BUILDING SUPPORTIVE CLASSROOM COMMUNITIES

REALIZING ALL STUDENTS' MATHEMATICAL PROMISE: SARAH'S STORY
By Sarah Samarin and Maryann Wickett

A SORT OF MIRACLE
by Jean Hafner
with an
AFTERWORD
by Julian Weissglass
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SARAH'S STORY

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In 1993 I began my participation in the Equity in Mathematics Education Project and the California Elementary Mathematics Initiative. Reflection on classroom practices was an important element of both projects. As a result of this constant reflection, I discovered many things. Among them I discovered the power of the regular use of dyads. The suggestion to write Sarah's Story was made by Joan Carlson. But it was the inspiration that only a child can give, that Sarah herself gave, that caused me to invite Sarah to work with me to create this article. Sarah was a student in my third/fourth multigrade classroom at Paloma Elementary School in San Marcos, California from July, 1993 to June, 1995.

Maryann Wickett

"And exactly what is a 'mathematically promising student'?" I decided to ask a few of my peers what their definition of a "mathematically promising" student included. The child typically described was one who is quick and accurate with numbers and formulas. Mathematical understanding was not a part of the definition, nor were other areas of mathematics such as geometry and spatial or logical reasoning. This definition, which most likely reflects public opinion as well, would seem narrow and dangerous when considering the needs of citizens in a rapidly developing age of technology.

It is my belief that ALL students have "mathematical promise" and should receive instruction that supports them — enabling them to develop their full potential. Teachers must raise both the ceiling and the floor of mathematics education. It is folly to do otherwise. Under no circumstances can mathematics education be elitist. "Mathematics is a right, not a privilege" (NCTM, 1996). "The social injustices of past schooling practices can no longer be tolerated" (NCTM, 1989). All children must be considered "mathematically promising" and all must receive the best mathematics education available — not just the few labeled in the typical sense as "mathematically promising". An example of a practice that helps bring out the mathematical promise in ALL students is illustrated by an
episode from my classroom.

Sarah did not seem to fit the typical definition of the “mathematically promising student”. She quietly went about her work never bothering anyone, always in the background. But through the use of a structure called dyads (Weissglass, 1996), Sarah’s promise became evident. In a dyad students are paired and each receives an equal amount of time to talk while the other listens without interruption. The use of the dyad allowed Sarah the opportunity to participate and be heard in a safe, supportive environment. As a result, her belief in herself and her motivation increased. The use of the dyad helped Sarah find her voice and demonstrate her previously unnoticed “mathematical promise”. What follows is an illustration of the power of dyads when they are woven into the fabric of the classroom culture.

As a beginning third grader, Sarah did not share her thinking. She watched silently with her intelligent blue eyes, looking away fearfully if I dared to look in her direction during a class discussion. I was concerned about Sarah and some other students who were reluctant to share their thinking during class discussions. How could I encourage these shy, intelligent, and sensitive children to speak out and be heard thus revealing (and realizing) their potential? As a result of this concern, I implemented the use of dyads to give these quieter students a voice and to keep them engaged, thinking, and developing their mathematical understanding.

On this particular day, Sarah was a fourth grade student in my multigrade 3/4 class. She had been involved with the use of dyads for approximately one year. Our class was engaged in the study of pattern. I had shared a book, Dinner at the Panda Palace (Calmenson, 1991) with the students in order to provide a context for an exploration of pattern. The story recounts the arrival at the restaurant of one elephant, then two lions, and three pigs continuing with increasing numbers of animals up to ten chicks. “How many animals have come to dinner?” I asked the class. The quiet of the room was soon replaced by the hum of students engaged in dyads as they shared their ideas with a partner who listened quietly
without interruption. After a minute, I asked the partners to switch roles so that the listeners now became the speakers and the first speakers now became the listeners. After the pairs of children had their turn to share and to listen to one another, I asked for the students’ attention once again.

Several children shared their ideas with the class about how many animals had come to the restaurant for dinner. One child stated that the problem could be solved by adding $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10$ which would equal 55 animals. Another younger pointed out that you could reverse the process beginning with 10 and then adding 9 and 8 and so on back to one. Sarah quietly raised her hand and shared a most unusual and sophisticated idea with the class. “I was wondering something,” began Sarah, “what if I just added five ten times? It seems like it should work, but it comes out to fifty instead of fifty-five and I am wondering why. I added five because it is a friendly number for me to add and it’s in the middle of one to ten. I thought about the middle of one to ten because one was the least amount of animals and ten was the most so five was in the middle. Instead of adding the numbers in order, $1 + 2 + 3$ and so on I thought I could pair them like adding ten and one to make eleven and five would be the middle. It seems like it should work. It seems like adding the number in the middle ten times, ‘cause there were ten groups of animals, should work.” (It should be noted that according to legend (Hall, 1970), this is the same method the famous mathematician Carl Friedrich Gauss came up with at the age of ten when his class was asked to sum the whole numbers from 1 to 100.)

