MELANIE SKELIN

Research Topic: How to effectively use writing in a senior mathematics course in order to deepen student understanding and guide teacher instruction.

Method: I will be conducting my research in a Principles of Mathematics 12 class of 13 students. I will begin by giving them a survey exploring their ideas about mathematics learning and understanding. I have purchased a journal for each individual student which will be kept in the classroom and where students will be expected to regularly respond to carefully chosen written prompts. In addition, I hope to conduct spoken interviews with each of my students at various times during the study in order to gauge their mathematical understanding and to explore if and how their writing has deepened that understanding. I also plan to use their responses as formative assessment and feedback to guide my instruction.

Attachments:

1) Survey: Mathematics Questionnaire.doc

2) Miscellaneous Writing Prompts: 59 Writing Prompts for Math Teachers.pdf

3) Math 12 (Addison-Wesley) Writing Prompts: Math 12 (Addison-Wesley) Prompts.doc

4) Math 12 Prompts - 2009/2010: Math 12 Prompts 2009-2010.doc

5) Exponents and Logarithms Final Project: Logarithms Assign 2009-2010.doc

6) Trigonometric Functions Project: Final Assignment 09-10.doc

7) Photos of Student Work:
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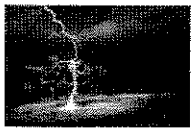

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09/13/2009 - First Week

skelin_m Sep 13, 2009 8:39 pm

Due to assemblies and other first week logistics, I ended up teaching my Math 12 class only once this week. Instead of beginning with the course outline and a review of Math 11, I decided to start off the year by putting the students in random groups and asking them to engage in some problem solving.

The first problem I assigned was to find how many "7s" were in-between 1 and 1000. Although one group solved the problem fairly quickly (within 5-7 minutes) I would not confirm their answer. Instead, I questioned their answer and let them know that other groups were getting completely different responses. I asked two groups to get together and convince each other that their responses were correct. This process continued until everyone in the class was convinced that the answer was 300. It was a lot of fun; one of the students commented on how I was playing "mind games" with them.

We then proceeded to the Palindrome Problem. The students were remarkably engaged. They were up and about at their white boards and everyone was participating in the solution (we'll see if this continues for the rest of year :). The class ended prematurely so I was unable to get any feedback, but I did include a question pertaining to that class on their survey (Describe your first Math 12 class this year. What did you like/did not like about it? Did you think we were "doing mathematics"? Why or why not?)

On Monday, I plan on giving my students a survey asking a bit about their beliefs towards mathematics and their understanding of mathematics. I also included a few questions relating to writing in mathematics. I'll attach it sometime this week. I've also begun accumulating a list of potential writing prompts which I will also attach at some point.

I went to Superstore last week and I picked up journals for each of my students (18 cents for an 80 page notebook...a great deal!). I have a box ready in the classroom to store them and they will be mostly kept there. I would like them to remain in the classroom so I can read them regularly.

I'm hoping that through the journal writing, students will become more aware of connections they can make between what they are learning now and what they have learned before (Where have you seen this before? Where have you done something similar before? Explain). I also hope that they will become better at reflecting on their thinking processes. In addition, often when I ask students if they have any questions in class, there is usually quite a bit of silence. I'm hoping with the journals that students will be more comfortable sharing their questions/problems/concerns or that by presenting appropriate writing prompts, I will be able to pick up on them.

I am a little nervous trying this with a group of Grade 12s. They haven't done a lot of writing before so I think that some of them will be resistant. I think that I will also have to come up with some exemplars of what a good response looks like. Although I do plan on using the journals primarily as a formative assessment tool, I'm debating on whether or not to assign a summative mark to them at some point (and if I do, what kind of rubric should I use).

[delete]

re: 09/13/2009 - First Week

DeannaBerg Sep 23, 2009 1:35 am

I like the idea of your students having a journal; it seems like a great tool to assist them with becoming reflective thinkers.

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[delete]

re: 09/13/2009 - First Week
peterliljedahl Sep 23, 2009 2:29 pm
Some schools of thought are strictly against summative marks for journals. They feel it corrupts the process and, hence, what gets written. I think summative marks can be given but it has to be on well defined criteria like "How articulate was your description of how you solved it." Notice that this does not hang on mathematics but on their ability to tell a story.
[delete]

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Subject re: 09/13/2009 - First Week

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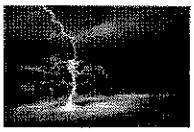

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09/27/2009 - Survey

skelin_m Sep 27, 2009 9:13 pm
09/27/2007 – Survey

On Monday of the second week of classes I handed out a survey for my students to fill out. I've attached it on my wikipage as "Mathematics Questionnaire." Since the block was only 40 minutes long, I asked my students to spend time thinking carefully about their responses; particularly when answering the questions on the second page. Most of my students took about 30 minutes to complete the survey.

The first page consisted of a series of statements to which students were asked to respond on a rating scale (strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, strongly disagree). I noted the responses to several statements that were of particular interest to me:

1)Group work helps me learn mathematics: Most students responded with 'neither agree nor disagree' – I suspect that students may not have much of an opinion since they have not done a lot of group work in mathematics to this point.

3)Anyone is capable of learning mathematics: Most students responded with either 'strongly agree' or 'somewhat agree' to this statement.

8)I enjoy doing mathematics: Surprisingly the students who were the highest achievers in Math 11 responded with 'somewhat disagree' or 'strongly disagree.'

12)I find it easy to express my mathematical understanding in words/writing: Most students either responded with 'neither agree nor disagree' or disagreed with this statement.

19)Writing is an important part of the mathematics classroom: Most students responded with 'neither agree nor disagree' – I suspect that, as with the group work, students have little experience with writing in the mathematics classroom and are therefore unable to formulate an opinion.

27)I feel anxious when I walk into a mathematics class: Surprisingly, the majority of the students responded with 'neither agree nor disagree' with some leaning towards 'disagree.'

29)After I have been tested on a certain mathematical concept, I usually forget it: Most students responded with 'neither agree nor disagree' or 'somewhat agree.'

The second page consisted of written response questions. I have included the questions and some student responses:

(1) Describe what you think problem solving is.

•finding the answer to a problem using the shortest and easiest solution possible
•the ability to identify a problem and using the correct method to solve it
•working through a question/problem systematically to find a correct answer
•finding all possible solutions to a problem
•finding a solution to a question/problem using knowledge, intuition and creativity; not necessarily using an equation to find a variable answer – different aspects of knowledge must be applied to problem solve

•thinking about the problem either individually or in a group and trying to find and answer by following a certain concept

(2) Describe how you feel about mathematics.

