
When the “Tried and True” Doesn’t Fit

Cara Streck

I really like math and have since I was a child. This affection for math, I believe, springs from the same root as my passion for detective stories. I like to untangle all the clues and solve a mystery/problem by following the rules of logic and my intuitive sense of what’s happening. I also have a passion for teaching. Again, I like to solve the mystery of what is getting in the way of learning and then suggest new images or methods that will help each student acquire the skills she needs.

Teaching students rather than subjects, I tend to use a number of methods in any one class period, trying to make sure that everybody “gets it.” For five years, I was a math consultant in Canada for a publisher of an elementary math program. That experience allowed me to learn from a great number of teachers throughout North America. It also forced me to become very familiar with the use of manipulatives in helping both teachers and students decode the logic behind the computation. I have also come to value greatly the ways students can teach each other and help each other learn, and, therefore, I encourage students to work in pairs or in small groups. In the autumn of 1996, however, I encountered a multilevel classroom situation where nothing I had done before seemed completely appropriate to the needs of the students.

The Students

The Adult Learning Program in which I teach is housed in a shelter for homeless families, Project Hope, located in an urban neighborhood on the border between Dorchester and Roxbury in Boston. All of our students are women.

The education program was begun seven years ago at the request of former shelter residents who, having obtained housing for their families, realized that in

order to enjoy any measure of economic security they needed at least a GED. Most of the students currently in the program are on AFDC and consequently are being affected by the limits put on education and the demands for community service that were part of “welfare reform” legislation at both the state and federal levels. Many of the women have reported being pressured by social workers (who undoubtedly were being pressured by their supervisors who were under pressure from the state, who . . .) to quit school and get a job, even before the legislation was finalized. At Project Hope, we have tried to help them sort out fact from interpretation, but students still have felt under enormous pressure to finish their GED’s before being forced to quit. This in turn affected the questions I asked myself as I tried to figure out how best to help the women meet their educational goals, especially the one that involved passing the GED math test by the next summer.

On Monday and Wednesday mornings from October, 1996, to June, 1997, five students and I met for 90 minutes with the expressed purpose of their getting ready to take and pass the GED math test. I’d like to introduce them to you so that you will have some understanding of their many levels of math proficiency and maturity. (Students’ names have been changed to protect privacy.)

Four of the students had been in the Adult Learning Program for at least a year prior to the first meeting of this particular class. Of these four women, three (Janine, Donna, Neruda) showed evidence of having made progress toward the mastery of computation with whole numbers, fractions and decimals, as well as some understanding of basic geometry and measurement. Each was determined to pass the test by July, 1997. During the previous year, we had struggled together to

find ways through the math anxiety they had encountered at various stages, and at this point they generally felt competent with basic math and relied upon each other for help when they felt blocked. They had come to recognize that each had areas of strength and areas of weakness, but that together they could usually solve the problems they encountered.

The fourth woman, Sunny, already had been struggling with math for two years. She had spent one year in a group of eight women with whom I had used a project-centered approach to math, focusing first on measurement and whole number computation, then moving on to informal geometry and decimals. One of the main purposes of these classes was to give students an opportunity to “play” with numbers in settings that seemed real to them. (For example, we simulated redecorating the classroom and measured, computed areas, estimated amounts of paint needed, and shopped for the best bargains in paint and carpeting.) Sunny participated shyly, but seemed unable to transfer what she was able to do in a group activity to solving problems in a math book. The second year, she spent her math time working on computation with one other student and a different teacher. While observing her during independent study periods, I noticed that she was able to do basic computations, as long as the problems were all of the same type. She was not able to transfer computation skills to word problems, even when she had repeatedly practiced the computation skill required. It seemed obvious to me that Sunny needed a different kind of instruction, so I asked to take her into my class.

The fifth student, Maria, was new to the Adult Learning Program that September. Her placement test results indicated that she had mastered basic computation and had some knowledge of algebra, but she needed practice decoding word problems and applying what she knew.

In February, we were joined by Nyriisa, who had entered the program in January. Her placement test indicated that she belonged with another math group where basic skills were being emphasized. Yet her sister, who had acknowledged suffering from a great deal of math anxiety, was already in that group, and experience with the two siblings in other classes indicated that putting them together for math would not help either. So Nyriisa also joined the class.

The Question Evolves

How could I best help this disparate group meet their goals in math? In October, we spent class periods working as a group on problems from many sources. We especially enjoyed some of those included in the Massachusetts Portfolio Assessment Project’s task bank. This approach gave students an opportunity to “play” with math, reinforcing their appreciation of what each already had learned and reminding them that they could enjoy solving problems. These classes also gave me an opportunity to get a feel for the needs and

strengths of each member of the group. Working together also reinforced the notion that they could rely on one another for help and support. Students enjoyed these classes, but a spate of publicity about the “welfare reform” increased their anxiety, and some began asking for “real” math classes, meaning ones where I

taught and they used books. Sunny was ready to accept my recommendation that she stay in the class and work with manipulatives at her own pace for as long as she needed.