The class sat motionless as they tried to follow Sarah’s thinking. Quickly and without prompting, the children were again working in dyads trying to make sense of what Sarah was thinking. Later Sam*, a special education student, shared with the class, “At first I was confused about adding 1 and 10 to make 11. But then I thought real, real hard! She could add 1 and 10 to make 11 and then 2 and 9 to make 11 and 3 and 8 to make 11 and so on, which would come out to five pairs of numbers that make 11. Then ‘cause there are five pairs she could add 11 five times to get 55. It’s a pattern! It’s

* All student names other than Sarah have been changed.
just adding the numbers in pairs in a different order. Then I think Sarah thought that five was in the middle."

"But five and five makes ten, not eleven. So five isn't half of eleven. That's sort of where I got stuck," interjected Maria, a native-Spanish speaking student.

"Well I thought the same thing as Maria and then I tried six, but two sixes make twelve which is too big. So José got out a piece of paper and drew two circles. He put an X in one circle and then the next X he put in the second circle until we did that with ten X's. The circles both had five X's and we still had one more X, so we put a half of an X in each circle and that made 5 1/2 X's in a circle or eleven altogether for two circles," said Michael.

"And if you use repeated addition, ten groups of 5 1/2 makes 55!" exclaimed Helen, "Isn't that amazing, Sarah! Your idea does work, you just needed to find the right middle number!"

The classroom dialog above illustrates how dyads develop and bring out the mathematical promise in ALL students. Through the use of dyads, children were motivated to think about a complex idea, their dialog developed belief in themselves and belief that mathematics should make sense, and they had the opportunity to explore a rich and interesting idea generated by one of their classmates. Students responded thoughtfully and even congratulated Sarah on her idea. Sarah's confidence and ability to articulate her unusual idea were a result of her experience with using dyads in class. She reflects and writes about her feelings at the beginning of third grade:

"At the beginning of third grade I felt scared. I felt scared because there were new kids and I was very shy. I was afraid to raise my hand or talk and I was afraid the teacher would call on me and I wouldn't have the answer."

As Sarah began third grade and felt the emotions she describes above, I began my participation in the Equity in Mathematics Education Project funded by the California Mathematics Project. Giving ALL children
access to ALL aspects of the learning process was a constant focus. For me, dyads had proven to be an effective means of access. Dyads provided an opportunity to be listened to without judgment or interruption, I was able to clarify my thoughts with one other person before sharing with the group. This process helped build my confidence thereby giving me greater access to group discussions. I decided this might help Sarah and others like her develop their “mathematical promise”, so I began the regular use of dyads in my classroom. Sarah writes:

“Sharing my thinking with a partner helped. Lots of times in the beginning I wouldn’t raise my hand because I was afraid of getting the answer wrong. By checking my answer with a partner or a small group first, I could try my idea first and think and we would all have the same answer and we wouldn’t be so shy. When I worked with a partner, I would not be so shy with them because everyone else couldn’t hear. Soon I wasn’t afraid of getting the wrong answer anymore. And besides I wasn’t getting a lot of answers wrong and I got a lot more right. And sometimes when I had to listen and think about what my partner said, my partner had stuff to say that helped me understand.”

ALL children have “mathematical promise”. Helen, José, and Michael fit the typical definition of “mathematical promise,” and have benefited and grown through the use of dyads. But also clearly showing evidence of “mathematical promise” are Sarah, Maria, and Sam, students who would usually have been overlooked as possessing “mathematical promise”. Dyads provided the structure and opportunity for ALL to develop their potential. As educators, it is our professional responsibility to consider ALL children “mathematically promising”, providing them ALL with a challenging stimulating curriculum enabling ALL to succeed at the highest level possible. This is the challenge to which we must rise with passion, persistence, and caring ... for the good of ALL our children. It is their right and our responsibility.
A SORT OF MIRACLE

by Jean Hafner

I recently returned from my second EMELI workshop. The first night we met, I was eager to share a sort of miracle that happened in one of my [community college] science classes. Here is the sense of what I wrote in my journal the night it happened.

Today I took some risks. I was in danger of losing a chunk of my class after the first test. This is one of those “oh-so-slow” classes. It is a diverse class composed of women returning to school, students with disabilities, Chicanos, African Americans, and Native Americans. (I had the feeling I was being tested.) I spent last evening and this morning grading the tests. What a mess, how many hurt feelings. Didn’t they study? Why didn’t they pay attention? Why did they resist doing all those clever activities? What should I do? As I passed a colleague in the hall, I bemoaned the fact that half the class failed their tests. I was afraid that everyone who failed the test would drop the next day. But one of Julian’s statements kept ringing in my ears—that students fail because of their negative learning experiences, not because of their lack of ability.

