

Chapter 14



Ajay Kalra: Rate of Change and Linear Equations

Hello, I am Ajay Kalra, Math educator and facilitator. I have been involved in the field of Math education continuously for 16 years as a Math Educator. I have been teaching/facilitating math courses ranging from pre-algebra level to advanced calculus level at High schools/Community colleges/Universities. I also had an opportunity to teach college algebra to US Marines stations in the U.S. embassy in New Delhi. I did my Master's degree in Mathematics from a prestigious school (University of Delhi) in New Delhi. I did my math teaching certification program from National Louis University in Chicago and completed Masters of Online Teaching (MOT) from University of Illinois (Urbana).

Rate of change and Linear equations

Grade Level: 9-10

Content Area Topic: Slope

Content Area Standard(s): 8.EE.B.5

Learning Objective(s):

- Determine the slope of a line given two points on it.
- Determine the slope of a line given its graph.
- Compare the slopes of two lines.
- Graphically by viewing the steepness
- Algebraically by viewing the slope values

Suggested Time Allotment:

Three– 55–minute lessons

Sequence in Learning:

After this lesson students will apply Common Core Mathematical Practices to slope, rates, unit rates, linear equations, and linear graphs. Students will also see how the concept of slope can be connected to real world applications.

Materials & Resources Needed:

- Dry Erase Boards / Pens
- Calculator
- Colored pencils
- Rope/string
- Worksheets
- Vocabulary Cards
- Vocabulary Report
- GeoBoards Practice & Homework
- Geoboards Exit Ticket
- Slopin' It Up Warm– up
- Coordinate Grid Transparency
- Four Corners Activity – Slopes
- Four Corners Activity – Graphs
- Steppin' It Up Homework
- Warm-up (lesson 3)
- Scavenger Hunt
- Scavenger Hunt Student Record Sheet
- Slope Application
- Slope Quiz

Lesson Activities & Sequence:

Pre assessment: Students were given vocabulary cards (based on slope) and instructed to find another student(s) with same vocabulary word and together discuss how the word relates to slope. After a brief student discussion, each vocabulary group reported out to class. The students completed the “Vocabulary Report” chart as each group presents.

Setting the stage: Based on student input from the vocabulary card activity, I gave my students definition of the slope which students were required to copy on their vocabulary sheet the word, the definition and examples for slope.

I used Geo-board activity to demonstrate a positive slope. I used three different colored pens to correspond to rise, run and line to define the slope so that students could easily visualize what is rise and run to define measure of steepness which is called slope.

Student activities:

Geo-board (dot paper) activity: Students will use Geo-board sheet to develop the concept of positive slope with a positive “rise” and positive “run.” The line formed by looping the beginning point and end point with colored pen would be the line that has the particular slope value. Lines with negative slopes, zero slope, and no slope will also be developed using colored pencils on Geo-board practice sheet

Four corners Activity: “Four Corners Activity – Slope” in four separate corners of the room”

In this activity, I cut up the graphs with different slopes and give each student one graph and have them determine the slope of the line. Students were instructed to go to the corner of the room where the slope of their line is posted. Students discussed the similarities and differences amongst the graphs and the corresponding slopes.

Technology: Students used free online application to find the slope of line by changing the direction of line and moving points on lines.

Proficiency:

Formative Assessment: Students are assessed during the lesson based on their classroom performances. These assessments are completed through teacher observations, peer questioning, and group work during the activities.

I used different tools and teaching strategies like proceduralization, paired learner model, modeling and experimentation and game

completion with graduated difficulty to meet needs of different learning styles in class to understand and master the concept of slope.

Students were able to find slopes graphically and algebraically and also participated actively in Jeopardy game and four corner activity. Students communicated their understanding of concept using graph, formula and words. Without calculating slope of line student were able to recognize whether slope would be positive, negative, zero or undefined. Ability to recognize sign of slope of line will help them to recognize increasing and decreasing functions in subsequent topics in Algebra.

Summative Assessment: Students will be given check point quizzes, performance task and tests after the lesson to provide students an opportunity to communicate their understanding of concepts and skills through verbalization, visualization and symbolization.

Feedback

Teachers As Learners:

“Excited, good pacing, very visual, saw that we were advanced and moved quicker. Liked the way he assessed prior knowledge through words and visual. Did not allow student heckling to derail lesson. Good connection with students. Friendly affect”

My reflection: Using pre-assessment and asking relevant question I got feedback about my students prior knowledge about concepts of slope. Most of my students did not know the meaning of slope (that it is measure of steepness and represents “unit rate of change”).

I launched the lesson explaining student how to measure steepness using hands on activity on Geo- board emphasizing what is positive rise /run, what is negative rise and run, why horizontal has zero slope and slope of vertical line is undefined. I showed them video and images of from real life showing four different kinds of slope (positive, negative, zero, undefined).

Elements of Pretty Good Practice:

“Assessing prior knowledge was a great practice, had visual aids that students could use during the activity. Got us to move around, clear instructions on the handout, allowed to work in pairs. Good summary and review of objectives. Students were able to decide whether they met the objectives. Showing the visuals made the concept more real.”

Modifications and Adaptations:

Extending to more problems or real world examples. Could easily go to science pulley and levers. Kids could graph the slope of them walking or running. Use geoboards, higher level users could use a computer program. Use maps and ask what the slope of Clybourne, Montrose Hill, slide outside the playground. Go find different things in the neighborhood, what alphabetical letters have slopes? Skateboarding

Questions Arisen by Group

How could we make this more real world?

I have attached the power point presentation to show the real life application of concept of slope.

Peer Feedback:

Lens 1: Affect of Teachers and Students

Teacher was very excited, good pacing, very visual, saw that we were advanced and moved quicker. Liked the way he assessed prior knowledge through words and visual. Ajay did not allow student heckling to derail lesson. Good connection with students. Friendly affect

Lens 2: Best Practices

Assessing prior knowledge was a great practice, had visual aids that students could use during the activity. Got us to move around, clear instructions on the handout, allowed to work in pairs. Good summary and review of objectives. Students were able to decide whethery we met the objectives. Showing the visuals made the concept more real

Lens 3: Standards

CSSS 8.E.E.B.5 Understanding expressions and equations.

Lens 4: Extensions and Adaptations

Extending to more problems or real world examples. Could easily go to science pulley and levers. Kids could graph the slope of them walking or running. Use geoboards, higher level users could use a computer program. Use maps and ask what the slope of Clybourne, Montrose Hill, slide outside the playground. Go find different things in the neighborhood, what alphabetical letters have slopes? Skateboarding.

Lens 5: Questions

How could we make this more real world?

Related Resources/Ideas:

- Real Life Slope Application (PPT)
- Handouts
- http://www.nsa.gov/academia/_files/collected_learning/high_school
- http://www.montgomeryschoolsmd.org/departments/itv/mathdude/MD_Algebra1_3-1.shtm
- <http://video.mit.edu/watch/slope-8183/>