Because of the need of the majority in the class to practice applying basic computational skills to a wide variety of situations, I introduced them to Myrna Manly’s work-text *The GED Math Problem Solver*, from Contemporary. Each student had her own book and they started together on Chapter One, using a combination of large group instruction, peer teaching, and independent work.

By the end of November, it had become very clear that Janine and Maria were able to work through material in the book much faster than others and felt frustrated at the group’s pace. Again the anxiety driving this frustration seemed to come from media reports of the punitive measures soon to be taken against those on welfare. Students were willing to help one another learn, but some were clearly able to move on before others were ready and were beginning to fear that the slower pace of the group would lead somehow to their being penalized by the welfare system.

This put me in a dilemma. I like to teach and know I’m regarded by students as a good teacher, but I felt that in order to meet these particular student needs I would have to change my teaching style radically. I truly believe that students learn best when they know themselves to be part of a community of learners. Yet the needs of students in this particular group were

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diverging to such an extent that in my mind they threatened any sense of group identity. I also am strongly committed to listening to what students say they want and need, but, in this situation, I felt that what they wanted was driven by anxiety fueled by a social movement that denied the value of education to those on AFDC. It was at this point that I was invited to become part of the group committed to looking for ways to function in a multilevel classroom. The timing couldn't have been better.

I framed the question I wanted to study as follows: **“When is it appropriate for a more advanced student to work with a less advanced student and when is it not helpful?”** Some of my students were clearly telling me that working within the group was not helping them meet their goals. I was already individualizing instruction for Sunny. Was it time to find a way to do so for the others? After a group discussion about where we needed to go, we agreed that each woman would work on the material that she felt she needed and that each would work on the material required to pass the GED at her own speed. The book would provide the framework and I asked that each woman commit to following the text sequence and discussing her work with me at the end of each chapter. I gave each woman control over her own learning process and firmly committed myself to the role of resource person and facilitator.

Student Response

Janine and Maria took off! For the first couple of classes in the new format, Janine looked for a lot of reassurance, acting as though she really couldn't believe that she was actually understanding what she read and solving word problems. Both she and Maria were very willing to ask either me or another student for help when they hit snags; moreover, both were now quite willing to give help when asked, while they had previously begun to show annoyance.

Donna, who was in the process of being tested at Massachusetts General Hospital for dyslexia, seemed wary about working more on her own, yet she also expressed relief that she did not have to keep up with anyone else and could move at her own pace. Neruda, whose reading vocabulary (as opposed to her spoken vocabulary) was probably at a third grade level, was glad to be able to take her time with problems. Naturally gregarious, she, more than the others, expressed a

concern at not being part of a group for instruction.

Sunny was spending the class periods finding patterns and relationships while “playing” with Cuisenaire rods. She was beginning to show an intuitive sense of what it meant to say that one number was bigger than another and of the meaning of addition and subtraction. She worked at a table by herself, and she seemed happy and relieved to finally be able to move at her pace.

Was this somehow supporting the mentality that told the women that it was completely their fault that they were on AFDC and, therefore, it was up to each one to pull herself out?

Consulting the Experts

While the students seemed happy with the new order, I was uneasy. I felt uncomfortable with the individualistic atmosphere we were creating. Was this the best situation for these students, all of whom had already experienced some marginalization? Was this somehow supporting the mentality that told the women that it was completely their fault that they were on AFDC and, therefore, it was up to each one to pull herself out? Hoping to get some insight I posted my question to a list of math teachers on the Internet:

I'm working on a research project looking at strategies that work in a multilevel classroom. I find myself questioning the value of having students who already “get” a concept take time out to teach someone who doesn't. Is the value gained by either student enough to override the need of the first student to pass the GED test as soon as possible? In working with adults, most of whom have been out of school for some time, and most of whom did not seem to have gotten math instruction adequate to their needs in previous educational settings, is it fair to expect that even when they are able to work with a concept adequately themselves that they will have the skills to help another student undo the inadequate conceptual frameworks she has held for many years? Tis a puzzlement!

