Jessica Steffel

About Me:

K-1 Multiage Teacher

(http://k1-multiage.wikispaces.com)

Graduate of Saginaw Valley State University (2002) with Elementary Education, Early Childhood Education, and COATT endorsement

I also have 18 credits of my master's degree at SVSU in reading, but I achieved my goals for my reading instruction in those credits and have moved on to my true love, TECHNOLOGY! I am completing my Masters in Educational Technology at Michigan State University in summer 2011.

I define myself as a teacher using these criteria: I'm effective at using technology and getting students to use it even at the young age of 5, AND I don't teach "one-size fits all." From the time I first heard of Vygotsky's philosophy of the Zone of Proximal Development, I knew that was what I believed about learning and I continue to work to put that in practice. It is NOT easy and I feel like I never stop working, but it is intensely satisfying to know that students feel challenged yet supported and enjoy themselves along the way.

HIGH SCHOOL: In high school, I had one of the best math teachers you could imagine, all the way through pre-calculus. Mr. Perschbacher would pose a problem and give us time to work in pairs to attempt to discover how things worked, and he had a talent for giving just the right additional clues. I remember the feeling of satisfaction I would get when I would help figure out a problem, and the disappointment when I couldn't quite put it together. Later, in some of my undergraduate teaching classes I remember the aha! moment I experienced when this teaching strategy was discussed and I realized just what a master he was.

COLLEGE AND BEYOND: As an elementary education major, I focused on math for elementary students, and really enjoyed learning ways to connect the wonderfully abstract ideas in

math for my students. I remember dissecting mathematical ideas using manipulatives, doing a sort of "reverse" learning. It was a very unique perspective to learn about how I had learned the ideas I take for granted.

K-1 MULTIAGE: In my K-1 Multiage class (2 teachers, 2 grades, 2 classes) we use the Everyday Mathematics program. It is an extremely driven program that encourages independence, critical thinking, and problem solving, and over the years I have evolved as a teacher of this program. Actually, I now teach a centers-based version of it, which means I "cover" less but deeper. I include a variety of challenges for students in each center by differentiating individual centers and providing choices. The centers include a variety of manipulatives, pencil and paper practice, and games. I meet with groups of 6 – 8 at a time (This year they are grouped somewhat by ability, for this is the way it works best with this current group. I've also done it with mixed ability when appropriate.) I know my students' individual strengths much better when I am teaching small groups than when I taught whole-group.

Technology-wise, we have Smartboards and Smart Response Clickers in our rooms, which are very engaging to students, and I feel pretty skilled at using them. We have a subscription to Symphony Math, so students work at their own levels on that as well. We use that and a variety of interactive math websites during our centers.

DISCLAIMER: Even though I feel I am an effective teacher, I still want to know what more I should or could be doing to make sure I am building healthy mathematical attitudes and a solid foundation for the skills and ideas they will be asked to use in the future.

Unit 1 Reflection – Jessica Steffel

Myself and Others

I think my group members are great; and I think the spirit of learning in this entire class is high. I already think that the forums feel more connected than other classes I have participated in. From what I have read in profiles, my group forums and in the watercooler, there are a lot of people in this class looking for answers, which is refreshing because that's where the good conversations can come from! Also, I think the group norms assignment was very helpful because I know I feel more committed to being there for my group and I also realize how busy we ALL are!

Technology, PSSM and Me

I really appreciate the chance to dig into the Principles and Standards as part of this class. I graduated with my BA in 2002, and haven't done much math PD since then, so I like reading this now that I have some experience and not just theory in my backpack. I look at things a lot more critically through the lens of my experiences now.

Math is a difficult area to feel like a master teacher. There is a lot of pressure to have kids achieve and be able to do the work the math book asks. There is also pressure to have good test scores, which seem to be a joke as far as MEAP goes. There is additional pressure to make kids good "thinkers" in mathematics, but this is the most difficult to measure and is the most difficult to spend time in due to the other pressures that are even incentive-based sometimes and part of the teacher evaluation. Not to mention the fact that as the years go on, it seems the diversity in skill level only stretches. I see the vast difference in ability and number sense in Kindergarten that is only exacerbated by the end of 1st grade.

I've made it my personal goal to differentiate during math time, so have been teaching with centers for a few years now. However, now that I differentiate well, the high kids get higher and the lower achievers still struggle as much as ever, despite the additional support they receive. I use technology in

the classroom, for drill and practice, for group think sessions, and even for student creations that demonstrate their understanding. My math teaching, as much as I think I am doing, still is a bit disjointed. I still feel like I'm missing the great connector that binds everything together. I am really hoping to use this class, my exploration of the PSSM, and knowledge from my group members to hone my math program so that the big sense of direction is apparent to me, my students, and the parents of my students.

Looking ahead

I like the format of the units. I have always known what the general strands are, but haven't done much deep discovery in them since college. I am looking forward to expanding my big picture of K-12 mathematics because I remember high school math and I teach primary math, but I don't remember a lot of what came between. I hope to have a chance to explore how each strand stair-steps up and to learn just what to spend time on in primary math to build that really strong foundation for higher math classes. I think that knowing the expectations of higher levels will help me do that.

Technology

I am pretty brave at trying everything I can, technically speaking. It did take me a day or two to wrap my brain around where everything for this class is (the difference between when I go to the wiki and when I go to Angel). I think I've got it down.