•somewhat interesting most of the time; usually find it quite logical, but when it's really hard, I feel really bad and stumped
•easy for me to learn and understand, but it gets boring for repeating the same concepts over and over again
•often times I am worried about my math marks and performance in class
•when I understand material I'm happy with mathematics; when not understanding it is easy to become frustrated with math
•I don't really enjoy it because it has consistently been the most difficult subject for me to grasp since early elementary school
•you can feel proud when you figure something out in math
•I really enjoy mathematics; what I like about it is probably the fact that there is always an answer (even if the answer is that there is no solution)
•I like puzzles and that's kind of what I see math as being

(3) When an assignment/test/quiz is returned to you, what do you do? (i.e: Do you simply look at the mark you received or do you take the time to correct your mistakes and understand where you went wrong?) Why do you do what you do?

•if it's a good mark I think I tend to look at it a bit longer just because I know that I could've gotten another problem right and done much better; but with a low score I don't really bother took as I know most of what I think I know is wrong
•I usually just look at my mistakes and correct them in my head, because I am too lazy to actually do the whole question over again
•primarily, I look at my mark because truthfully it's what I care about most; after I will review my wrong answers and usually ask questions about where I went wrong
•I usually don't bother with corrections unless they are for marks or gone over in class; this probably because I don't really have the motivation, and sometimes if I've got something wrong I become discouraged
•I first look at the mark I received, then look at the questions I lost marks on and try to figure out what I did wrong; I do all of this because I'm anxious about how well I did on a test, especially a hard one

(4) Have you ever tried to express any mathematical thoughts/concepts/processes in words/writing? Why or why not? Do you think this would help your understanding?

•yes, because sometimes I find it hard to express in mathematical signs and numbers; I think it helps my understanding because by reading the words, you understand it immediately, but for numbers, you might not understand some signs
•I use writing as it does make the steps to take much more clear; I don't like to but it does make the problem easier to explain
•not on my own, but sometimes in class we are asked to; sometimes I think expressing concepts in words over-complicates the learning process
•yes I have, occasionally if an equation isn't working I will write it out or even draw pictures to help solve a question; sometimes this helps and other times it just distracts
•yes, I find it pretty helpful because I am a 'words' person and it makes concepts simpler for me to understand
•a few times because I had to; it gets too complicated for me when it all turns into a bunch of words
•I find that expressing math I words just complicates it so I don't express math in words

(5) When you do not understand something in mathematics, what do you do? Do you communicate your lack of understanding with the teacher? Why or why not?

•I will ask my peers and probably go to my teacher
•if I don't understand something I ask someone I know who does understand; I also tend to look up things I don't know online as it gives more examples and ways to solve, this tends to help a lot

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•sometimes when there is a big test coming up I usually communicate with peers/teacher; otherwise not really
•I always ask questions until I understand the concept in class
•sometimes it can be intimidating to ask to go over material again; it can feel like holding back the class; most of the time I'll go back later and attempt to learn it...this doesn't always work
•I don't usually tell the teacher because when I don't understand something I often seem to be the only one who doesn't; so it can get a bit embarrassing

(6) How do you know when you understand something in mathematics? Explain.

•when I can do many math problems of the same concept and get them most or all of them right
•it just...clicks
•usually when something clicks in my head I suddenly make a lot of connections (to previous concepts); also when I can explain it to someone else and make them get it – that's true understanding
•when I'm able to do a variety of questions from a certain concept without looking or asking anywhere for assistance
•when you are able to find a solution to a problem and explain how you got there
•I know that I have understood something when I can solve a question on my own and do well at a test

(7) Describe your first Math 12 class this year. What did you like/did not like about it? Did you think we were "doing mathematics"? Why or why not?

•it was mathematics because it (the problems) had logic, concept and numbers
•I don't particularly like these problems but they are not boring either
•my first class was fun; it wasn't intense math so there was no pressure
•I think we did mathematics, but nothing really on a Grade 12 level
•it was a good start to Math 12
•sometimes I don't enjoy trying to do non-formulate math; yes it was math, but I'd rather be learning a new concept rather than testing our pre-existing mathematical knowledge
•I liked it because it was more relaxed; we didn't dive right into a textbook
•yes we were doing math; math is numbers and manipulating them and thinking about them (which is what we were doing) – it doesn't mater that I have never used numbers like that, it matters how my brain dealt with them
•I feel the first class we weren't really learning anything
•working in a group was a bit annoying because you have to communicate your thought process and go along with how they want to solve it

(8) If you could change several things about the way mathematics is taught or learned, what would they be?

•I'd keep chapters short so that we wouldn't have to memorize so many concepts at once for a test
•I think math is taught the way it should be right now; we go over the topic and then practice the material
•use examples of how we use it in real life; a lot of the time math is frustrating because you think what is the point!
•if it was more interesting or engaging, I might like it more
•sometimes it feels like things are rushed
•I'm pretty content with math
•less information, more homework

I was quite surprised by the generally positive feel that most of the students have towards mathematics. Although not all of them claim to enjoy math, most of them are confident that it is possible to be successful in mathematics. I was pleased with this response because I was worried that with a set of Grade 12 students, they would have a preconceived idea that only a certain population can 'do mathematics.' While responding to the questions on the second page, students expressed that when they do well in mathematics, they feel proud and accomplished but that they can also easily feel frustrated when things are not going well.

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In terms of writing in the mathematics classroom, students generally had no opinion on its usefulness. Several students stated that they find it somewhat difficult to express their mathematical understanding in words (something that became quite obvious in their first journal writing attempt – which will be alluded to in the next discussion). Most students remarked that expressing mathematical concepts in words is useful, but a few notable exceptions stated that it often made things more "complicated." Several students commented that they knew they understood something in mathematics when it "clicked" or when they could explain a concept to someone else. One student even suggested that she knew she understood something in mathematics when she could make connections with previous ideas/concepts (something that I would like to encourage/explore).

I was not surprised that all the students mentioned that when they receive tests/assignments back, that they check for the mark first. As a result, for the time being, I will not be assigning marks to any of their journal entries. I was surprised; however, that a few students mentioned that when they do poorly on a test/assignment, they do not try to see where they went wrong because they feel there is "no point." After the students write their first test, I am considering asking them to complete corrections, but in a way that requires them to write out their solution (perhaps a 'story' of how they came to that solution).

