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## MATHEMATICAL METAPHORS FROM ADVANCED PLACEMENT STUDENTS

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The images and perceptions of mathematics held by many math avoidant people often surprise me. I encourage these people to develop their metaphors and stories for me. (See Buerk 1982, Buerk 1985, and Potter 1978.) The more I listen to the math avoidant, the more I wonder what the images of those more successful with mathematics might be. I am beginning to ask and want to share some responses with you.

In May I asked two different classes of Advanced Placement high school students to develop their images of math. After an introduction by the classroom teacher, I asked students individually:

- 1) to list words they would use to describe math (5-7 minutes),
- 2) to imagine themselves in a situation of doing math and to list all their feelings while doing math (5-7 minutes),
- 3) to list all of the objects (nouns, things) that math is like for them (5-7 minutes),
- 4) and finally to read over their three lists and write a paragraph beginning, "For me math is like a..."

The paragraphs of two-thirds of these students follow.

### FOR ME MATH IS LIKE A

For me math is kind of like an incredible book that you have to read through an infinite number of times. The first time you get the general idea, but until you reach the end you really have no idea what's going on in relation to anything else. Each successive reading brings out more meaning and little unimportant asides suddenly relate to everything else in the most amazing way. It has to be read an infinite number of times because there's always more meaning to be found. But the book would have to be infinitely long as well, because math has no beginning or end and there's no place to stop. Like the book, questions posed at the end may be answered by some tiny thing at the beginning. Sometimes it seems hopeless and completely irrelevant, but if you force yourself to continue it will suddenly clear up and make more sense than you ever thought possible. You have to have faith that it's worth plowing through it.

### FOR ME MATH IS LIKE A

Math is often like a track race, because sometimes it works and sometimes it doesn't. My experiences with math have sometimes been frustrating in practice although I might work hard at it and see the overall picture well. Running can be like this because although you can work hard for a long time, so-called success comes down to one race, which either could be good or not, depending on the day. In the same way, math sometimes "clicks" and becomes great fun and beautiful, but other times seems just annoying, and although perhaps exciting, out of reach.



#### FOR ME MATH IS LIKE A

For me math is like an egg. It is simple and one can hold it in one's hand and roll it about. But then it has a surface that is smooth in some places, rough in others, but always pure white. It can be delicate and breakable, but remarkably tough when, for instance, you try to crush it from the ends. It may seem like an oval or a simple circle, but it is a slight contortion. And, best of all, deep inside rests the baby of the world, a wonder for all to speculate upon, for we only see it after the egg breaks. We know it is in there, living; if only we could get to it without breaking the shell.

#### FOR ME MATH IS LIKE A

For me math is like a maze or rather a huge maze made up of many smaller ones which you have to finish first in order to get to the end. Except it really has no end. There are rewards, though, on different levels as you finish various submazes, and excitement when you discover a pattern or a new path. It's fun to explore and to succeed and it's worth the frustration and sense of being lost that comes when you have taken 20 wrong turns in the last hour. Math and mazes are tedious in the areas you already know but exciting when you discover something new. They are very rewarding; they bring great senses of accomplishment.

#### FOR ME MATH IS LIKE A

For me math is like a strange object in a glass case where the object intrigues you but you can only guess. Sometimes you can spend hours standing looking at it and still can't figure out what it is. Sometimes you can pin it down and easily walk away. It is when the object is something you can't figure out that stimulates, fascinates, and makes you eager to go to other sources to come to an idea of what it is. But what you decide the object is depends on your background and education. There are many approaches to take you to a conclusion.

#### FOR ME MATH IS LIKE A

For me math is like a puzzle that is all blue sky with a couple clouds in it so that most of the time it is just luck whether you get the pieces together, sometimes it's easier because of the clouds. Actually, math is really easy for me when I don't really have to figure anything out. That's when it's satisfying, when you have a bunch of formulas and you can plod through a bunch of problems with them - not really easy, obvious problems but hard ones where you have to figure out which method to use first to solve it. So math has been alright so far, I'm just scared when I think about trying to apply it to a problem in real life, or when I think about discovering something new. It just seems so impossible, like the puzzle. That's why I won't enter math contests. Maybe I'm just scared I'll fail. Math has always been really competitive for me. It's like a race, but there always has to be an end because if there wasn't I think I wouldn't feel compelled to do it.