I still wasn’t sure what to do when I walked into class. The usual routine is to look at a frequency distribution of the grades and for me to stand up in front and demonstrate how to do the problems they missed. I could see myself saying discouraging things. I asked them “How’s it going?” T.S. said, “That depends.” “On the test?” “Yes.” I made a last-second decision to trust Julian’s assumptions: that students should not be blamed for inadequate knowledge, that they are disempowered from past educational experiences of ridicule and criticism, that they need an opportunity to heal themselves by being heard. I was willing to sacrifice time to avert a disaster. I handed back their tests. I told them that they may not have done well because of previous experiences, so we were going to do something different today. I told them they would have an opportunity to rework these tests at home for more points. The class sighed in relief. We spent about 30 minutes going over the test in small groups.
Then I explained the rules of the dyad and pulled out the timer, which I had bought after the first EMELI workshop. We paired up to address these questions: What were your experiences in science and math classes? What did your teachers do? What did you do? How did you feel about it? At first they were shy but quickly gained enthusiasm. P. said, “I thought a minute and a half was so long, but I really got into it and didn’t have time to get to my punch line.”

Back in our whole group, a few of the women agreed to share, then another and another. None of the men shared but all listened with great interest.

**P:** I feel my mind came back into my body this year. Before that I wasn’t there, just spacing or daydreaming. I had a bad experience in math and just stopped learning it. I didn’t even know percents. The people in admissions made fun of my test scores. Math teachers here have been wonderful though. [P. was painfully introverted at first. Other students actually avoided her. As the term went on, she completely opened up and became a student the others looked to for help. Once she shared that she got a B+ on an algebra test, the highest in her class.]

**TS:** Last semester was my first science class, and I hated it. [She went into more detail.] I’m enjoying this term, though.

**R:** All negative. My chemistry teacher in high school gave me a D. It was a gift because I didn’t understand any of it.

**TH:** I was a winter baby and entered Catholic school at age four. The teachers would hit us on the hand with a ruler if we were wrong or misbehaved. I learned how to be invisible [she demonstrated by covering and covering her face with her forearm]. The nuns’ eyes would pass right over me and not see me.

**P:** I, too, felt invisible.

**R:** I needed to see things. I’m very visual. The instructor would say, “Just do it.”

**K:** I had no memories of science classes. I was in an alternative school, and we didn’t have to take science.
TS: [to me] Would you share?

Jean: I had lots of good experiences. I had support from my family and great teachers in high school. [I went on to describe the “passage” through freshman biology and some of the great experiences I had in college. I told them that I came from a middle-class family and that financing college was not a problem.]

We took a break. The men all made contact with me privately, so I learned more about what was going on with them. I went upstairs for a cup of tea and a moment to reflect. I was amazed at how willing they all were to share and how a simple technique uncovered some very wrong assumptions on my part. As I passed a friend’s office, I said, “Wow, something incredible just happened in my class. I need to tell you about it later.”

During the second half of the class, the entire tone was different. The students were unusually attentive as we went over the last homework assignment and worked on the lesson for that day on atoms and elements. Students were comfortable about asking for what they needed, such as when R. asked me to help her see it. We discussed learning styles and I wondered aloud if the test I wrote favored verbal learners.

There’s another important dimension to this story that has to do with race. W. is an African American male student in this class. Since the first EMELI, I had been working primarily on my fearfulness around African American males. Fortunately, I had a great experience at EMELI getting acquainted with a kind, thoughtful African American man and I had shared about my past experiences on a personal experience panel, so I was a lot more relaxed than I would have been a year ago. During our introductions the first week of the science class, W. explained that being in school was his “way to freedom.” He is a tall, athletic man who wore a nylon stockingcap. “Uh oh,” I thought. “This is a test.” However, I had a new perspective. I recognized his intelligence, understood that he must have experienced continual rejection, recognized how my own experience was one of privilege, and became determined to see him succeed. He had done rather well on the test, so he was quiet that day. I do believe he was affected by the bonding that happened, though. On his own initia-
tive, he started to help a woman with severe disabilities during class, during lunch, and after class. He continued with me the next term too—he’s now in my algebra class. He’s doing well in his college classes, including chemistry. He treats me like I hung the moon.

That day I could have easily lost half of my students. There were many times when they would freak out about a concept, but they were willing to have those moments of discomfort if I asked them to “stay with me on this.” The students went out of their way to help each other. There was a lot of love in the class. At the end of the term, 92 percent of those who started completed the class, and all but one of those passed. Many have gone on to freshman chemistry and biology. I don’t look at students the same way that I used to. My assumptions are completely different. The miracle was what happened inside of me.