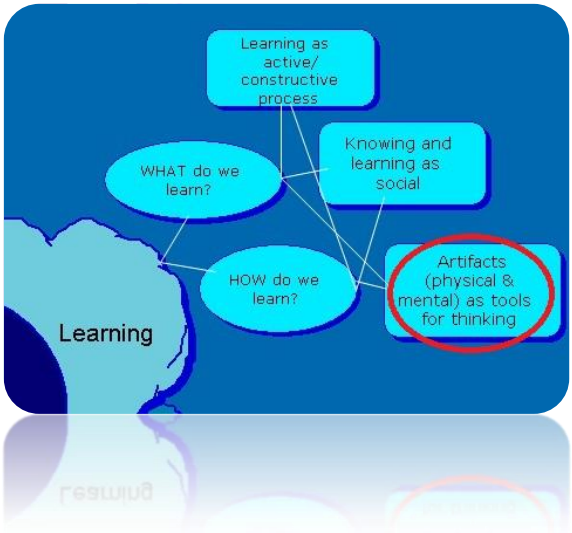
Reflection 1: Learning and Teaching (due 2/7/2010)

Write a 2-4 page reflection (double-spaced) that expresses what you have come to think about learning and teaching mathematics as a result of our activities in this unit. Here are some specific suggestions for structuring your reflection.

- What is your view of what we learn when we learn mathematics?
- What are some of the "active" things we do when we learn that mathematical content? [This is a "how" question about your answer to "what" above.]
- How do (and can) teachers support that view of active learning to learn the "what" of mathematics?
- What has changed in your thinking about any of these three issues in the course of the unit? What questions have appeared or become more important?

Jessica Steffel ~ Unit 2 Reflection ~ 2/7/2011

Our focus this unit was about how people learn mathematics. I had to spend some time really thinking about what we learn when we learn mathematics. I know what I teach because it's in my curriculum and I know my standards, and I can tell you if a concept is appropriate for a math class or not. So I can define math by what it is and isn't. But I wasn't sure how to "define" it precisely, especially from the other end (learning instead of teaching). So, after turning to Wikipedia to see what the world says, I think my most simple explanation is that learning mathematics involves exploring and explaining the patterns in our world. Some are explained by numbers, which help us express quantity and relationships. Others are expressed with shapes or formulas or many of the other "math" tools we've created for explaining these phenomena.



Along with what we learn and how we learn, the tools are what we use to achieve that learning and demonstrate our knowledge and understanding. So when we learn mathematics, we learn about the observable and unobservable patterns in the world (what we learn) by observing, discussing, and (yes) listening to others explain them (how we learn.)

I have a tendency to focus on the early elementary concepts, but that is my area of experience. My students learn the abstract concept of number – that a number represents a quantity but in

different ways. 5 shoes is 5. 5 horses is 5. 5 cups of water is 5. 5 dots on a dice is 5. 3 dots on one dice and 2 dots on another dice adds up to 5. 4+1=5 When it is 5 degrees outside, 5 is a low number. When you get 5 pieces of candy, it's a high number. Oh, and you can trade 5 dollar bills in our classroom store for one 5 dollar bill. And don't forget that 5 is always more than four – it shows that on the number line. And on and on.

How do they learn this? Through repeated experience with the concept. "5" is not a definition I can explain to them…they must be active learners as they build their schema of everything that 5 means through the activities, explorations, and explanations we have. Once they have the concept, we look even further for patterns. What happens when you add 5 to any number? We branch into frames and arrow problems, which is repeated adding or subtracting. Again, the procedure for learning these often starts with tools – the "function machine" is a real machine that we use and one number goes in and another comes out. What is the rule? (What is the pattern?) Then we continue to use tools to practice with them – such as the number chart for counting on. Eventually they perform the calculations (evaluate and extend the pattern) without the support of the physical tools because their mental tools are sufficient.

I can't "pass on" my understanding of mathematics content to another learner. If I were simply to explain how to multiply to my first graders, they would find me quite nutty! That would be for two reasons – one, they don't have the background knowledge to support that thinking. A few of them have older brothers and sisters so they know 10x10 or something, but that's about it! Two – they aren't active learners of that content. If I simply explain to them about graphing coordinates, for example, they might learn a procedure for finding (3, 2) but they wouldn't

understand it like I do with my experience, knowledge and understanding. They haven't acted with it and experienced enough to truly understand it.

Thought: everything builds on what you already know. So what if what you already know is WRONG? As I am typing this, I am thinking about the Benny article. Who was there to discover that he didn't really understand the patterns in his mathematics classes? It makes me think I might be missing something with my students sometimes, when we are running short on time and I go with a "this is how you do it" lesson. I wonder how they are connecting that information I bestow up them to other information in their mental backpacks. Do the wires get crossed because they didn't get to really dig into the meaning themselves?

I think it is tricky to give just the right amount of guidance, too. When to explain? When to allow exploration? How much time should be devoted to these activities? I still feel like I am on the path to finding an answer to that. However, after this unit, I feel strongly about two essential components of a math class

- time to build their own understanding (active learning)
- interaction with each other and the teacher to share and examine their findings (learning is social)

Questions

I'm pretty certain about the validity of that kind of teaching for number concepts. Then I was thinking tonight about an analog clock. How long would it take my students to discover how that works, how it keeps track of time, the relationship between hours, minutes, seconds, and days, and what quarter

after, half past, etc. mean? Is this a concept I can just explain instead of explore? I guess that lots of exposure to playing with the toy clocks, manipulating them to make times we are practicing, and reading the clock randomly through the day are helpful. I'm just not sure that there are explorations to build clock reading skills as it seems to be more of an instrumental understanding concept than a relational one. But I guess I'm still not certain about this and will keep it in mind as we forge ahead.