In summary, it appears that I have a generally positive group of students who are willing to try to do well in math (which is fantastic!) It appears that although they may have done some writing in the mathematics classroom previously, it has not occurred on a consistent basis.

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re: 09/27/2009 - Survey

skelin_m Oct 20, 2009 11:46 pm

The survey is attached to my main page.

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Subject re: 09/27/2009 - Survey

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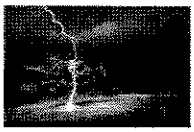

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09/27/2009 - What is a Function?

skelin_m Sep 27, 2009 9:54 pm
09/27/2007 – What is a Function?

During the first class of the second week, my students completed the Mathematics Questionnaire. The second class was spent in a lockdown situation :(while reviewing some basic functions.

We began the Transformations unit during the third class. I decided to not spend so much time reviewing Grade 11 material this year as I had done the years previous (as we discussed in class it seems to make more sense to 'review on the fly,' if necessary, instead of bunching everything up at the beginning of the year). In an effort to cut down on note-taking time in order to give my students more opportunities to work on problems and write in their journals, I have decided to use photocopied notes; that is, I am (slowly) typing up my notes with blanks in appropriate places for students to work out examples and such. This seems to be consuming a lot of my time but I think it could be beneficial in opening up time that could be spent on journal writing and other activities.

I am also planning on decreasing the amount of homework that I give my students; as mentioned in an article I just recently read, journal writing should not be implemented on top of current homework, but in place of it (or in conjunction with decreased homework). I am still a little nervous about this because I am cutting out some of the problems that are similar but are just "asked differently." Yet, ultimately one of my goals as a math teacher is to teach my students to feel confident enough to approach problems they have never seen before and to have the skills to deal with them.

We spent the third class of the week studying vertical and horizontal translations (the class was about an hour long). I tried some visualizing techniques that were mentioned in one of the geometry articles Nathalie asked us to read (where students were asked to close their eyes and try to see the picture in their "minds"). I also asked the students to use their hands/bodies to demonstrate these translations. We finished the lesson during the next class (in Inter-A we have math about 3-4 times a week and classes range from 45 minutes to 70 minutes long). At the end of the lesson, I distributed a journal to each student. They seemed to enjoy the idea of getting new and individual notebooks.

I asked them to make a Table of Contents with the first entry titled "What is a Function." My instructions to them were: "Write a paragraph describing what you think a function is. You can't include more than one equation but are welcome to use diagrams." I also asked them to come up with an example if they could (one that wasn't an equation). My students really struggled with these instructions; many of them stated that they did not know where to start. As I was circulating, I also heard a few remarks of "This is so hard, I know what a function is, but I can't write it in words." Some students tried to sneak a peek in their notebooks for the definition and many asked how they would be marked on this (I told them it was not for marks and that seemed to alleviate the anxiety a bit).

Most of the students expressed that a function "has only one output for every input;" however, they often wrote this in terms of x values and y values (i.e: for every x value, there is only one corresponding y value). Many of them stated that a function "passes the vertical line test" without really explaining why the vertical line test "works." Every student drew a diagram of an example of a function and not a function on the xy-plane (except for one student who drew some sort of machine). One student stated that functions "are used to discover rates or make predictions."

Two of my students wrote down examples of functions that were not equations. One alluded to the function as a gumball machine (which was a bit incorrect) and another stated:
For every seed you plant, one flower grows (function)
When you plant a bush or tree, many flowers grow (not a function)

Although all of the students were able to produce a decent 'definition' of a function, few were able to go beyond the equation; it appeared they lacked a bit of intuitive understanding. Many of the students had a difficult time trying to express their thoughts in words (or it could have been that I didn't phrase the question properly?) Although there was that struggle, the writing did reveal their understanding better than a multiple choice-type question. I did comment in each student's journal and I'm hoping that this will be an effective way to communicate with them. Although I currently do not plan on summatively assessing the journals, I think I need to come up with some sort of rubric to help the students with their explanations and defining their thoughts. Any ideas?
[delete]

re: 09/27/2009 - What is a Function?
peterliljedahl Sep 28, 2009 4:12 pm
`Yet, ultimately one of my goals as a math teacher is to teach my students to feel confident enough to approach problems they have never seen before and to have the skills to deal with them.`- this is an excellent point that we often overlook. If we want our students to be able to handle anything then we can`t give them everything!

You will get so much information about what students understand (and not) about functions from this entry - information that would be jeopardized if you were assessing. Once you start assessing journals they become obsessed with putting down the right answer rather than what they think. What you can do is now comment on their entries and ask them to respond to your comments. How they respond is fair game to rubrics and assessment. I suggest you have a wiki exchange with Patrick about this!
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Subject re: 09/27/2009 - What is a Function?

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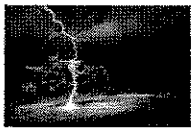

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09/27/2009 - Third Week

skelin_m Sep 27, 2009 9:58 pm
09/27/2007 – Third Week

During the third week, I did not teach any Math classes because our entire program was away for three days on a retreat on the Sunshine Coast. It was a lot of fun! We did a lot of cooperative games and worked on group skills. We also had a great Skit Night and Talent Show :) The Friday after the retreat we spent the morning as a program (150 students from Grades 7-12) working on Sudoku and Logic Puzzles.

I have not yet returned the journals to the students. They will have the opportunity to look at my comments on Tuesday.
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Subject re: 09/27/2009 - Third Week

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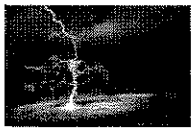

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10/04/2009 - First Journal Response & Photocopied Notes

skelin_m Oct 4, 2009 8:17 pm
10/04/2009 – First Journal Response & Photocopied Notes

As mentioned in last week's update, I had just recently assigned my students their first journal entry "What is a Function." I spent quite a bit of time commenting on their entries; I wanted to try to give my students some useful feedback instead of just writing "good work" and various other simple statements. As I was going through their work, I noticed that many of my students were confused about the input vs. output aspect of a function. This helped guide my instruction for Tuesday's class; instead of jumping into a new topic, we discussed some of their misconceptions about functions.