The responses were few and disappointing. It may have been the fault of the way I expressed my question or a result of using a faceless medium, but I felt that colleagues in adult education lectured me on the value of group work and peer teaching. They seemed not to understand that these would have been my natural choices of teaching methodology, except that these

students seemed to require something else. Was I the only one who felt the students' fears of being without financial support for themselves and their families unless they quickly passed their GED math test? Here's one example of the responses I received:

What do you mean by "get" a concept? After semesters of teaching arithmetic to adults, and more semesters reading mathematics education research (and earned advanced degrees in mathematics), I am still deepening my understanding of what most people would consider to be very elementary mathematics concepts, including arithmetic of fractions, and the teaching and learning of those concepts. . . . There is much more to teaching mathematics than understanding the content.

While other responses felt less patronizing, none really addressed the issue in the framework of a question of justice, as it had positioned itself for me. It was at this point that the support of Martha Merson at the A.L.R.I. became critical. She too found the replies disappointing and helped me move past the paralysis that gripped me by suggesting that if other teachers couldn't help me maybe my students could.

With her help, I developed a set of five questions, which I posed to the students. I gave it to them during our math period and asked that they write answers so that I would not influence their responses by a word or gesture. (See box below for their unedited responses; Neruda and Nyriisa were absent):

After reading their responses, I summarized what I thought they were telling me and checked my understanding with the women. They all agreed with the following summary: *The students told me that they*

Thinking About Math Class

1) What are the advantages you find in doing math this way?

- *The advantage of working like this is good because you get to get your brain working and learning for yourself. (Maria)*
- *The advantage that I have for doing math this way is I can work better if I have someone in the room with me in case I feel I'm gonna mess up. (Janine)*
- *I think it's a Great Advantage for me because I couldn't do a lot of the math before but now I see a whole new difference in my learning and it's very helpful to me because I don't feel as pressured and that nervous. (Sunny)*
- *What I like is you work on your own time and you don't have to keep up. (Donna)*

2) What are the disadvantages for you?

- *None. I like doing this way. (Maria)*
- *The disadvantage of math is if I feel I can't do it I want to give up. (Janine)*
- *My dislike - that we don't have board time. (Donna)*

3) Do you miss working in a group?

- *Sometime working in a group is good but sometime bad because we all learn at the same time. I like working alone. (Maria)*
- *Sometimes I miss working in a group because its fun all together. (Janine)*
- *I like working in a small group and one on*

one. I think it opens new doors for me. (Sunny)

- *I miss work in a group because you learn from other students and you learn different way. (Donna)*

4) Do you find your that own progress is helped or hindered when you work out math problems in a group?

- *Yes, because I like to teach and if anyone needs help and I know how to do the problem then why not help them. It makes me feel good. (Maria)*
- *I like it when someone asks me for help because it makes me feel like I'm doing my work right. (Janine)*
- *It helps me because I learn something new that I didn't know before every bit helps. (Sunny)*
- *It help me know that what I learned I can remember how to work it. (Donna)*

5) Do you prefer working on your own or with a partner or partners?

- *I like working on own. But I also like working with small groups. (Maria)*
- *Yes, it would be good if we works in 2's. I think it would be easier for all. (Janine)*
- *I think I wouldn't like to work by myself in a room. I find it distractful. I need for me a lot of encouragement and hearing that I'm doing well. (Sunny)*
- *I like working on my own because I can work at my own time. (Donna)*

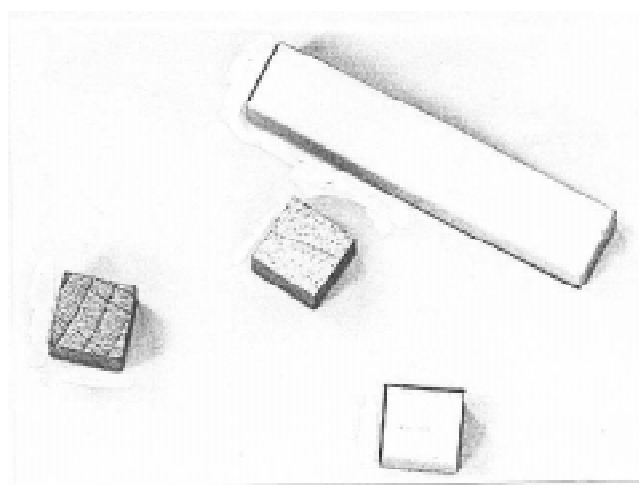
liked working on their own because they could move at their own pace. They also indicated that they missed the group work. All said they liked being asked to help someone else because it helped them learn more themselves. This statement then became my guide in structuring the class.

“Both/And”

Years ago a wise friend told me that a “both/and” solution was almost always preferable to “either/or.” Again he was proven right. The students wanted it all: the flexibility of working at their own pace; the stimulation of group work; the confirmation of peer tutoring. And I’d do all I could to see they got it. My question had changed and become: How do I structure a class so that students will gain the benefit of working with others without the frustration of feeling held back in their own process?