Other Questions (I just posed this to the group in the watercooler):

We have been charged by our principal to create a common core math test to give to our students at the end of this school year to evaluate "how would our kids do on the common core standards if we changed nothing about our math teaching." She would love to have it be something we can administer via clickers or online, something that the data is automatically stored for. After reading the Benny article, I fear this multiple choice option could really give invalid data. How can I show "understanding" on a test? Our date is Feb 18th so I would appreciate some guidance or resources if you have any!

Reflection part b: describe how your group is interacting so far

Overall, I thought my group was fine during this unit. Everyone seems to be on the same page, and putting in sufficient effort. My only issue with the discussion forums at this point is what always frustrates me – the comment threads (both group and class) usually only go 1 level deep, sometimes 2. It doesn't seem like a "discussion" if it has only one response. I am going to make a personal goal of trying to extend the discussions beyond one level in the next unit by commenting on more comments, and by asking questions to encourage even more response. I think many people feel compelled to start a new thread when more could be accomplished by engaging with other posts. I should note that I don't like the format of the Angel threads, either. They are very text heavy and unappealing, and they don't allow for html embedding. I would feel more connected to others in the class if it at least posted their profile photo with their posting, and if it seemed easier to follow one thread of discussion. It is what it is and I make the best of it; I guess I'm just not an Angel fan, sorry!

Reflection: Thoughts on what you've learned

Given your reading, thinking, and discussions over the past two weeks, present your current thinking about the following questions based on the readings we have done in this unit (and the course generally) and the technologies for learning and teaching number and operations that you have explored. We expect between 2 and 4 pages (double-spaced).

1. Do you generally agree or disagree with the goals that are represented in *PSSM*'s Technology Principle and Number & Operations Standard (overall and at the grade band of most relevance for you)? Explain your judgment. (We are not presenting *PSSM* as given truth.)
2. How well did the technology that you examined support these learning goals? How, if at all, would you change the nature of that technology to align better with those goals?
3. What, if anything, has changed about your understanding about number and operations from your work over the past two weeks? Are those changes educationally important (for learning and teaching)?

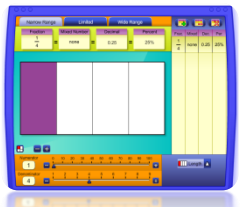
Jessica Steffel ~ CEP805 ~ Unit 3 Reflection

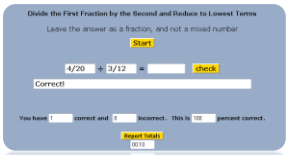
The primary goals of the principles and standards (PSSM) in regards to number and operations are that students will understand numbers, understand meaning of operations, and compute fluently. The document recommends that the best ways to achieve these understandings are through solving problems and discussing solutions. As a first grade teacher, I think these goals are very important. I have discussed several times how important their "sense" of number is for them to be successful in first grade mathematics. For those who do not have it, we struggle daily. I am of the belief that if these students had better number sense, they could work better in all of the strands, since it is the foundation of all mathematical skills.

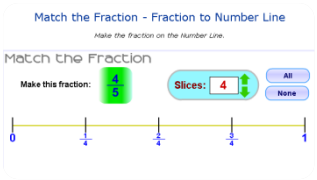
When I consider the importance of discussion that the PSSM stresses, I think about my classroom and my current students. We have 45 minutes a day for math (subtracting for time for snowpants removal, of course) and I run 3 math centers on a typical day. Therefore, students are at each math center for about 12 minutes. I think I am not providing them enough time to talk about their work, especially with me at the teacher center. By the time we get started with something, it is time to switch or go to lunch. I am considering changing to 2-centers per day so they can have more time to focus in and consider their thinking. That would give them more like 19-20 minutes, allowing me to still teach smaller groups, so my interactions encourage discussion, but also to allow them to explore and solve problems together with time to discuss them.

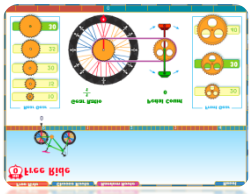
As I reread my notes from the PSSM, I laugh as I read that I wrote "when we talk, talk, talk, the work pages don't get done, done, done." And I laugh because I don't really believe in doing a lot of worksheets, often choosing to do something else. Yet, when a parent receives a book with unfinished pages at the end of the year, we sometimes get the 3rd degree about those pages. This reminds me of

the discussions we held in the forums about parent misconceptions of mathematics. If you looked only at the workbook from our math program, you get a much different picture than if you read the entire teacher's guide and take into account all of the games and activities. Maybe, in addition to their own school experiences, this is why parents think what they think about mathematics being computation.









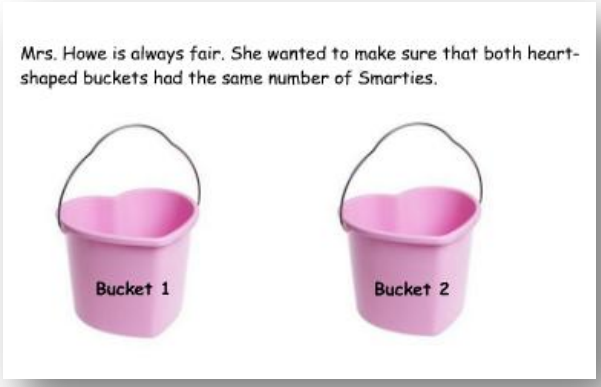
In Unit 3 we got the chance to "play" with several online technologies intended to help students develop their sense of number. According to the PSSM, these types of computer games can be helpful for students to build their number sense because it links their actions with the symbols. I am thinking of an online game I use for place value that does just that. Every time a student adds a base 10 block to the chart, it changes the number in the background so they see the effect of adding different blocks. It also asks them to make certain numbers. Through trial and error, students can discover the patterns of the blocks and how the numbers work.