While commenting on their entries, I wrote down questions asking them to clarify/explain their ideas or to generalize/create other examples. As I was reading their work, I noticed that there were small groups of students who had similar ideas/misconceptions about functions. At the top of each student's page, I wrote down the name of another student that I wanted them to talk to and discuss their entry with. At the end of Tuesday's class, I gave my students about 10-15 minutes to review my comments, talk amongst themselves and answer any questions that I had posed. It was great to see them walking around and talking amongst themselves (on topic!) I had a group in the corner arguing about the vertical line test (I had asked nearly every student to explain why they thought it was a "good test") and another group trying to come up with real-world examples of functions. I found that the first journal entry was quite successful in revealing the understanding of my students and guiding my instruction. In addition, by asking my students to read and think about my comments and answer the questions I posed, I believe my students deepened their understanding of functions (however, I don't know how I could collect 'data' on this).

In regards to instruction this week, the photocopied notes are going very well! The feedback I have received from my students has been overwhelmingly positive. At least 4 students have come up to me individually and said they liked the photocopied notes because instead of focusing on copying everything down, they could pay more attention in class, work through the examples and ask questions as soon as they didn't understanding something.

I have also structured the notes so that I spend less time at the overhead and more time circulating around the classroom. For example, this week we looked at reflections and compressions/expansions. I began the lessons with my students graphing a basic function on their graphing calculators. A transformation was then applied to that function and they were then asked to graph the new function on their calculators. Then they compared the two graphs and were asked to write a conjecture about what they thought the transformation was "doing" to the original function. The next task (without their graphing calculator) was to test their conjecture on another function. Most of the students were able to then continue on in the notes without any further instruction from me. Whenever I had a pair of students finish, they would compare their work and then compare with other students until eventually the whole class came to a consensus. I spent most of my time with the students instead of dictating at the overhead; it was a nice change in the Math 12 classroom :)

As mentioned in one of my previous posts, I have decided to decrease the amount of practice problems that I give as homework since I plan to spend the last 10-15 minutes during many classes on journal writing. While my students were working through some examples during Friday's class, I flipped through their notebooks and was pleased to notice that all of them

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(except for one) had completed all the practice problems assigned so far. In addition, I was also happy to note that my students are asking a lot more questions in class. I don't know what to attribute this to; it could be that they're just a more inquisitive bunch than all my previous classes!

On Thursday I asked my students to write another entry in their journals. This time, I gave them a pretty standard transformations questions (given a point on a function, what would it be on a transformed function). I asked my students to solve the question, but write it in a descriptive way such that a student who had been away from the lesson could understand it. I've flipped through some of the responses; some seem very detailed while others look like a point-form list. I did notice, however, that there was some confusion about the inverse, so that is something I plan on addressing in tomorrow's (Oct. 5) class.

Since I've been teaching Math 12, I have rarely collected any homework/practice problems. I've given out assignments, but they were more like 'glorified' homework problems. During my class on Friday, one of my students asked me why anyone would need to know how to transform a function. I gave her an example of using a function to model some real-world phenomenon and how we often have to transform it to more closely model that phenomenon and to make further predictions. After class, I thought that the 'assignment' for the Transformations unit could be something where each student is given a set of data (fortunately I only have 13 so this shouldn't be overtly difficult) and asked to find a function that would model it, using the appropriate transformations. I would ask for a written component as well, describing the 'story' behind the process. I'm still working on it; has anyone given an assignment that has worked particularly well during the Transformations unit?
[delete]

re: 10/04/2009 - First Journal Response & Photocopied Notes
DeannaBerg Oct 5, 2009 4:49 pm
I like everything that you're doing in your class! It sounds like you're doing a LOT of work, though: commenting on all of their journal entries and typing up notes for every class! That's great news that the students are appreciating/enjoying all of your hard work!
I like that in one of the journal entries, you asked the students to write in a way to describe something to a student who would have been absent for that class. That seems like it would put that entry into a more real-life situation. . . and wouldn't it be convenient if there actually was a student away that day!
[delete]

re: 10/04/2009 - First Journal Response & Photocopied Notes
peterliljedahl Oct 7, 2009 8:15 am
This is very impressive. I'll let others get into the conversation before I comment more, but I do have a question? You mention that reading the journals helps you see their misconceptions/confusions. How many journal entires do you feel you need to read before you get a sense of what the class has understood from your lesson?
[delete]

re: 10/04/2009 - First Journal Response & Photocopied Notes
DanicaMatheson Oct 16, 2009 8:24 pm
Interesting! I love that you had students finish their notes without you. I frequently give students time to work through examples on their own but they always know that we will do it together when we are done. It sounds like you are having a lot of fun and trying a lot of new things in your class. I also really liked that you had students generating their own examples. It would be fun to explore the effect of that practice further....

Writing all those comments by hand must have taken forever! Did you find that it was worth it?
[delete]

re: 10/04/2009 - First Journal Response & Photocopied Notes
skelin_m Oct 20, 2009 11:52 pm
I usually read about four to five entries and then I have a pretty good idea of what my students have understood from the lesson. Reading them is the easy part, writing useful feedback/comments is harder. Although I do dread it a bit (in that it takes up a fair bit of time) I find it extremely worth it. I try to have a "conversation" with my students; I usually ask them to

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answer questions or to clarify their thoughts/ideas and then I read their responses. It really is an excellent tool to see what my students "got" from the lesson. I find that the journal entries are also helping me guide my instruction, I usually pick up on misconceptions right away and can address them next class and generate some sort of class or partner discussion.
[delete]

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Subject re: 10/04/2009 - First Journal Response & Photocopied Notes

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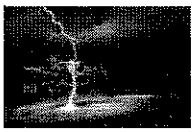

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10/20/2009 – (Fifth Week) Small Frustrations...

skelin_m Oct 20, 2009 10:44 pm
10/20/2009 – (Fifth Week) Small Frustrations...

This week was a bit of an odd week. Since the Grade 12s had various assemblies to attend, we only ended up have two short Math blocks. We spent the first class discussing the inverse a bit more in depth (I asked the students to look through their journals and respond to any questions I asked) and then began to look at combinations of transformations. I posed a couple of questions and asked the students to work in groups to come up with the transformed functions. As with the previous classes, this format worked quite well; I was able to circulate the class instead of spending most of my time at the overhead.

However, that night, I began to look at "my schedule" and realized how "far behind I was." This of course proceeded to stress me out and I unfortunately spent most of the next class lecturing from the overhead. Although I was not pleased with it, I'm starting to worry that my new method of teaching is "taking too long." I guess it's something I have to consciously tell myself not to stress too much over and realize that student understanding is what I'm really aiming for (not meeting a pre-determined schedule).

