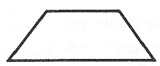
FOCUS ISSUE

TEACHER AS "KIMP"

Robert M. Berkman

Homework question #4: Draw a trapezoid.

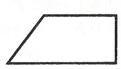
The first student stands up and draws what can be described as a "textbook trapezoid":



I look at the figure, reach back, and put on a phosphorescent yellow baseball hat with the word "Forks" emblazoned in white. The students begin to groan. "Oh, no, he's turned into a 'kimp'!" they whisper. As defined by one of my students, a "kimp" is "being so stupid that you are not aware of your stupidity."

"So what you're telling me," I say in my best Ernest-Goes-to-Mathematics-Class drawl, "is that a trapezoid is a four-sided figure with two line segments that go horizontally and two line segments that go diagonally."

An uprising appears to be brewing among my charges. A flurry of hands is waving wildly in the air. A student goes up to the chalkboard and draws this figure:



"Oh, I see! So a trapezoid is a four-sided figure with two line segments going horizontally, that can have a right angle and a diagonal, or two diagonals."

More moaning, more hands in the air.

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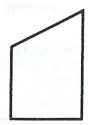
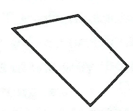
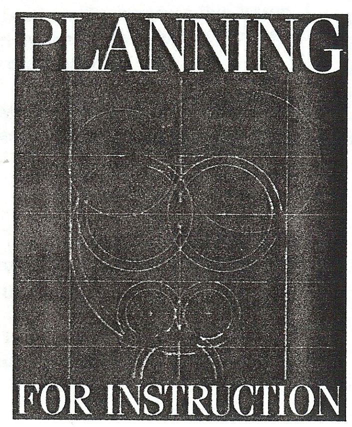
For a discussion of a similar technique used with older students, readers are referred to the article "What Is a Quadrilateral?" by Lionel Pereiera-Mendoza in the December 1993 *Mathematics Teacher*.—*Ed.*

Another student goes to the chalkboard. A lot of chatter ensues; some students are scribbling in their notebooks, others are looking on and commenting. Others are shaking their heads at how stupid a teacher can be. Next figure:



"Oh, I get it now, a trapezoid has four sides, and two of them have to go either vertically or horizontally, and the other two can be right angles or diagonals." A student shouts, "No, no, we're just drawing it like that to show you an example!" I give him my dullest look, "But that's what your drawings are telling me." More groaning, more energy. Another student charges to the chalkboard:

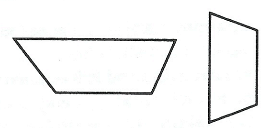




A flash of inspiration flashes across my face. "Oh, I have it now: it doesn't have two line segments that are horizontal or vertical, but it does have to have four sides, and two of the sides go in the same direction, and the other two don't."

A flash of relief runs across my students' faces. "Yes, that's it!" one cries, thinking that we can now go to the next homework problem. But not so fast. . . .

"But if it does have two line segments that are horizontal, the longer side has to go on the bottom, and if the two line segments go vertically, the longer side goes on the right!" Two more students run to the chalkboard. Two more drawings appear.

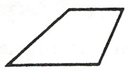


The students are sure it's all over. They've shown me every type of trapezoid that is possible to produce. They're emotionally and intellectually exhausted. But little do they know the depth of my ignorance.

"Okay, that's it: four sides, two of which are going in the same direction, the other two sides are not, it doesn't matter which way you turn it around." Twelve sixth graders are happy, twelve sixth graders are relieved, twelve sixth graders believe nothing more is to be shown. But not so fast. . . .

"And it always has to have two pointy angles on one side and two nonpointy angles on the other. . . ."

They're obviously frustrated. While one student threatens to tell the school administrator that I don't know what a trapezoid is, most just hold their heads in their hands. "Mr. Berkman, I'll explain one last time," one student mutters, and goes to the chalkboard.



"You see, it can have an acute angle and obtuse angle on the same side, and an acute angle and obtuse angle on the other side. Or it can have a mixture of right angles, and acute and obtuse angles," she explains.

"Those acute angles, they're the pointy things?" I inquire.

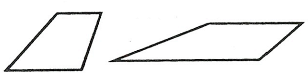
"Yes, Mr. Berkman, they are. You taught us that!"