All of these games have strengths and weaknesses. I think the most important thing I learned from this unit's readings is that everything should come back to conversation. What did you try? How did it go? What did you learn? Did anyone else try something like that? Did anyone else try something different? Students could possibly spend a lot of time actually getting nothing from these games if they aren't focusing, or just clicking and checking. I think of my intervention students, who struggle with number sense already. It would be very possible for them to sit and click without understanding what they are doing, or knowing what else to try. In our previous unit, we established that a textbook cannot replace a

teacher. Neither can a teacher be replaced by a computer, no matter how many advanced technologies the student has access to.

I found that the information in this unit helped me take a fresh look at what I am doing in the classroom. However, the extreme focus on examining thinking by talking and sharing ideas serves as an excellent reminder that the best way to increase learning and create better critical thinkers and problem solvers is through that process.

I also liked the many specific examples that the PSSM shared of open ended activities that have multiple correct answers, such as this one below. It not only allows students to solve the problems in different ways, but if a teacher allows for sharing of strategies afterwards then the activity goes a step further towards helping everyone understand better. I want to become more comfortable with this. I am starting this week by sharing this math problem from another first grade teacher in Canada. I follow Aviva on Twitter and she shares lots of wonderful ideas.



http://avivadunsiger.blogspot.com/2011/02/great-smartie-problem.html

From the readings and conversations this past couple weeks, I understand that developing number sense takes even more time than I have been giving it. I've also realized that I don't always choose the right activities from the math series. There are more conversation-driven activities suggested that I will

definitely take advantage of. I think I will also try to work in more written explanations of their thinking. There are “exit slips” suggested with some of the activities. I think this would be a great way to check on their thinking and come back to something the next day.

Jessica Steffel ~ CEP805 ~ Unit 4 Reflection

Given your reading, and discussions over the past two weeks, present your current thinking about these questions for the NCTM standards for algebra:

1. What are key mathematical goals at the grade level you teach?
2. What new understanding about algebra (broadly defined) did you gain from your activities over the past two weeks?
3. How can technology enhance learning in support of those goals? (Give examples of kinds of activities, software, or other technology tools; better yet, give examples of specific tools.)

This unit, in which we explored algebra and the way it is approached in schools, definitely enhanced my understanding of the ways that I support the building of algebraic skills and thought processes in my primary math curriculum. I had noticed when I returned to 1st grade in a teaching capacity that there are some ways I build thinking for what they do in algebra classes later on. Now I think I am more aware, and have even expanded my own definition of algebra.

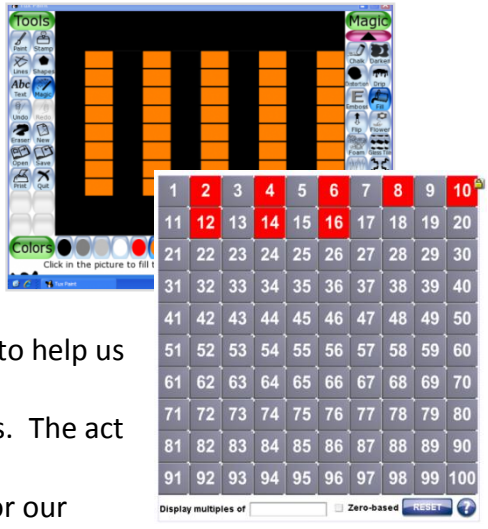
To me, Algebra is an important strand in mathematics because of its analyzing components. There are many discovery and discussion opportunities as students look at the relationships of quantities, express ideas, and analyze changes. Algebra takes a lot of critical thinking as well as a foundation of number understanding.

I think analyzing patterns and analyzing change are hardest for my K-1 students. The skill of analyzing and finding commonalities is difficult for them, but essential. I think the most difficult question I ask is "what is that problem asking you?" Algebra doesn't let them get away with limited understanding. From my reading in this unit, I am more determined than ever to get kids talking about their understandings because I worry about them getting correct answers without really understanding what they are writing. Just today, I had an advanced first grader working on a story problem. He knew the answer in his head immediately, but when asked to

draw a picture to represent his thinking (which we have been practicing for 2 weeks in small group), he really struggled to make the picture come out to show what he know. I think we have established in this class that knowing the answer does not always indicate understanding. This is just another example, and I definitely think the chance to work in small groups and have those discussions will be critical to their understanding.

Approaching the K-2 Algebra Goals – Patterns

We practice repeating and growing patterns with objects. Growing patterns are much more difficult for them to represent, but we practice them! We make patterns with our bodies during our good morning song every day, use shapes and color patterns to show the days on the calendar, create patterns with pattern blocks, and use function machines to explore numeric patterns. To explore patterns with technology, we use Tuxpaint to create patterns with stamps of objects, and there is a blank hundred grid-type template that we use with a paint bucket to make patterns. There is a similar applet I learned about in Unit 4 that we explored online.



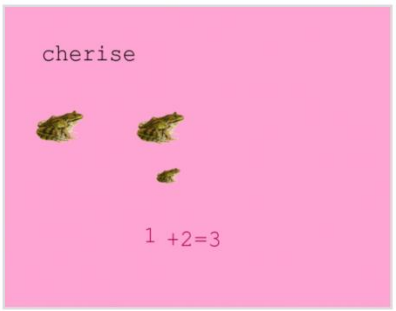
We also use an interactive hundreds chart on our Smartboard to help us explore counting patterns as well as function machine patterns. The act of visually representing the number pattern is very powerful for our young students. Seeing is believing, and repetition never hurts!