That being said, I also grappled with some (potentially major) frustrations this week. First, I noticed that there were several students who were falling back into the "I won't really try to do the problem, because I know that the teacher will eventually share the solution with me" mode. In addition to wondering how to deal with this, I'm also wrestling with how to encourage persistence in my students; many times, when working on challenging problems, my students will give up or turn to someone else for assistance way too quickly! (Although I do encourage discussion between students, sometimes this discussion isn't necessarily "collaborative").

I am also grappling with the idea of assessment. For now, I am not conducting any homework checks and am trying to come up with meaningful projects for each unit in Math 12. However, at the same time, I don't want to overwhelm my students with quizzes, tests, daily homework practice and weekly journal entries. I'm sure in the next couple of weeks these are some of the things that I will be thinking about more closely...
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Subject re: 10/20/2009 – (Fifth Week) Small Frustrations...

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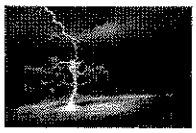

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10/20/2009 – (Sixth Week) Quiz and Reciprocal Transformations

skelin_m Oct 20, 2009 11:04 pm
10/20/2009 – (Sixth Week) Quiz and Reciprocal Transformations

During the first class this week, my students wrote their quiz on Transformations. After reading some of Peter's contributions to the wiki, I decided to take a different approach to my usual quiz format. At the beginning of class, I put the most difficult question on the overhead, and allowed my students about 10 minutes to work on it together. They were explicitly told that this question was the most difficult one on the quiz. They were permitted to consult their notes and anyone else in the class (I, however, did not take any questions). Most of the students were shocked and a bit confused. It took them about 2 minutes before they realized the opportunity and started to collaborate. The class ended up dividing into three groups. There was a lot of discussion and students trying to convince one another that their solution was correct. Eventually there was one "leader" in each of the groups to whom most of the students were listening. The students were then asked to return to their seats and had approximately 30 minutes to complete the quiz on their own.

The next class, after finishing up some activities on absolute value transformations, I asked the students to complete two journal entries. The first entry was a reflection on their quiz. They were asked to respond to the following questions in regards to their quiz: Was it fair/unfair? Why or why not? Did you like the "beginning activity"? Why or why not? Did it reduce/increase your anxiety? Explain.

I was surprised by some of the responses. I expected everyone to have appreciated the chance to collaborate with other students on the most difficult problem on the quiz; however, I had 3 students who commented on how they didn't like it and how it did not reduce their anxiety (all these 3 students scored a 97% on the quiz). One student mentioned that he wished for more time and felt stressed out by the fact that other people were getting different answers. Another student mentioned that she had felt very confident going into the quiz (0% anxiety in fact), but after seeing other people working through the problem and getting different answers, her anxiety level was raised. The third student mentioned that seeing the most difficult problem as the "first problem" she encountered caused her to panic.

The rest of the students, however, had a relatively positive response to it. Several mentioned that by seeing the hardest question ahead of time lowered their anxiety level because they were reassured that the rest of the quiz had to be easier. One student stated that watching everyone work on the problem together helped him relax. Another student said that knowing he could solve the most difficult question, raised his confidence level and made him feel better going into the quiz because he knew he could solve the simpler questions. Interestingly enough, one student mentioned that although he liked the format of the quiz, he felt as though I had allowed some form of "cheating."

Although allowing the students to work on the most difficult problem together appeared to stress out 3 of my highest-achieving students (on that specific quiz), overall, there was still a positive response to the activity. Although I can't necessarily quantify it, there was definitely a more easy-going, less anxious vibe in the classroom, which was a nice change. I am still a bit concerned though, because it appeared that the activity caused some students to doubt themselves; students who are otherwise usually confident in math. Perhaps this phenomenon could be related as well to this whole idea of how students often need other people (primarily the teacher) to verify their work/ideas before they are confident they are correct. I'm hoping to

explore this in the next few months and encourage my students to become more confident "self-reflectors."

That being said, in addition to the reflection on the quiz, I asked students (for their second journal entry) to choose one question from the quiz which they felt that they could improve on and re-do it, with a full written explanation. I circulated extra copies of the quiz and they flipped through them trying to determine which one to re-do. Several students complained that it wasn't "fair" because they couldn't see their responses and really had no way to know if they were correct. I encouraged them to review the quizzes with other students and try to reflect on their weaknesses and strengths to figure out where they might have gone wrong. I'm still debating with myself whether or not this was a useful activity, or if it would have been better for me to return the quizzes first. I have yet to match up their journal entries with their quizzes.

During the last class of the week, I asked my students to complete another journal entry; however, this one related to Reciprocal Transformations. I first asked my students to graph a line and a parabola, apply a reciprocal transformation and then use their graphing calculators to graph the new function. Their task was to use these pictures and explain in their journal how they could graph a reciprocal transformation without using a graphing calculator. I asked them to look for any patterns and to try similar examples to come up with ideas. At the beginning, there was a bit of resistance to the activity. Some students didn't "start," I think they assumed that I would give them the answer. Eventually, after my usual wait-time had passed, they grudgingly began to slightly engage. Some students tried to elicit ideas from me, but I refused to answer any questions.

Eventually one of my students piped up that "it looks like the x-intercepts become vertical asymptotes." After that, the discussion and writing began to flow a bit more. Some students were confused about the intercept/asymptote relationship so I asked the student who had discovered it to assist them. I think she rather enjoyed doing this, "historically", she has not been a very strong math student (interestingly enough, she often produces the most in-depth journal entries and has recently blossomed in class).

Although some students were eventually able to come up with some good patterns/relationships, I found that the activity was rather difficult for most of them. Some of them just didn't want to think about it, they felt entitled (in a way) to an algorithm provided by me. I noticed a real lack of a willingness to be persistent (something that I'm also now intrigued in pursuing). Yet at the same time, I recognized that many of my students have previously experienced very passive environments in the math classroom and I realized I need to be persistent in providing opportunities for my students to "construct their own knowledge." (As a bit of an aside, I also noticed that a lot of students mentioned in their journal entries that they thought the quiz was fair because "they had seen similar types of questions before." As I mentioned in a previous wiki update, I really want my students to be able to problem solve their way through questions they had never seen before [which also ties in with persistence and a willingness to take risks]).

