# Teaching about the meaning of PERCENTS: a conceptual and constructivist approach

Most of what follows is adapted from the Visual Mathematics Curriculum, written by Linda Cooper Foreman and Albert B. Bennett, Jr. and published by the Math Learning Center. Their materials are readily available. Check out the Math Learning Center's website @ www.mathlearningcenter.org

The point with these activities is NOT for you to be teaching the learners a bunch of rules, etc., about percents. The point IS for your learners to be given an opportunity to explore some key percent concepts and to create knowledge (and real understanding) for themselves. Give them time to think things through, grapple with concepts, make mistakes and ponder them, etc. Have calculators available! If you're working with more than one learner, be sure to give plenty of time for people to share their thinking and their models. If you're working with one learner, you'll want to both do some thinking out loud.

**1** WHAT DO YOU ALREADY KNOW? WHAT DO YOU WANT TO KNOW?
**A** Ask what learners already know about percents – when do they use them or see them around? Ask too if there's anything involving percents in their daily lives that they've wished they could do.

**2** WHAT DOES "CENT" MEAN?
**A** Together, think of some words that contain "cent" (like century, centenarian, centimeter, centennial, centipede, etc.). Ask learners what they think "cent" means in each of words. You want to pull out that since "cent" means "hundred," "percent" means "per hundred."

1% = 1 per hundred, or 1/100 or .01 (if they've studied decimals)
16% = 16 per hundred or 16/100 or .16
93% = 93 per hundred, or .93

**B** Generate some other fraction/decimal/percent equivalents, like these, with learners *(but only throw in the decimal equivalents if learners have already studied the meaning of decimals).*

**3** VISUAL MODELS
**A** Using the percent grid paper, ask learners to notice how many parts the big squares have been subdivided into. Then explain that we'll be using one big square to be equal to 1 whole, or 100%.

**B** Shade in 3 squares on the percent grid, and think out loud about how you know have a model of 3/100 or 3%. Do another model or two, continuing to think out loud. Then, ask learners to shade in and label some percentages themselves – including 1%, 25%, 50%, 5%, ¼%, ½%, 120%, 200%, 300%. Discuss what you all figured out. (Note: for fractions of a percent, like ½%, it can help to draw learners' attention back to their model of 1%).

**C** It could be useful at this point to SEE some common fraction/percent equivalents. With the percent grids learners can be asked to show, for example, how ¼ is the same as 25% and ¾ is the same as 75%, and 1/10 is the same as 10%, and even how 1/3 is the same as 33 1/3%, etc.

**D** Explore giving 100% (the big squares) a dollar value (see examples below) and ask the learners to think about how they might determine the value of 1%, 7%, etc. Use the percent grids for this! Feel free to use calculators so learners can focus on the MEANING of percents and not get hung up with number crunching.

For example:

- If 100% has a value of $300, what's the value of 1%? What's the value of 2%? What's the value of 7%? What's the value of 21%? What's the value of 1½%?

- If 100% has a value of $700, what's the value of 1%, 7%, 150%, 200%?

- If 100% has a value of $75, what's the value of 5%, 10%, 21%, 300%?

Ask learners to talk about how they're thinking about/approaching these problems, using the visual models. For all of these activities, if learners ask you if they're right, ask them to prove to themselves if they're right or not, using the visual models.

**E** Explore giving *less* than 100% (the big squares) a value, and ask the learners to think about how they might determine the value of 100%. Use the percent grids for this – draw/color in each percentage and label its value.

For example:

- If 2% has a value of $8, what's the value of 100%?

- If 7% has a value of $63, what's the value of 100%?

- If 5% has a value of $30, what's the value of 100%, 40%, 2%?

- If 2% has a value of $44.50, what's the value of 100%, 25%, 50%?

Ask learners to talk about how they're thinking about/approaching these problems. You may want to think out loud on one of two problems too.

**F** Explore finding out what percent one number is of another. This may recall some extra thinking on your learners' part – so don't stop their process by giving away the answers. As always, let them grapple with making sense of this. Again, use the percent grids. Do NOT teach any formulas, etc., for figuring this stuff out.

For example:

- If 100% is worth $200, how many percent have a value of $8?
Then – what percent have a value of $22, $50?

- If 100% is worth $430, then what percent has a value of $86?
Then – $387, $387, $25.80, $860?

**4** MORE VISUAL MODELS

**A** Explore more with percents using the handout "Modeling Percentages: Connector Student Activity 21.1, from the Visual Math series. As usual, allow time for learners to grapple with the problems. Talk together about how you're all thinking about the problems.

**5** APPLIED PROBLEMS USING VISUAL MODELS

**A** Go on to look at applied mixed percent problems (you could use the Mixed Percent Problems handout or make up your own, or ask the learner to make some up). At this point, work on a variety of problems that are purely percent situations – problems that have no question attached. Ask learners to make and share mathematical observations involving percentages – and to be sure that each observation can be supported with a visual model. If learners are working towards the GED or some other test, you could ask learners later to make up questions that their observations would answer (sort of like Jeopardy, eh?). It would be great to incorporate percentage situations that learners say that they come across in daily life. From here you could do things like bring in a newspaper or magazine and look for percentages or numbers that you could make percentage observations about – just to make it all even more applied.