Approaching the K-2 Algebra Goals – Represent and Analyze Math Concepts

We learn turn-around facts (that 2+3 is the same as 3+2). We find the missing number in __ + 2 = 11. We talk about the fact that the = sign can move, that 3+2=5 is the same as 5=3+2. Our Symphony Math program allows students to explore the concepts of equal, greater, less, addition, and subtraction with visual bars of proportionate length as well as numbers. Through this exploration (and games we play in the classroom) they learn commutative properties. The focus of the standards is really on the fluencies of all of these skills, so through the discussions with my group members, I have noticed thoughts of how difficult it is to get students to learn facts and I really think that teaching them to compose and decompose numbers using symbols like this is going to give them a good solid understanding.

Approaching the K-2 Algebra Goals – Mathematical Models

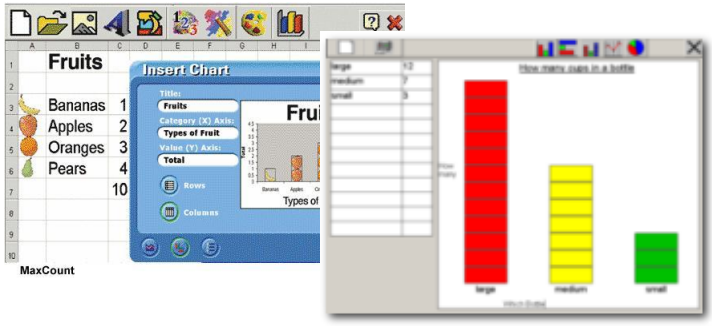
We use story problems along with manipulatives and numbers to demonstrate addition and subtraction in many ways. Students create number stories with stamps in TuxPaint. The standard encourages us to us problems with what I would consider multiple variables. In our math series, a question comes up about how many hands there are in the classroom. Some students have the strategy of counting every single hand. Others figure out they can speed up and count by 2s. In the past, I have usually just pointed out counting by 2s as a better/faster strategy than counting by 1s, but when I get to that this year I will definitely hold a longer discussion about why that is, and I will step more



out of the discussion and coach it along rather than declare the supremacy of one strategy over the other!

Approaching the K-2 Algebra Goals – Analyzing Change

We perform measurements and comparisons during the year. In the spring, we weigh our chicks every day and chart their growth. We also measure our plants in the fall and see how tall they get. We use green key in Scholatic Keys (kid version of excel) and the early learning toolkit graphing program to show how numbers on charts look in graph form so we can visually see how much growth/change happened.



I really appreciate the multiple chances in this class for reflection on our own practices and their alignment with the standards. Sometimes I think I am pretty comfortable with something but this process allows me to question everything I'm doing. I'm finding some common themes and can't wait for the next unit to once again remind me to check for understanding through discussion!

Unit 5 Reflection: This paper has two parts. (You can either combine them in a single document or submit two separate documents.) In the first part, please write up your "best solution" to the Rescue problem, explaining your reasoning. You already have two possible solutions to present -- your own original solution or the one your group posted to the whole-class forum. You can use either of these, or write something new. In any case, be sure to explain your reasoning to your own satisfaction.

In the second part, please write a short paper -- 2 or 3 pages double spaced -- addressing one of the two questions from the first part of this unit (repeated below). The purpose of this paper is to get you to relate the work you have done with Jasper to something you might do or benefit from in your own classroom.

1. What are the general problems with learning that the Jasper series was designed to solve? Are these problems that you see in your classrooms? How do these problems relate to the current standards for mathematics education in the NCTM's Principles and Standards? Are there other solutions to these problems that you have tried, or that make sense to you?
2. If you think about the affordances of technology for learning (information, representation, transformation, collaboration/communication), where does Jasper fit? What "kind" of technology is it? What are its most important affordances for learning in your mind? How do the affordances of Jasper for learning fit with the standards in the Principles & Standards?

My final Jasper solution:

What to do	Why?
Emily flies the plane to Boone's meadow straight from the city: 65 miles, 4.3 gallons of gas	Flying straight to Boone's meadow instead of to Hildas and then Boone's Meadow will save over an hour of time as compared to flying to Hilda's and then to the meadow. The doctor estimated this distance to be 65 miles. At 15 miles per gallon of gas (determined by the fact that Larry went 30 miles on 2 gallons of gas), this would be 4 and 1/3 gallons of gas used from the 5 gallon tank.
Emily brings the box and the small gas tank to refuel out at the meadow. Estimated payload for 1st part of journey: Emily 140 + Gas 30 + Box 10 + Gas can with gas 12 = 192 Est Time 130 minutes Time at stop: 5 minutes	Emily would not have enough gas if she didn't bring the small tank with her to refuel at the meadow. As one group pointed out, as long as Emily weighs less than 165 she will not exceed the payload limits with the added cargo of the gas can and the box. From the quick glimpse of the scale in the video, it appears this is a safe assumption. The journey is 65 miles and at a speed of 1 mile every 2 minutes, it would take 130 minutes.
Emily flies the bird to Hilda's. Est payload for 2nd part of journey: Emily 140 + Gas 4 (left from trip) + Box 10 + Bird 15 + Gas Can with Gas (now in tank) 12 = 181 lbs Est Time: 18 miles (as told by Jasper) will take 36 minutes	The trip to the meadow will use over 4 gallons of gas, leaving less than one gallon in the tank. After refueling with 2 gallons of gas from the small tank, Emily can bring the bird with her in the box.
Time at stop + transport the bird to the city by car: 65 minutes	It would be helpful to have the vet meet them their and begin treating the bird in the car on the way back, but I decided this wasn't possible since the vet was going on another call.
Total time: 130 + 5 + 36 + 5 + 60 = 236 minutes or 3 hours and 56 minutes	This estimate must be understood as an estimate. As long as nothing else happens on the trip, 4 hours is a safe assumption for getting the bird back to Cumberland.