#### FOR ME MATH IS LIKE A

Math is like a puzzle because it contains a million pieces that fit together perfectly only if you understand the relations of the pieces to each other and each piece helps put the others into perspective.



#### FOR ME MATH IS LIKE A

For me math is like trying to eat a jawbreaker that is too big to swallow and too hard to chew. It dissolves away a little at a time, very slowly, but it tastes good along the way - and there's the promise of the sweet, soft center.

#### FOR ME MATH IS LIKE A

For me math is like a strong, secret hiding place that I can escape to, think in, and be comforted by. It's in another world away from interruptions. It's filled with rare objects, unknown objects that I am drawn to and mesmerized by. I stare at each one of these objects for long periods of time - I have all the time in the world in this place - trying to unravel its mysteries, trying to find out what they really consist of. Some are easy to discover, others are very difficult, almost impossible. When I've had no luck with these more difficult objects, I wander back into the cave, the center of this secret place. In this cave are many different crystals and many beautiful, but well known rocks and gems. Here lie all the basic 'truths.' The foundations upon which everything is based. Then I go back out again, renewed with strength.

#### FOR ME MATH IS LIKE A

For me math is like a Bach fugue. In a fugue there is an opening phrase, the very foundation of the fugue. It is used and spun out. But as soon as you've stated this idea another voice enters in. Horizontally there are a lot of single voices going on, all developed from the same basic assumption, but alone wouldn't make it music. It is important that the voices go together well, the vertical harmonies of the different lines. They're all separate but together and only together they make harmonic and musical sense. The contrapuntal voice leading.... One line alone in a fugue might be beautiful but the depth comes into existence because of the complicated interweaving patterns. There is no way to find all the structures and connections but it is a nice challenge to look for them.

The difference though is, that a fugue ends and the search ends at a certain point. A fugue was set up in its complexity by a human being and finished, while math, though created by humans, never ends.

The different "branches" of math are the voices of the fugue that are built(?) on the same assumption, developing different things from there and not contradicting each other.

#### FOR ME MATH IS LIKE A

For me math is like a toolbox. The tools in the toolbox represent the concepts, formulas, and techniques needed to solve problems. However, I could always use the wrong tool, or maybe my toolbox doesn't have the tool I need. The tools can be used to construct something, or they can be used to strip down a complicated machine so that all the parts can be analyzed. Some tools can become obsolete if I acquire new ones. When working with the tools of mathematics, I could just as easily use them to fulfill my needs by solving the problems.

#### FOR ME MATH IS LIKE A

For me math is like a non-existent rubbery wall of silly putty that, while you can imprint cartoons on it, shoves you back time after time. A shapeless blob that has to be molded into something obvious and simple.



#### FOR ME MATH IS LIKE A

For me math is like a human being (one not always easy for everyone to deal with). My first exposure to math was Winroth's "How many can you do in three minutes?" (no, it was learning to draw eights in nursery school - also frustrating) and memorizing times tables. I hated both - the pressure and the rote learning was boring, and I was a daydreaming type who didn't like the pressure of time limits, I guess. Then came a mysterious thing called "pie" (sic) that my parents and brother talked about, over my head, at dinner, and the physics my parents discussed. I was a girl and I didn't like boys and math, which was boy's stuff. Gradually I had to get to know both - and I love math now because it's interesting. Math is temperamental and not easy for everyone to get along with. An eccentric personality that, though varied, still is oriented with one goal in mind, and, even when you know and like him/her/it, can be intimidating because it sounds pretentious, stuffy, over-intelligent, eccentric-like your typical stereotype physicist or mathematician. But sometime he/she/it has flashes of brilliance where "it" says something incredible and you say - wow. What a neat person.