Eventually, many students were able to pick up on several patterns and were able to articulate them in their journals (I have not read all of them yet). I hope to lead a discussion next class on exploring/explaining why these patterns/relationships occur.
[delete]

re: 10/20/2009 – (Sixth Week) Quiz and Reciprocal Transformations
DanicaMatheson Oct 21, 2009 11:15 am
Wow, you bring up a lot of interesting ideas. I really like your choice of journal questions. It looks like the math journal has become a really great tool for you to improve your teaching (as well as for them to reflect and clarify math concepts). It also seems like a really great opportunity for you to listen to your students and build a relationship.
[delete]

re: 10/20/2009 – (Sixth Week) Quiz and Reciprocal Transformations
DeannaBerg Nov 12, 2009 1:53 pm
It sounds like there is some pretty neat stuff going on in your classroom!
[delete]

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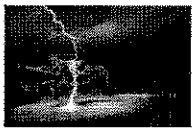

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10/25/2009 – (Seventh Week) Results of Reciprocal Transformations Journal Entry

skelin_m Oct 25, 2009 8:54 pm
10/25/2009 – (Seventh Week) Results of Reciprocal Transformations Journal Entry

As I mentioned in last week's wiki update, my students found the activity of looking at several graphed examples and trying to find a way to graph reciprocal transformations without a calculator to be rather challenging. Several of them were waiting for me to give them the "answers" or "procedure" while others were having a difficult time finding where and how to get "started." As we discussed in last week's class, I think that many of my students believe the teacher to be the "holder of all information" in the classroom and do not have a lot of practice or opportunities in coming up with their own ideas. I was hoping that with this activity the students would be challenged to think, and to construct knowledge for themselves (thus deepening their understanding).

As I was reviewing their responses, I noticed that most of my students were able to pick up on several patterns and were somewhat able to express what they saw in words. In addition, some students came up with supplementary examples to verify the patterns and relationships they were coming up with. I noticed while I was reading the entries, however, that none of my students came up with an explanation as to why these relationships occurred. This could have been because of the way I posed the journal prompt, but nonetheless, in my comments to each of my students, I challenged them to give reasons for the relationships and patterns.

As I mentioned in a previous wiki update, I was also concerned because it appeared that some of my students were not putting as much effort into their entries as they had at the beginning of the year. In fact, I noticed that most of these students were the ones who typically performed well in mathematics (these were the students who mentioned in the survey that they feel there is no need to change the way that mathematics is taught). I think these are the students who are used to not thinking in the classroom and having the teacher give them the knowledge and procedures that they need to be successful (which happens to work for them). They are not used to coming up with their own ideas or reflecting on their work; they are happy with "the way things have always been." As a result, when responding to these students, I specifically challenged them to write better entries and wrote a few words about how I am encouraging them to get to the next level, that is, not just to be able to imitate procedures/algorithms, but to understand and explain "why." For the next unit on Logs and Exponents I think that I will take the suggestion that was brought up during our last class and have my students create a portfolio of their best work to be handed in at the end of the unit (which will consist of, among other things, their journal entries and their responses to my comments/questions).

I have yet to return the journals to the students; we only ended up having one class this week because of a Vancouver Playhouse field trip and a South Asian festival. What I discovered, however, that by spending some time thinking about Reciprocal Transformations and somewhat constructing their own knowledge, the lesson that followed the journal writing activity went a lot more smoothly and quickly than in years past. Referring to their comments, we were able to formalize them and engage in a bit of a discussion of why the relationships emerged. After this, the students were able to work through all the examples without my assistance. I then had the students wander around the classroom, sharing their work and making sure that everyone was on the same page. In retrospect, although it was a bit difficult getting the students to buy into this journal entry, it was well worth the effort.

In addition, this week, I assigned the students their first project of the year. Their assignment is

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to create a "mother function" (such as Math Mouse) and to apply a combination of transformations to it that would result in 10-12 transformed functions. The goal is to demonstrate that they have a sound grasp of the concepts covered in this unit. I was also inspired by Patrick's wiki update on treating assignments as "artist portfolios" and challenged my students to showcase their best work in a creative way.

This next week my students will be away on a Biology field trip, so I will only have two math classes, one of which will be the review "session" before their test on Transformations. In light of our discussion last week, I am thinking of giving my students one of my past Transformations test and asking them to "tear it apart." :)
[delete]

re: 10/25/2009 – (Seventh Week) Results of Reciprocal Transformations Journal Entry
peterliljedahl Nov 10, 2009 5:34 am
Nice! When giving a portfolio assignment remember that you can specify the number of journal entries you want to see, and leave it up to them to choose which one. You can also require that they include a response to one of your comments that you give them on their journals.
[delete]

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Subject re: 10/25/2009 – (Seventh Week) Results of Reciprocal Transforma

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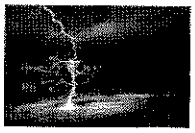

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11/01/2009 – (Eighth Week) Transformations Review and Test

skelin_m Nov 1, 2009 9:49 pm
11/01/2009 – (Eighth Week) Transformations Review and Test

As mentioned in my last wiki update, this week I only had two classes with my Math 12 students: the first being a review session and the second, their Transformations unit test. I decided to discard my old review routine and try one of the methods that we discussed in our October meeting. I photocopied last year's test and handed out a copy to each of my students. I then paired them up and asked them to "rip the test apart." I told them that it was too long, there was too much repetition (all true facts) and asked them to rework the test so that it would best reveal if a student writing it understood the concepts from the past unit. I was very impressed with the results; it was the most productive review session I have ever witnessed.

As I circulated the classroom, I heard some great conversation happening within the pairs. One student would suggest cutting a question, while the other would give reasons why it was a "good" question and why it should remain. Students were either trying to combine questions or re-write their own. They were flipping through their notes and examples and making comments such as: "Remember when we learned this? It's important," and "This question is too easy and doesn't test ." For the first time, all my students were actively involved in the review process as opposed to being passive listeners: they were evaluating and making judgments. When I wrote the test, I carefully looked over my students' suggestions and incorporated many of their examples and recommendations.

On Thursday, the students wrote their Transformations test. Most of them agreed that it was fair; I, however, have yet to mark them. In order to keep in the "spirit" of the journal writing activities that my students have been engaging in, in addition to 'numerically/graphically' solving problems, I asked the students to write out their solution process in words (with an explanation at each step) for several questions. For their corrections, I also plan on asking my students to do the same writing process for each question they need to correct.