1. What are the general problems with learning that the Jasper series was designed to solve? Are these problems that you see in your classrooms? How do these problems relate to the current standards for mathematics education in the NCTM's Principles and Standards? Are there other solutions to these problems that you have tried, or that make sense to you?

The Jasper videos are designed to challenge students to think in ways that apply directly to the world they live in. The one that we explored was an excellent example. Viewing the characters in a video made a deeper connection for me than reading it in a story problem would have. I found myself considering and talking with others about the many mathematical applications of the problem in the story: getting the bird to the vet.

Mathematics learning, as we know from our discussions, suffers from the public perception of being almost strictly computation and that the only math people need is enough to buy things and balance their checkbooks. Unfortunately, that perception leaves out the many great opportunities for inquiry and real-life application. As one person stated in the forums, when we teach problem solving it carries over into other areas of life!

I find it very challenging to get my students to think. First of all, at their age they are very concrete thinkers, so that is one challenge. Secondly, so much of the “mile wide and inch deep” curriculum that we have been teaching lately only challenges them to memorize and apply procedures in order to get right answers. This perpetuates the perception that math involves mostly computation. And finally, it is difficult for me to support students in developing critical thinking in math because I don’t always know the best ways to support them as they problem solve, and it sometimes makes me very uncomfortable to see a student frustrated because they don’t know where to begin.

As I read the NCTM, I am encouraged by the language it uses to support mathematical thinking because it reminds me so much of the ways that I teach literacy, which I AM comfortable with! I noticed that the NCTM asks us to teach a set of strategies, such as "it sounds like you made an organized list." Knowing the strategies to teach and support gives me the confidence to approach problem solving with my young students armed with some new ways of supporting their thinking.

The NCTM encourages the following strategies, and it says we are to give focused instruction on the strategies:

- Using diagrams
- Looking for patterns
- Listing all possibilities
- Trying special values
- Working backward
- Guessing and checking
- Creating an equivalent problem
- Creating a simpler problem

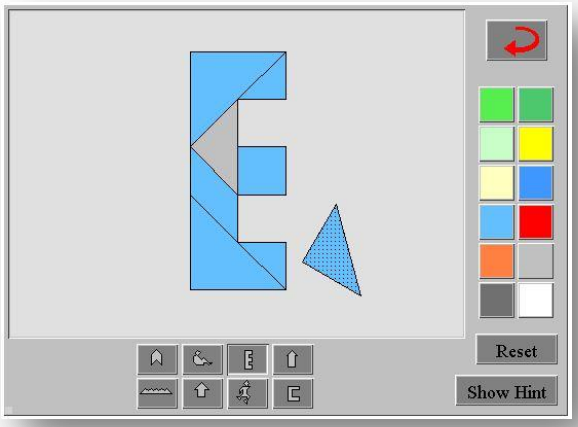
The Jasper problem required several of these strategies, and we didn't all use the same ones, either, which is why it is important to teach all of them. Putting these strategies together in a person encourages divergent thinking because they won't think that there is just one possible answer. Sir Ken Robinson in his RSA talk about Changing Educational Paradigms asserts that we actually teach divergent thinking right out of students and that they are better at it before they come to school than when they leave it. Honestly, that saddens me but I understand what a sizable shift in thinking that requires the majority of teachers to make radical changes to how they operate in a classroom. That's just not comfortable for a lot of people! Problem solving

activities are a lot less cut and dried and definitely more difficult to grade! (I know, grades are a whole new paper to write!)

Essentially, the problem is that we don't create great mathematical thinkers from a typical workbook and follow-the-procedures math curriculum. We get it by discussing, trying, and discussing some more about problems that have real-world application. In order for this to happen widely across the US, teachers need to understand and commit to this process, but the PD has to be available as well. In every unit in this class, I have challenged my own thinking and become more confident in the teaching I am doing while always tweaking to accommodate new learning. Taking time to think and discuss about the material helps me to change my practice. We all (teachers) need that time, but just how do we instill that in every school in America???

Tangrams Applet, and Tangrams Challenge Applet

Which Geometry standards are addressed by the applet?



- **Analyze Characteristics**
- Specify Locations
- **Apply Transformations**
- **Use Visualization**

Rationale: This applet allows students to manipulate the shapes of the tangrams (2 large triangles, 1 medium size triangle, 2 small triangles, a square, and a parallelogram) to fit into a shape. These are much like the physical tangrams you can buy and build shapes with, but they allow for point and click exploration. A student moves and rotates the smaller shapes onto the screen either in free exploration or in attempt to fit the shapes into a larger designated shape. In the Challenge applet, students are challenged to make larger known shapes out of a certain number of tangram pieces, such as "make a square with 3 tangram pieces."

When I played with this applet, it reminded me of a student I have in Kindergarten this year who could not even write his name when he came, is struggling to read and write, and understands numbers but not as well as most others in the class. Yet, when we are working weekly through pattern block levels (sets of the picture cards), he is the K student who has made the most progress. He can't write higher than 19, but he can work the block pictures like no one else in the room! This is the kind of activity I like to provide so that everyone's natural strength shows through, but it also shows that it is important for the other students to spend time developing those skills that don't seem as natural to them

What mathematical content is being learned (or intended to be learned)?

- **Shapes**
- **Geometric Relationships**
- **Transformational Geometry**
- Coordinate Geometry
- Constructions
- Locus
- Informal Proofs
- Formal Proofs

*

Rationale: Students learn about the shapes they are using and explore their properties and they examine different ways for the shapes to fit together. Understanding what happens when you place shapes next to each other is important. They may think things like, "I need a square, but I used the square already, so maybe I can use two triangles." They are using transformational principles as well, as they decide to rotate or flip shapes to fit in the desired shape.