#### FOR ME MATH IS LIKE A

For me math is like a hunt or an adventure. You have a seemingly impossible problem in front of you, and all these formulas and methods in your head. You have to keep pulling out methods and formulas until you begin to weaken the beast, and keep working until you've turned the lion into a pussycat. Once you've accomplished the feat, you can again say you're King of the Jungle and go out in search of the next lion to be tamed. You find the next one - and it's huge! You begin to try your different weapons, but it thwarts them all off. But finally, exhausted, you remember L'Hopital's Rule, and finally the battle is in your favor. From then on it's an easy fight, and you win again.

#### FOR ME MATH IS LIKE A

Math is like a name, you are given names to ideas that don't even exist, it's so abstract, you call the sky "sky" but if you wrote "sky" on a piece of paper it wouldn't be the sky so that's what numbers, real and imaginary are. But then we made laws for the numbers, and with the first defining statements all the rest followed. When someone took a step in one direction we had to keep walking that way. Math could have developed in a completely different manner, but it would still be just as correct. It's important to remember that math isn't really a reality, it's a philosophy, a way of relating tangible things. The fact that it does such a good job is amazing to me. The thing that excites me the most about math is the connections, for example, the number,  $e$ , shows up mysteriously in so many places, as do the golden ratio and  $\pi$ . But also the connections between logic and proofs in math and debating arguing a point. Math is in many ways a magic, a supernatural entity that we can attain, this makes it very special. Yeah, yeah and I really think I know what I'm talking about. Math can be amazing if you can appreciate the many things it has made us capable of. I said that math was simply a philosophy, which is true, but look at what this philosophy, law, that at one point did not exist, has blossomed into. Math is a creation of man, or is it?



#### FOR ME MATH IS LIKE A

For me, math is like a jigsaw puzzle with hundreds of pieces. It can be frustrating when I can't grasp a concept or can't find a mistake in a problem I did wrong. On the other hand, when a concept does make sense, it's like putting many pieces of the puzzle together at once. It's also puzzle-like in that it's intriguing how so many seemingly unrelated pieces can fit into a coherent whole which is visible in nature as well as in textbooks. It's rewarding like a puzzle when a concept is fully understood - hence, the puzzle is finished.

#### FOR ME MATH IS LIKE A

For me math is like a trial - a test of my intelligence. I feel a lot of pressure to do well. This pressure comes from several different places. First, at home: my father is a mathematician and my older brother has always been a math whiz. I am expected to be the same way, but my interests lie in other areas (music, poetry...). For me math holds no interest. Thus the only point (to me) of learning it is to succeed, to excel, to please others. I like to think slowly and figure things out. When my Dad helps me with math I feel pressured - like if I don't know/understand something he will think I'm stupid.

But the pressure also comes from the whole system of the advanced math sequence. People are expected to keep up with the speed of these courses. If I didn't understand something (a common experience) there was no time to ask questions. We had too much material to cover. Basically the system is inflexible. It is geared towards ONE kind of student: fast thinking, smart... and if you are not these things you are left behind.

Another thing: there is a big "competition" (unspoken) between my level math class and the level just below - a real snob attitude of those more advanced towards those less advanced. This competitive attitude is not one I work well around. I get angry and vent that anger toward the subject (math) not towards the people.

DEVELOP YOUR OWN METAPHOR FOR MATHEMATICS! PLEASE WRITE IT UP AND SEND IT TO ME. I WILL SEND SOME/ALL(?) OF THESE TO AL WHITE FOR THE NEXT NEWSLETTER!

Have you seen Lynn Steen's metaphor in Science (1988)? Where are others written down?

#### REFERENCES

- Buerk, D. (1982). An experience with some able women who avoid mathematics. For the Learning of Mathematics, 3(2), 19-24.
- Buerk, D. (1985). The voices of women making meaning in mathematics. Journal of Education, 167(3), 59-70.
- Potter, B. D. (1978). The train and the fly or why I hate math. The Two-Year College Mathematics Journal, 9(1), 3-4.
- Steen, L. A. (1988). The science of patterns. Science, 240, 611-616.