**AFTERWORD**

**by Julian Weissglass**

The two stories in *this booklet* touch me deeply and I am glad to have played a supportive role in what Maryann and Jean did in their classrooms. The incidents that they describe provide good examples of what can happen when students are respected as complex, intelligent human beings with feelings. The articles remind me of the experiences that influenced me to change my career from mathematician to mathematics educator to an agent for educational change.

In the early 1970s I was asked to be the faculty supervisor of the Community Teaching Fellowship Program (an outgrowth of Project S.E.D. — started by Bill Johnz) at UCSB. It employed graduate students in the mathematical sciences to teach mathematics in “disadvantaged elementary schools” using a *guided discovery approach* to mathematics learning. The method had someone knowledgeable about mathematics committed to asking youngsters leading questions about mathematical situations in order to help them discover, understand, and become proficient in mathematics. The basic idea was that when asked to explain a wrong answer, students would discover their mistakes and by working together as a group develop their understanding. I was impressed by the demonstrations I saw, so I agreed to supervise the program upon the
condition I could participate in it. Little did I know that doing so would change my professional life!

I had one day of training in the discovery approach before going into a fourth grade classroom. I had a lesson plan that would lead the students over a period of a few weeks to investigate spatial visualization, symmetry, transformation geometry, and abstract algebra. I started by asking the students to close their eyes, picture a box, and count the number of sides on their box. I still remember their excitement when telling their different answers — three, four, five, six, eight, ten, eleven, and twelve. I asked the little boy who said ten to explain his answer. I couldn’t understand what he was saying very well or follow his logic. When I asked him to explain for the fourth time he became frustrated, so I asked some other students to explain their answers, all the time asking myself, “How did he get ten, how did he get ten?” A remark by one student clicked and I turned to the first boy and said, “Did you have a box without a top and you were counting the insides and the outsides?” He smiled — a mixture of pleasure and incredulity that it had taken me so long to understand him. It turned out that all of the students had logical explanations for their answers!

I left the classroom that day humbled and deep in thought. How easy it would have been for me to invalidate their thinking, to add one more negative learning experience to the many they had already experienced in mathematics. Even more troubling was that all their thinking had been excellent and mathematically valid, but I was looking for the one (or possible two depending on whether the box had a top or not) correct answer. During the next few years, I spent a lot of time in third, fourth, and fifth grade classrooms. I continually found students who were brilliant and yet had been labeled slow learners. I repeatedly saw students whose thinking was mathematically valid but who were using different definitions or axioms to come up with unexpected answers. I came to believe that all students could learn mathematics. It was their past distressful experiences, or lack of support, or a misguided and meaningless assessment system, that most often led to failure.

Once in a class of students labeled as “slow learners” I found a deep mathematical thinker. She asked penetrating questions and analyzed situations in depth. One day I said to the teacher, “Isn’t E____ brilliant?” The teacher looked puzzled and responded, “She is classified as the slowest of the slow.” Neither the teacher nor the school recognized her intelligence. I realized then that I could make more of a contribution to society by working to improve mathematics education than
by doing mathematics research. Over the course of the next decade I changed my career from mathematical research to working for change in mathematics classrooms. I began to read widely about education. I asked adults and young people to tell me about their stories as a student. I listened a lot.

When I started working with teachers in 1983 I articulated a few goals. I wanted to increase teachers' understanding of mathematics content and pedagogy. I also wanted to increase their capacity to completely respect students as intelligent human beings with considerable knowledge and ability — and with emotions and past experiences. I wanted teachers to understand that students' emotions from past distressful experiences often interfered with their thinking or communicating their understanding. I knew that peoples’ best thinking emerged when they were given a chance to be listened to, whether it was about mathematics or anything else. I wanted to be sure that teachers had time to be listened to about their thoughts and feelings as professionals so that they would be able to listen to students and help them learn to listen to each other.

I started using dyads (a simple process where people pair up for a fixed amount of time and take turns listening to each other without advice, interpretation, or analysis). I used dyads with teachers and parents, asking them to talk about different things — their history as a mathematics learner, what they liked about themselves as teachers or parents, the challenges they faced, a hands-on mathematics lesson they had just participated in, their experiences with prejudice and discrimination. I encouraged teachers to experiment with dyads in their classrooms since I knew that no teacher has the resources to give enough attention to the many children they see each day. Many teachers reported excellent results using dyads with students. They paired up and listened to each other talk about a story they had just read, their fears about a nearby fire, their thinking about a mathematics problem, their experiences with prejudice and discrimination. The students liked having the opportunity to be listened to and they liked listening to each other.

Although I have not done a research study, there is substantial anecdotal evidence that dyads are helpful to teachers and students. They can be an important feature of a classroom environment where students' thinking is respected.

* Dyads and other structures for providing emotional support for teachers are explained further in Ripples of Hope: Building Relationships for Educational Change (Weissglass, 1997).