Is the focus on instrumental or relational understanding?

- instrumental understanding (carrying out procedures)
- **relational understanding** (understanding the meaning of mathematical words and symbols; connections among ideas)

*

Rationale: This activity requires students to explore. There is not one right answer, and there are multiple useful strategies. It is a great activity to talk about what students try and why things worked or didn't work. As they work through the templates, they will have multiple chances for noticing how the shapes work together and how those workings are affected by the original shapes and the intended large shape.
I'd even like to play with having students do video screen captures while they work on this applet so they can watch and evaluate what they tried. Sometimes students don't know how to talk about what they tried (in K-1) so having the video playback might be useful for that discussion, just for their own information or also to share with a partner. "What did someone else try that you didn't?"

What role does technology play?

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Response: The technology replaces the physical blocks that a teacher might have in the classroom. It allows students to be using them all at once or in partners, depending on the configuration of computers in the classroom. In my opinion, I would offer students choice because I found it a bit frustrating to rotate the shapes and would rather use blocks, although I know I have students who would prefer the computer version. I also think it is important for them to physically handle the shapes (due to the connection between touch and memory), so a balance of using both the physical blocks and the virtual blocks would be ideal.

What instructional function(s) does the resource serve?

- **practice** (i.e., practicing skills or knowledge already learned)
- direct instruction/explanation (i.e., explaining or presenting content to students)
- **learning through exploration** (i.e., provides context in which students can see new relationships; come to new understandings)

*

Rationale: Students explore the shapes and build their own understandings. It is possible to share answers, but it should be done from an exploratory set of questions such as "what did you try?" and "What did you discover?" rather than "How did you get the right answer?" The discussion of their learning with this applet is just as important as their practice.

What kinds of representations of the mathematics are used?

- symbolic (i.e., numerals, symbols)
- graphical (i.e., standard graphical notation such as Cartesian (X-Y) coordinate system, bar graph, pie chart)
- **visual/spatial** (e.g., circles or squares with lines to show fractions)
- **concrete or real-world objects** (e.g., images of base-10 blocks, puppies, or jars)
- dynamic(mathematical ideas represented through motion or sound)

Rationale: This applet encourages the development of understanding of visual and spatial skills with shapes, sizes, and rotations. It uses the tangrams, which have a physical real-world counterpart.

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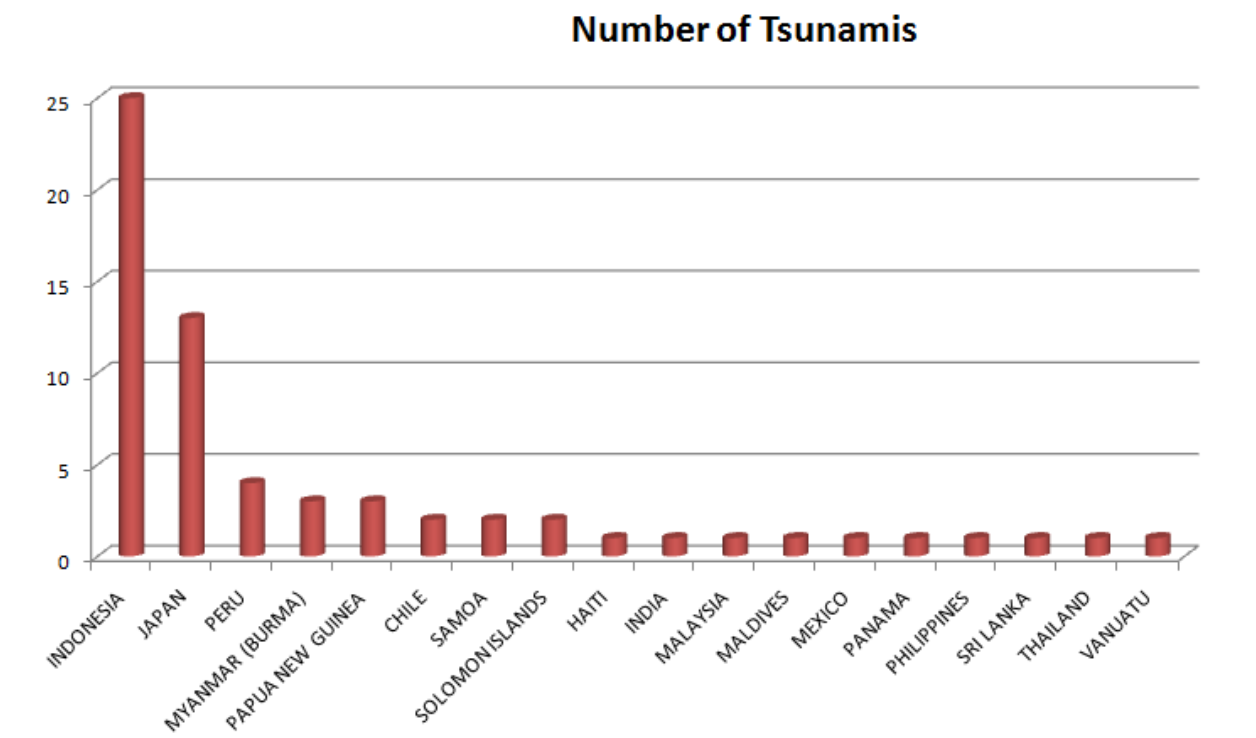
My group decided to study the types of data we could figure out about Tsunamis. Jamie found a really great resource that houses a lot of data for them. Once I examined the data that other members of our group used, which compared times of the year that Tsunamis are more prevalent as well as which Tsunamis were the most deadly, I decided to ask the question about WHERE Tsunamis happen the most. On the search page, I filtered just for 1980 -2011 Tsunamis and received raw data for many Tsunami events. I then used excel to sort and group the data to show how many Tsunamis had occurred per country. After cleaning up the data, I ended up with the following table:

