

A problem-solving climate of learning

Students learn by attaching meaning to what they do. Schooling, in part, must be about enabling students to construct their own meaning of mathematics. This means providing students with experiences that include appropriate materials, tools (such as manipulatives, calculators, and computers), and contexts which allow students to solve problems directly related to the world around them. In this way, students can see the structures of mathematics in their lives, as they construct personal meaning about mathematical ideas. This approach to teaching and learning can be called a ‘problem-solving climate of learning’.

In a problem-solving climate of learning, students ideally act as investigators who see new learning as a problem-to-be-solved. Teachers act as facilitators who set up interesting learning conditions, encourage student thinking and explanation of thinking, and help as needed so that students learn worthwhile mathematics. This type of learning environment, where risk taking is an important element, is a large change from the past where good teaching was seen as consisting of show-and-tell with lots of practice on the matter at hand.

An important point must be understood. A problem-solving climate of learning is not simply about providing students with some problems to solve. Rather it concerns a way of teaching and learning where teachers act as facilitators in setting up a community of learners that involves openness, reflective thinking, risk taking, and investigation. Practice is still necessary but it should not dominate instruction. Guided discovery is one version of a problem-solving climate of learning.

An important issue with ‘teacher as facilitator’ is the extent of teacher involvement in student learning. Some see it as taking a largely hands-off approach to their learning. After the teacher has provided a learning opportunity, students are to be left free to construct their own knowledge with minimal input from the teacher. That certainly can make sense for situations where there is a high likelihood that students will “sort it all out themselves”.

On the other hand, suppose that a teacher wants a grade 2 class to learn about place value to 99. The teacher can pose the problem of what a number such as 45 means, organize the students into groups, give the groups some concrete materials (e. g. beans), and ask them to figure out on their own what numbers such as 45 mean. That is not likely to work well (unless some child already has a good idea based on some adult telling the child about it) because the teacher is asking children to recreate something that took adults about 4000 years to sort out. The teacher is going to have to be much more involved in students’ learning in this case. It cannot simply be a ‘leave them alone and they will figure it out’ approach.

Setting up a problem-solving climate of learning, where the teacher is a facilitator, is not a simple matter. Deciding how much teacher involvement is needed requires understanding students’ existing mathematical knowledge, experiences, and interests. And, it depends very much on the mathematical notion that is the intent of instruction. Deciding how much help to provide students depends on the complex interaction between who students are and what is to-be-learned. There is

no simple 'rule of thumb' available for making the decision. The reader will need to gain classroom experience in the matter. You will make mistakes, but that is part of learning.

One of the important consequences of a problem-solving climate of learning concerns the ownership of learning. In transmission teaching (show-and-tell, for example), the ownership of learning does not reside with the student. The student acts as a passive receiver of knowledge from the all-knowing teacher. The ownership of learning thus resides with the teacher. In a problem-solving climate of learning, the ownership of learning resides with the student because he/she is an active participant in the learning process by being an investigator of new knowledge. The teacher is responsible for setting up the learning situation and optimizing the student's investigation in order to maximize deep learning. In other words, in transmission teaching the teacher cannot "go for coffee" because the teacher is the star of the show. In a problem-solving climate of learning, the teacher can sometimes "go for coffee" because the star of the show is the student.