"Oh yeah, I forgot. I'm a real kimp today."

She walks away from the chalkboard.

"One last question, do those trapezoids always have to be so, well, square? I mean, it looks like they can't be short and fat, or long and skinny. Are there any rules about that?"

A quiet girl from the back raises her hand. "I'm going to settle this once and for all." She heads to the chalkboard:



"See, they can be skinny or fat, long or short, in any direction, all they need are four sides, only two sides of which are parallel. It doesn't matter which way they are turned, what length their sides are, or where the angles are placed, as long as they have only one set of these parallel sides. Now, are there *any more* questions you have about trapezoids?"

"Yeah, do you always have to draw them in white?"

Is My Teacher Stupid, Smart, or Both?

One of the main goals of the NCTM's curriculum standards is "Mathematics as Communication," that is, children should "reflect on and clarify their thinking about mathematical ideas and situations" (NCTM 1989). One of the best ways to accomplish this goal is to take a problem and use seemingly stupid questions to goad students into thinking carefully about how they are describing their ideas. "Kimping" is the word I use to define this strategy. The wise teacher knows that being a "kimp" means stimulating a deeper understanding of a concept or procedure.

"Kimping," if done well, forces students to be very precise about their language. By taking on the guise of one who is completely ignorant, we challenge students to reflect on their thinking and not accept "textbook" answers. In effect, students become creators of their own knowledge, uncovering complex ideas contained in seemingly simple questions. Many teachers object to this kind of struggle, as they believe that mathematics is a clean, precise collection of concepts and operations. By working through these ideas, however, students emerge with a depth of knowledge that cannot be developed through conventional means.

Use seemingly stupid questions to goad students into thinking.

Kimping can be used as a tool to teach by counterexample. Too often, teachers show the correct way to solve a problem without allowing students to see why the incorrect way yields a wrong answer. One good example of this tactic involves the addition of fractions. To introduce this lesson, I start by putting the following problem on the chalkboard:

> Mr. Berkman says that if you add 1/2 and 1/2, you will get the following:
>
> $$\frac{1}{2}+\frac{1}{2}=\frac{2}{4}$$
>
> What do you think of Mr. Berkman's thinking?

In this example, I am asking students to assess my thinking. I explain that it is my belief that fractions are added in the same way as whole numbers and decimals: since we add ones and ones, tens and tens, and hundredths and hundredths, with fractions we add numerators to numerators and denominators to denominators.

Of course, the students know that I may be playing a kimp, so the discussion is lively, yet intellectual. What emerges from the students' analysis of the problem is that although the logic for the procedure seems to be consistent with other areas of mathematics, it doesn't yield correct results. How can one start out with 1/2, add another 1/2 to it, and end up with the same amount one started with? Furthermore, the students already know by their experiences that the answer must be 1, so they must then think through an alternate procedure that will yield the correct answer. By presenting a counterexample and trying as hard as possible to defend it, the students are better prepared to generate and accept the proper method for solving the problem. Furthermore, students can discard their previous conceptions of how similar problems are solved by proving to themselves that this simple method just doesn't make sense.

An International Movement?

This type of lesson is consistent with what is found in successful mathematics classrooms in countries that boast high rates of mathematical literacy, better known as *numeracy*. According to Stigler and Stevenson (1991), Asian teachers make use of incorrect answers as the jumping-off point for discussions, particularly to help reverse children's incorrect notions about mathematics. In effect, instead of regarding incorrect answers as dead ends, we must use them as opportunities to look deeper into a problem—to get at the misconceptions in our students' minds and correct them. The interesting thing about this approach is that it works for students regardless of perceived ability level. For weak students, it will clear up their misconceptions without embarrassing them (after all, the *teacher* is the one playing the idiot!), whereas for stronger students it will reinforce their understanding by forcing them to construct a rational and cogent explanation. In effect, everybody benefits when you act like a kimp.

Choose Your Opportunities

Kimping has a few drawbacks. The teacher must cease being a transmitter of knowledge and become a creator of questions that lead to clearer conceptual understanding by the students. Sometimes this role means asking a question that will cloud the issue, as did my queries in the beginning of this article about the shape of trapezoids. A good teacher will be able to keep the discussion focused and the students motivated. The net result will be to confirm those conceptions that are correct and to challenge those that are not.

