OER In Mathematics Professional Development Project

Lesson Plan

Topic of the lesson:

Rate of Change / Slope

Standard(s)/Learning Result(s):

ALGEBRA: Students understand and use the basic properties of linear relationships, y = kx + b.

Translate common linear phenomena into symbolic statements and graphs, and interpret the ***slope*** and y- intercept of the graph of y = kx + b in terms of the original situation.

Goal(s) of the Lesson:

What do you want the students to know and be able to do? What overarching questions do you want them to be able to answer?

We want students to be able to understand rate of change, both varying and constant, within the context of linear relationships. These concepts can be explored in real-life contexts including time-distance problems, gas mileage, item costs, and rate costs such as cell phone, Internet or DVD rental rates.

- Students should understand that slope is the numeric value that describes the rate of change for a linear function. (the amount y increases when x increases by 1 unit)
- Students should be able to recognize that a linear function can be written in the form of y = mx + b where m is the rate of change or the slope of the line.
- Students should be able to zero and undefined (no) slope.

Context

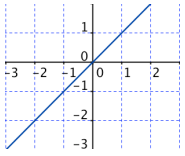
What should students know to engage in the lesson?

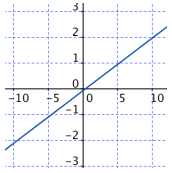
Students should have experience in analyzing change in various contexts and have opportunities to explore how change in one variable can relate to change in a second variable. For example, students could have investigated geometric and numeric patterns given a string of pattern blocks. (Explore change in perimeter…1 block, p=4, 2 blocks, p=6, 3 blocks, p=8 and so on)

Associated Student Difficulties

Describe known misconceptions (overgeneralizations, common errors, and misunderstandings) associated with the content in this lesson?

Sometimes students do not look at the scale on the graph and assume that the x:y relationship is 1:1 so they interpret the graph incorrectly. For example, they see these two graphs as having the same slope even though the first has a 1:1 ratio and a slope of 1, while the second graph has a 5:1 ratio and a slope of 1/5.





Another common error is if students are given two points that are in the third quadrant, they assume the slope is negative.

Planning for Differentiation

Describe how the lesson design incorporates a plan for differentiation.

Students grouped across abilities and degrees of understanding (not same ability groupings) to minimize students with similar misconceptions within the same group.

Possible pre-activities

- Engage students in talking about slope in real life situations like the pitch of a roof or a ski slope.

Pre/Post Assessment

Review what you want students to know and be able to do. How will you determine what they know and don't know? How will you determine that they have met the target? (Describe the pre/post assessment)

Pre Lesson Probe:
- Administer to determine if students recognize the scale on the graphs and how to determine the slope from the relationship between change in y and change in x (rise over run.)
- Review results to determine specific instructional interventions.

Post Lesson Assessment: Administered to determine if students changed their understanding of the meaning and effects of the order of operations.

Materials & Resources

Describe any tools and resources that are needed to support the lesson.

- Applet & Student Exploration

Technology Tools / Applets

What technology tools, applets, and/or resources you will use for this lesson?

- Calculating Slope Applet: http://maine.edc.org/file.php/1/tools/CalcSlope.html
- Projector
- Laptops
- Smartboard (optional)

What management strategies will you utilize during the lesson?

- Load the applet on the teacher computer before having students launch the applet
- Put the link on the classroom wiki (or blog, online bookmarks, or other management site)

Teacher Notes:

Lesson Description

Preparation	*What resources will you need? What type of preparation is needed before you can begin the lesson?* - Clickers, Laptops - Print Exploration/Recording Sheet for exploring slope. - Print Pre and Post Lesson Probes (Or make sure the probes are in an online administration site) - Approximate Time: 1 1⁄2 hours

	Lesson	Questions for Learners	Notes / Reflections
Introduction	Steps of the lesson: learning activities (and time allocation) • Students complete the probe for the pre-assessment (10 min). • Students use the clickers to get class results on each question from the probe. Teacher explains the significance of the results (5 min). • Teacher picks out the questions from the probe that have the most discrepancy (5 min).	What is the significance of the information gathered by using the clickers? What do the percents/numbers represent and mean to the class? How can we use this information? *Note – If students struggle with scale use the ***Effects of Scale Interval Changes (2)*** applet. If they struggle with the calculation of slope, use the ***Calculating Slope*** applet.	1) Review probe prior to instruction, make observations about misconceptions 2) Clicker set up, have student data put into graphs
Core Instruction	• Students answer the first few questions from the exploration (5 min). • Class discussion on the first few questions from the exploration (5 min). [Page 1]	What happens to the value of the slope as you move the second point (Point B) to the right? Up? Down? Discuss example 5 & 6. What do you notice about the slope when Point B **is up and to the right** of Point A? Point B is **down and to the right** of Point A?	Point out rise and run when viewing $\Delta y/\Delta x$. Model labeling the change on the graph on the board or smartboard.

	Lesson	Questions for Learners	Notes / Reflections
Core Instruction (cont.)	• Students use the applet to answer the questions from Page 2 of the exploration (25 min). • Class discussion of the questions in the exploration page 1 (10 min). Let them do one then discuss then the other two. • Next have them check their work using the applet • Class discussion on the final two problems on page 2 of the exploration to come to a generalization. Compare and contrast the 3 problems. (10 min). • Complete page 3. Class discussion. (See notes) Have them do the calculations without using the applet. Then have them state which line determined by the set of points has the greater slope. Next have them draw the lines on the graph have them label the change in y and change in x with a number.	Page 2 – Have them do the calculations without using the applet. Then have them state which line determined by the set of points has the greater slope. Next have them draw the lines on the graph have them label the change in y and change in x with a number. In 7 & 8, how is the value of the slope similar and different? How is that shown in the graph? How does that relate to the "steepness"? What is different in example # 9? Page 3 – After the graph is drawn, ask them if there is more evidence to confirm their prediction about the greater slope. Tell them to add this to their justification	Compare the 3 graphs from problems 7, 8, and 9. Make sure to note value of y changes, x changes, relationship, direction and steepness of the graph *Note – in example # 10, the slopes are the same but some students may think that Line 1 has a lesser slope since there is a point with negative coordinates. Or others may think line 2 has a greater slope since it is above line 1. This is a great example to stress it is the relationship between the change in y over change in x which is 2/2 and you can have many lines with the same slope. Ask if lines can have the same slope but can be located in different places on the graph. (Find two more points with same slope on a different line.
Closure	Students will retake the probe: • Students complete the probe again for the post assessment (10 min). (Students will complete on paper first. Students then will complete using clickers. • Teacher and students go over the solutions to the probe (10 min). • Final wrap up over lesson (10 min).	Reinforce relationship between Δy and Δx. (slope is a ratio.) Reinforce positive slope goes up and to the right and negative slope goes down and to the right. Reinforce same slope, different lines, multiple points on a line…slope same even looking at different points on the line.	Review data Reflect on remaining areas of difficulty Determine next instructional steps