I'm looking forward to the next unit on Logarithms; I think that there will be a lot of fantastic opportunities for journal writing. I was flipping through the Math 11 textbook of one student that I tutor and I noticed that there are some great writing prompts that I could use (hopefully they are also in the Math 12 text -- Addison-Wesley).

Aside: I have attached a pdf file of some Math Writing Prompts I found on the internet.
[delete]

re: 11/01/2009 – (Eighth Week) Transformations Review and Test
karlhk Nov 10, 2009 11:30 pm
Hi I'm just coming on board and like what you are doing. I'm actually quite envious, as i tried journal writing before and it flopped because I couldn't keep up with reading and commenting back, so YOU ARE AWESOME.

I had one thought regrading your corrections for the test. I like the idea of writing out the solution process. I was wondering if is worth writing what they did wrong. Making them think about why it's wrong. It may make them better at predicting their own mistakes. It may deepen their understanding knowing what is right, what is wrong and WHY.
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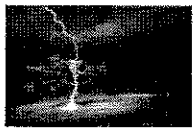

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11/11/2009 – (Ninth & Tenth Weeks) What is meant by a Logarithm?

skelin_m Nov 11, 2009 4:06 pm
11/11/2009 – (Ninth & Tenth Weeks) What is meant by a Logarithm?

Since this week I only had one short Math 12 class with my students (due to a two-day week and Remembrance Day assembly); I have combined my Week 9 and 10 observations.

Last week, I handed back the Transformations unit tests that my students wrote in the previous week. Although I had a range of marks from 46% to 100%, on average, my students appeared to do better this year than my group from last year (maybe it's the journal writing :). In previous years, I have always asked my students to complete corrections. This year, in addition to completing corrections and providing the correct numerical/graphical solution, I have also asked students to include a written component to each solution; that is, they are to describe in words how they came about the answer and explain their solution process and reasoning. I remember reading an article late in the summer that described an undergraduate mathematics course where students were asked to do something similar: write out an explanation of their solution on tests/homework assignments. When asked to reflect on this process, many of the students in the class shared that although they were initially resistant to this writing, they eventually came to appreciate that it helped deepen their understanding of mathematical concepts. Through this "new correction process" (and the journal writing activities), I hope that my students too will eventually begin to appreciate the value of writing in the mathematics classroom.

(Aside: Karl made a great suggestion on one of my previous wiki updates: in addition to asking students to write an explanation of the correct solution, to perhaps ask them to also write an explanation of where they went wrong and reflect on why it produced an incorrect solution. I plan on doing this after the next unit quiz/test). – Thank you Karl!

In addition, last week, I collected my students' unit projects on Transformations. Although I have yet to assess them, they look absolutely fantastic: most of them certainly look like pieces of artwork! Several students created large elaborate posters while some created colourful booklets; they really are fantastic! Hopefully I can take a picture of some of these with my camera and upload them so you can have a look.

This last week I also started a new unit on Logarithms. The journal entry for this week was: "Write to explain what is meant by a logarithm. Use some examples to illustrate your explanation." This prompt was taken from the 'Connecting Ideas' sections in the Math 12 Addison-Wesley textbook. I have uploaded a document with these prompts from the text and will be updating it as I progress through the Math 12 units. Most of the prompts are quite good and target conceptual understanding. I have also uploaded a document titled "Math 12 Prompts – 2009/2010" which will be a continuously updated list of all the writing prompts I will be giving my students throughout the year.

As with previous journal entries, I allowed my students about 15-20 minutes to complete their responses. Although they have not completed an entry for a while, I was impressed with the willingness with which they approached the journal writing. I think the students are becoming more accustomed to writing and are realizing that it is becoming a permanent fixture in our classroom (a part of the "culture of the classroom"). I was pleased to hear a lot of discussion in the class; many of the students were generating ideas in small groups before writing anything down. Within these groups, several students were bringing up Log Identities, the Change of Base Rule, etc. while other students challenged them with "that's not really what a logarithm IS...those

are just nice tricks."

As I reviewed their responses, I noticed that many students expressed that logarithms were necessary/helpful in order to solve for "variables in the exponent." While several students discussed the significance of having this logarithmic function, some did not and I challenged them to think about it (and write about it) when commenting on their entries. I noticed that most of the students were showing more effort in trying to explain their thoughts clearly and were coming up with their own examples to illustrate their explanations. In my comments, I also encouraged some students to explore and explain the relationship between the exponential function and the logarithmic function. As with all previous journal entries, I commented on each and posed at least one question to each student that they will be asked to respond to when I return their journals. Although I have yet to return the journals to all the students, I did ask several students to share their responses during the one class we had this week.

While looking over the entries, I remembered a comment that I believe Peter made in one of our classes together; that is, at the beginning of the unit on logarithms, all the students know what a logarithm IS, but by the end, after all the 'tricks' and algebraic manipulations, they seem to forget the big idea. Hopefully with this journal entry, as a class, we can keep referring back to it whenever all the little details get in the way of understanding what the big idea of the logarithm is.

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Subject re: 11/11/2009 – (Ninth & Tenth Weeks) What is meant by a Logarith

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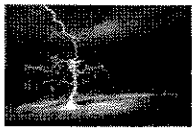

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11/25/2009 – (Eleventh Week) Graphs of Exponential and Logarithmic Functions

skelin_m Nov 26, 2009 9:00 pm
11/25/2009 – (Eleventh Week) Graphs of Exponential and Logarithmic Functions

This week we started looking at the graphs of exponential and logarithmic functions. In the past, I have found that students tend to approach units as disconnected entities; that is, they have a difficult time recognizing connections between concepts. This week, I really wanted the students to recognize how to connect their knowledge from their Transformations unit to this section on graphing.

In the past, my lessons on graphing exponential and logarithmic functions have been primarily teacher-centred. Typically, I model some examples on the overhead and then allow the students some time to work through several more problems. This year, I instead displayed the equations of several exponential and logarithmic functions on the board and asked them to work in groups to create graphs for each of them. After some discussion and sketching, they eventually identified the role "of the base" in the exponent and/or logarithm and somewhat recognized the asymptotic behaviour. They were then able to establish the "mother functions" (that's what we call our basic functions) and soon realized that the transformations were the same as what they had studied in the previous unit. It was also nice to see students discussing how to find the x and y intercepts, in order to graph more accurately.