The last point brings up a second drawback of kimping—time. The homework problem we went over could have taken a minute or two of class time, but instead took ten minutes to bring to its conclusion. Was the time worth it? Our discussion led to high stages of critical thinking, levels that cannot be reached in a minute or two. At the lowest level of understanding, one can recite the properties of a concept by rote: "a trapezoid is a quadrilateral with exactly one pair of parallel sides" (Serra 1989). At a higher level, one can give examples and nonexamples. At a still higher level, one can actually manipulate the attributes of a concept and determine whether it still fits into the original concept. By "kimping," I was able to move my students through these different levels of thought, resulting in their increased grasp of the concept.

Kimping changes the atmosphere of a class—it throws everyone into open discussion. It relies on the construction of convincing arguments rather than retrieval of isolated facts. Factual information works hand in hand with the explanations. For example, in my presentation of the equation $1/2 + 1/2 = 2/4$, the students pointed out that this equation makes no sense because everyone knows that 2/4 is exactly the same as 1/2. Of course, being a kimp, I have to explain that I didn't know this fact, could you please explain it to me? This question leads us into a discussion of equivalent fractions, which I can continue if I perceive any weakness in this area. Kimping, although unpredictable, allows the teacher to introduce new topics, assess the class's understanding of a topic, and determine if a given concept needs reinforcement.

Kimping is not a technique one can use every day. Like any good thing, it can be overused, dulling its effectiveness. Used carefully, it can motivate a class to high levels of understanding while acting as a tool for the teacher to assess a class's level of understanding. It is also a unique way to introduce new material while reinforcing what has previously been studied. A Spanish adage says that only fools and children speak the truth. By playing the fool, we can help our students see the truth.

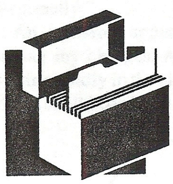
References

National Council of Teachers of Mathematics. *Curriculum and Evaluation Standards for School Mathematics.* Reston, Va: The Council 1989.

Serra, Michael. *Discovering Geometry: An Inductive Approach.* Berkeley, Calif.: Key Curriculum Press, 1989.

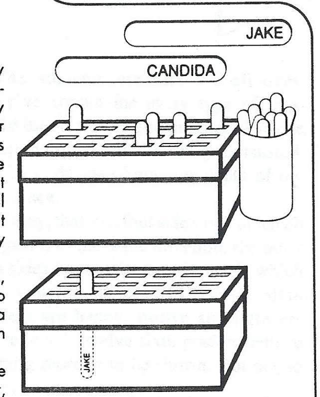
Stigler, James W., and Harold W. Stevenson. "How Asian Teachers Polish Each Lesson to Perfection." *American Educator* 15 (Spring 1991): 12–47.

FROM THE FILE



Miscellaneous

PROMOTING EQUITY



When facilitating a teacher-directed discussion, we promote equity by using a planning tool that has been used by many classroom professionals for years: tongue depressors in a shoebox. (1) Find a sturdy shoe box with a cover; (2) cut enough 1- to 1-1/2-inch slits in the cover to hold the class's tongue depressors upright; (3) print each student's name on one end of a tongue depressor; (4) place the tongue depressors through the slits in the box so the students' names cannot be seen; (5) when random selection of students' names is required, pull tongue depressors one at a time from the box; and (6) once a student has been identified, move his or her tongue depressor to a nearby container.

We use the tool to determine whose group may share their work, who may answer a question, who may contribute an opinion, or who will perform a special task. The shoe box is especially helpful when a volunteer or resource teacher wants to get students involved in an activity but doesn't know their names.

The importance of equity as it relates to students' responses in the classroom is explained at the beginning of the school year. After that, the shoe box is seen as a way to promote fairness rather than as a punishment. When the shoe box is used, our students know that everyone has a chance to contribute.

Probability can be informally introduced by occasionally asking students, What is the chance that your name will be selected now? The answer depends on whether their tongue depressor is still in the box and how many are left there. Answers can range from specific numbers (e.g., 1/12) to general impressions (e.g., good chance), depending on the grade level.—*Ed.*

From the file of fourth-grade teachers, Willard Math/Science/Technology Elementary School, Minneapolis, MN 55411

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