	A	B
1	COUNTRY	Number of Tsunamis
2	INDONESIA	25
3	JAPAN	13
4	PERU	4
5	MYANMAR (BURMA)	3
6	PAPUA NEW GUINEA	3
7	CHILE	2
8	SAMOA	2
9	SOLOMON ISLANDS	2
10	HAITI	1
11	INDIA	1
12	MALAYSIA	1
13	MALDIVES	1
14	MEXICO	1
15	PANAMA	1
16	PHILIPPINES	1
17	SRI LANKA	1
18	THAILAND	1
19	VANUATU	1

From this table, I created two different graphics. The first, a graph, shows by country how many Tsunamis have happened during the time frame. It is useful for seeing which countries have experienced the most events. The second, a graph, I created in fireworks and created the dots to scale. Each event expanded the diameter of the circle by 3 pixels. By placing the dots on the countries, people can get a visual showing not just the number, but the locations of them to further analyze the patterns of Tsunamis on the planet.


Number of Tsunamis
25
20
15
10
5
0
INDONESIA
JAPAN
PERU
MYANMAR (BURMA)
PAPUA NEW GUINEA
CHILE
SAMOA
SOLOMON ISLANDS
HAITI
INDIA
MALAYSIA
MALDIVES
MEXICO
PANAMA
PHILIPPINES
SRI LANKA
THAILAND
VANUATU


Greenland
Iceland
Suomi
Finland
Sverige
Sweden
Norge
Norway
United
Kingdom
Polska
Poland
Deutschland
Germany
Україна
Ukraine
France
España
Spain
Italia
Italy
Türkiye
Turkey
Россия
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Algeria
Libya
Egypt
Iraq
Iran
Afghanistan
Pakistan
China
India
대한민국
S Korea
Mauritania
Mali
Niger
Chad
Sudan
Saudi
Arabia
Thailand
Nigeria
Ethiopia
Venezuela
Colombia
DR Congo
Kenya
Tanzania
Brasil
Brazil
Bolivia
Angola
Namibia
Botswana
Madagascar
Indian
Ocean
Australia
Papua New
Guinea
South
Pacific
Ocean
Chile
South
Atlantic
Ocean
South
Africa
Argentina
New
Zealand

I found this activity to be useful. I did think it was difficult to decide all of these things without a real-time chat option, and I felt that we got a lot accomplished three of us I spent about an hour chatting via our Google doc to make plans. In the end, after looking at other group projects, I felt like some of theirs had a larger plan than this. We just spent time looking at what kind of data we could pull from the database and had several types as examples, where some of the other groups had a 'driving question' behind their efforts. I think we could have also come to more of a driving question had we had a better understanding of the data in the database. I think it was pretty tricky for us elementary gals! I definitely felt challenged by the types of data offered and it was work for me to wade through it to find the meaning. I felt we did challenge ourselves and definitely learned more about data as we worked.

Jessica Steffel Final Reflection

What do I know now? Well, I know for SURE that I always have more to learn! This class had a lot of excellent material and discussion that have helped me forge ahead in my teaching of mathematics to my K-1 students.

I really appreciated the chance to dig into the Principles and Standards as part of this class. Between reading that, the Benny and Skemp articles, and participating in the ISD math roundtable discussions at school, I feel like I can defend my choices for the ways that I run my math program in my classroom with well-documented research! In fact, I can't even count the number of times I've said to people this semester "I'm taking this math class and we're talking about ____."

I learned to define math as exploring and explaining the patterns in our world. Some are explained by numbers, which help us express quantity and relationships. Others are expressed with shapes or formulas or many of the other "math" tools we've created for explaining these phenomena. By looking for the patterns in everything this semester, I've become an expert at finding them.

I've learned to catch misconceptions early; that correct answers do NOT indicate understanding. I even used that argument against creating a new test for our 1st grade students. Our principal wanted us to create a multiple choice test that 1st graders could take, and I really helped my grade push back against it because of what I learned in this class! We ended up tabling the issue.

In fact, as I talk to my students now, I've learned to do LESS talking, and ask MORE questions. I explain LESS and they explain MORE! I mentioned to my title 1 math support paraprofessional the other day that I was worried about my title students moving on to 2nd grade and she encouraged me, saying "they ARE getting it!" And it's true, because I adapted my teaching style to focus on their learning rather than

my teaching, I've been able to draw out those misconceptions and find ways to counteract them. I find myself thinking of the Jasper video as I talk with groups, trying not to lead the discussion to one right answer.

While I was in a group of elementary teachers, this class also helped me understand a lot more about the math curriculum beyond my own classroom. I have a more solid K-12 math understanding now, and I feel like I know which areas the teachers of 2nd and 3rd graders are hoping that I'm spending time developing in 1st grade!

From here, I am looking forward to rereading some of the material over the summer as I prepare for next year, so I can start my plan from day 1 to include lots of discussion around activities. I will admit that holding these discussions can be downright intimidating for me. In explorations, where we expect them to discover something for themselves, we ask open ended questions and can be surprised by their answers. I have to remind myself that it is my job to guide, not to be right all the time, so I join in the exploration and try to see it from their perspective, then interject an idea or a question back to them to help them think in a new way. Yes, I think next year will be a great math year!