Together we developed a rhythm with which both they and I feel comfortable. We open with a group activity. Sometimes it’s multiplication bingo, at others an article from the morning paper that involves math, such as a story about the pros and cons of using check cashing stores. If I’ve seen a number of students struggling with the same concept in a previous session, I may present a short review of the principal concepts involved and get them to make up problems for each other. We spent the introductory period of six classes, for example, developing the idea of patterns from pattern blocks through number series. This was our time to play with mathematical ideas together.

Students then spent an hour working in the text at their own pace. Sometimes I spent time with a particular student who needed help with a certain concept. Donna especially liked to work problems on the board when she was having difficulty, so we did that together. Sunny by this time was becoming more and more self-sufficient and by February had moved from her work with the manipulatives into the book. She needed support and encouragement from me to use drawings or manipulatives to visualize a problem, but was able to work for long periods on her own. Neruda needed to be encouraged to believe in her ability. She had to be weaned from an over-dependence on someone else to tell her she was right. Janine and Maria became more and more self-confident. Each took more and more control of her own learning as was



evidenced by their requests for supplementary materials to help them when they felt stuck or by their allotment of class time to both practice tests and new material.

Nyrisa now became the most challenging member of the group. She sat by herself at a table and had to be coaxed to join the others for the introductory game or class. She tended to simply flip pages in the text, trying a problem here and there when something looked familiar, then sighing dramatically when she found she had the wrong answer. When I suggested that she’d have more success if she worked through a chapter from start to finish, she got very agitated and told me over and over again how much she hated math. Finally, after being allowed to express her opinion for a few weeks, she let me help her with the concept of perimeter. She grasped it quickly and was thrilled when she began to understand what the problems were asking for. Gradually, she began to tell me when she had a problem and to ask for help. We were also able to get her a tutor so she now is feeling more confident in her own ability.

What I’ve Learned

Throughout this period, as a teacher I felt stimulated and challenged because in the course of a period I might have to teach a number of different concepts to various learners. I enjoyed it so much that I found myself questioning whether I was working hard enough. Preparation meant reviewing notes from the previous class and trying to predict what would be needed by the various class members. I was constantly unraveling the mysteries of what a student already knew that could help her understand what she needed to learn.

Through this process I have learned to trust my students to help me understand what they need to succeed. This group was multilevel in many dimensions—previous learning experiences, concept mastery, self-confidence, reading/vocabulary skills. By many criteria, they should never have been constituted as a class; the differences were too great. Yet, with their guidance, we were able to create an environment in which each one’s needs were met.

This happened despite the tremendous pressure from forces outside the classroom which greatly affected the environment within it. We were able to create a space for learning, not by denying the real

impact of welfare reform but by acknowledging its reality and adapting accordingly. We were able to create a community of learners within which students had the freedom and support to move forward, each at her own pace, toward her goal of passing the GED math test.

Will I use this format in September? I have no idea! It will depend on the needs of the group I have at that time. The longer I teach the more I am convinced that

each class is its own mystery. Each woman comes into the group with unique life experiences, some life-promoting and some life-denying. Students interact with each other based on the coping skills that have gotten them this far, even if they are inappropriate to this setting. Within all this diversity, my role is to help each find her own way to her goal and to invite them to share their gifts with one another. What a privilege for one who so loves mystery. •

Working With Patterns

Purposes: 1) Monday morning “wake-up”; 2) Help students use spatial intelligences; 3) Lead-in to discussion of number patterns.

Materials: Sets of pattern blocks or xeroxed sheets that include various sizes and shapes. (Available for loan at the A.L.R.I. library or for purchase from publishers of math materials and manipulatives.)

Method: 1. Ask students to take five blocks and create a pattern.
2. Discuss meaning of the word “pattern.” (I find students often confuse “pattern” and “picture.”)
3. Teacher uses five blocks to model a pattern with enough information that someone else could continue it. If one of the students in Step 1 has made such a pattern, use that instead.
4. Have students articulate or show what the next block would be. Have students describe the pattern in words.
5. Continue, building the complexity of the patterns.
6. Make sure each student understands both how to build and how to describe their own pattern with at least three different elements, and how to continue someone else’s pattern.

Possible Pitfalls: Some students may be able to show you what to add but find it hard to tell you what to do next. Help them find words for their process. Praise their intuitive grasp but encourage them to become verbal and logical.

Extension: Put a simple number pattern on the board, such as five consecutive even numbers. Have students describe the pattern in words (give the rule for the pattern) and continue it. Gradually increase the complexity of the patterns.

Why does it work?: Students can start from very different levels of understanding and can choose how complex a pattern to make and how quickly to build complexity. Students learn from hearing others describe the pattern.

—Cara Streck