear Equations

Legend High School, Douglas County, Colorado

At Legend High School, algebra teachers Roger Miller and Chris Zimmerman use linear (two-variable) data as an application in which to observe linear relationships and linear equations.

Slide 1: Using linear data

Slide text: Two-variable data are the focus of several lessons in a unit on graphs for Algebra I classes. This unit follows units on Arithmetic to Algebra and Expressions and Equations.

Audio: We approach the concepts of linear equations using some real data or some connection to a real-life problem. We'll look at slope and intercept with graphing, and we try to connect that with the kids with some real-life example that they can connect to—whether it's a set of data that they look up on the internet, or if it's something that we go out and gather ourselves.

Slide 2: Scatterplots

Slide text: In this lesson, students collect real data and use given data. They construct scatterplots of the two-variable data and interpret trends in the data. The goal is to determine relationships between two variables using scatterplots.

Audio: In this lesson the goals were to look at two quantities and find a relationship between those two

quantities using scatterplots.

Some of the connections that we are trying to make with other skills and topics in algebra are the solving equations for a variable—solving for a Y variable, an X variable, or any given variable. We're also making a connection working with real numbers—integers as well as rational numbers, fractions—because we know that most of our real data that we use is not going to be whole numbers or integers. Another connection that we are making, we're trying to make, with our math skills is finding patterns and relationships. The ultimate goal is the connection of looking at this data, looking at the relationship in order to make a prediction.

Slide 3: Understanding the data

Slide text: The first step in the exploration is understanding the data. Students determine the independent and dependent variables, plot points on a grid, and examine the plot to decide whether there is a positive (upward) or negative (downward) trend.

Audio: They're talking about plotting points. They look at what positive and negative correlation are, what is independent and dependent variables, how do they relate. And in doing the exercise that we did with the wave drill, that kind of gave them a better understanding of what the data looks like and how we collect it and then how we can take that data and put this into a scatterplot and then how am I going to relate those two quantities.

Slide 4: Collection of data

Slide text: Together as a class, students collect real data from a "wave" experiment with runners and timekeepers. All students in the class contribute to the experiment conducted in a school hallway.

Audio: Anytime that we do a project where they are collecting their own data from an experiment or an activity, they really have a connection there instead of reading it out of the book. And often sometimes they all have real engaging questions or real thought provoking questions from an activity.

Slide 5: Examining data

Slide text: Collectively, the class examines the data, makes a scatterplot, and talks about how to interpret information from the data, including the idea of a trend line.

Audio: When we're dealing with linear equations, we try to connect it to a lot of things in algebra, such as a lesson on scatterplots. We try to deal with trend lines in that linear line and try to bring that back to the real-life situations we explored when we were doing trend lines, and then we can tie that into linear equations.

They were talking about what is the relationship, what does this mean? And without sparking this conversation, they were talking about, "Well, what if it was going up here on the top of this line? Can we predict this?"

Slide 6: Making data displays

Slide text: Next, groups of students are assigned to make posters with graphs for a variety of given data such as oil changes and costs of engine repairs, age in weeks and heights of plants, and hours of study and test scores. When there is a correlation, graphs include a trend line—or "eyeball" line of best fit—as a straight line representation of the data.

Audio: I was talking about scatterplots today in class, and all of a sudden somebody said, "Well, isn't that the line of best fit?" And just asking questions that bring out those types of answers to what we are going to connect later on, I mean, that's a perfect type of informal assessment. And that just tells me right there that, okay let's move on to line of best fit. What is line of best fit? Where are we going with this, and what's going to happen next? What does this line mean? How do we use this line to predict outcomes?

Slide 7: Trend line

Slide text: For some data, students may observe that there is no correlation and that a linear representation is not reasonable.

Slide 8: Gallery walk

Slide text: Groups of students, having made posters of their work with the different sets of two variable data, display their posters around the room. Next, students participate in a gallery walk viewing the posters and individually writing a summary of each poster.

Audio: We hung them up on the wall and they were able to summarize—do a gallery walk around the room and summarize—all of the different types of scatterplots around the room, and that kind of brought it together. And they can compare the graphs, the positive correlations, the negative correlations, the no-correlations, and they can summarize that and bring it all back in.

The thing we are doing in our classes right now, we are having groups working together and showing their own work. And as the students walk around to see other students' work, they're recognizing a variety of different methods of seeing a problem done.

Slide 9: Summaries for day

Slide text: The summaries include a discussion of the scatterplot for the data, the significance of the trend line, and the possibility of prediction from relationships between the variables.

Audio: A lot of times I'll give them writing assignments. I think one of the key concepts in mathematics in our classes is really focusing our writing mathematically and technical writing and talking mathematically. I think you find out a lot more about the kids' understanding when you ask those types of questions. Sometimes you just don't have the opportunity to go around and ask every single kid, "What do you know about this?" But if a kid can explain it, they know it, and if they can write it down, their explanation is now in a written form. A lot of times you get deeper understanding by seeing what they write and how they write it.

Slide 10: Equations for trend lines

Slide text: In the next lesson, students will write equations for trend lines, interpret slope as rate of change, interpret intercepts, and compare points above and below the trend line in a scatterplot.

Audio: We worked on scatterplots, and what's coming next in my instruction is going to be going towards those trend lines and how do we find those trend lines and looking at those linear equations. And then once we find those trend lines, we're going to do some projects that are more towards the prediction, so the "What is going to happen next?" or "What if we were here? What would happen?"

Slide 11: Progression of topics

Slide text: The progression of topics for this Algebra I class includes other types of functions, such as quadratics and absolute value, and leads to systems of equations and interpretation of multiple relationships in data.

Audio: As we progress from linear equations and graphing, and we have gone from different graph types, we'll look at a family of functions. We'll look at equations. Now that we know that we can graph linear equations, we want to see how are other equations presented, and how do they look as far as quadratics, absolute value functions, and what are the relationships between all of these families of functions and how do independent and dependent variables change when we are looking at different types of graphs, and then actually having the kids looking at different properties that they can identify with, and how do they change from linear to quadratic. And then we move forward to systems of equations.