These revelations certainly did not occur spontaneously. I wandered around the classroom and had to ask many leading questions. I did, however, always try to avoid the use of any statements; everything was a question. As Brian mentioned in one of our classes together, the students seem to think of the teacher as the "holder of all knowledge." I wanted to challenge them to be more confident in what they were doing and be able to self-assess their work. After a while, I then asked the students to create some of their own functions, graph them and find their inverses. Once again, I hoped that the students would be able to proceed without my instruction. I have noticed that they are starting to look less at me for guidance and more to themselves or their peers.

Before I formalized any of this learning, I asked the students to write their journal entry for the week. Relating to their previous activities, the prompt was: "Using the examples from today, describe how you can graph exponential and logarithmic functions. Incorporate your knowledge from the transformations unit and include several examples."

That night, I responded to their journal entries. They were fairly well done. Most of the students discussed the "mother function," the asymptotic behaviour and were able to articulate a pattern for generating key points. Several students also mentioned that since the exponential and logarithmic functions were inverses of each other, they only had to "know" how to do one, and all the key points and asymptotes would "switch" for the other. All the students mentioned the R(eflections) E(xpansions) C(ompressions) T(ranslations) transformations and were able to explain what "they did." There were, however, some misconceptions. Some students confused the base and the vertical stretch/compression and reflection. In addition, since the input variable was in the exponent or in the logarithm, there were two students who did not "deal" with them, because they thought the transformations were different than those from the previous unit.

I addressed these misconceptions in their journals (asking each student one question at least) and discussed them with the students during the next class. As I am sure I have mentioned before, the journals have been a great guiding tool for my instruction (and a way to check for

understanding and address "big ideas"). The usefulness of them was further cemented when one of my students came up to me and expressed how valuable she thought it was when we discussed misunderstandings in class. She mentioned that she is sometimes nervous to ask questions in class, but is happy that most of her questions get answered when we discuss the journal entries.

At the end of the week, we also pulled out the journals to review the responses on "Defining a Logarithm." I just wanted to make sure that amidst all the graphing and algebra, that students still understood the "big idea" of the unit.

I have updated the "Math 12 Prompts – 2009/2010" document.
[delete]

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Subject re: 11/25/2009 – (Eleventh Week) Graphs of Exponential and Logari

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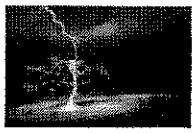

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11/26/2009 – (Twelfth Week) Log Laws & Domain/Range

skelin_m Nov 26, 2009 10:11 pm
11/26/2009 – (Twelfth Week) Log Laws & Domain/Range

This week we began by discussing and generating 'Log Laws.' Instead of just presenting the properties/laws to my students and giving them problems to work on, I put them in groups of three, gave them a couple of leading examples and asked them to look for any patterns and to generalize their observations. Once the students were well on their way to discovering these laws/properties, I asked them to prove or explain why they worked. The students were able to explain the properties, but the proof of the laws was too challenging for them. So, instead, I modelled the proof of the Product Law, asked them to write an explanation for each step and then asked them to generate the proofs for the Quotient and Power Law (using the Product Law as an example). As a final exercise, I asked the students to see if the Log Laws were analogous to any other laws that they had studied before.

Once we formalized this learning, I gave the students several problems to work on and asked each group to generate the solutions. Since the students had spent so much time actively constructing their own knowledge of the laws/properties, they had very few questions. I was pleased to see that most of the students ended up being an "expert" for one problem at least once.

After we spent a couple of classes exploring the Log Laws, I decided to address exponential and logarithmic functions again in their journal entries. Although the students were able to proficiently graph the functions, I was unsure if they really understood the behaviour of the graphs. The prompt was: "Why are there restrictions on the domain and range of exponential and logarithmic functions (consider asymptotes)? (i.e: Why can't we "have" certain values of x and y?) Support your response with at least two examples."

When I posted this question, I could tell that most of the students had no clue where to begin; but I was pleased to note that they automatically formed groups of two or three and started discussing. Most groups began by graphing the "mother functions" and were trying to reason why there were asymptotes and why the function existed on only one side of the asymptote. The students spent about 20-25 minutes on this response, but it was well worth the time; all the students were particularly engaged during this journal writing activity. I even had two students come in at lunch to add to their entries; they told me that they had been thinking through the prompt during their last class and now had a bit more understanding.

I responded to the entries right after school today and I was quite impressed with their responses. Although most of the entries consisted of unclear explanations or misconceptions, I could tell that the students had put a lot of effort into their work. There were many diagrams, examples and words indicating that although they were struggling, they were struggling to understand. I also noticed that the amount of text/words in the journal entries is increasing. I think that many of the students are anticipating me asking "why?" to many of their statements and are focussing on trying to explain themselves as much as possible. Tomorrow, the students will be writing a quiz, but I certainly will address some of the issues that came up in the journal entries. Although the majority of the students were able to somewhat explain the restrictions on the range of the exponential function, most of them were unable to articulate the restrictions on the logarithmic function. In addition, some students are still a bit shaky on domain/range and asymptotic behaviour which I addressed in their particular journals with several explanations and questions.

This week, I also received some feedback from the students on their Transformations project. Although they said that it was "weird" and unusual to be assigned projects in a senior mathematics course, they enjoyed doing something different. One girl said she had a lot "fun" doing it and wanted to know when the next one would be assigned. :)

For the Logarithms unit project, I plan on taking Peter's suggestion and asking the students to submit two to three of their journal entries including a response to the comments I made and answers to any questions I may have asked. I also think that I might borrow Brenda's idea of asking my students to create a concept map for the unit. In the past, in the Science courses I have taught, I have found that concept maps have really given students the opportunity to explore relationships between concepts and to deepen their understanding. I hope that creating one will also be a good way for my math students to demonstrate their understanding as well. I am currently co-teaching Science 10 with a colleague of mine and he has created a fantastic rubric for concept maps. I hope to modify it for a Math unit and will post it once it is ready. I think the journal writing so far has been a great formative assessment tool and I would like to start incorporating other aspects of formative assessment such as rubrics, exemplars and self-reflection. In regards to self-reflection, I like what Lisa has been doing in her classroom; asking the students to reflect on different methods of solving the same problem. I hope to incorporate something similar in the upcoming weeks.

[delete]

re: 11/26/2009 – (Twelfth Week) Log Laws & Domain/Range

DanicaMatheson Nov 28, 2009 8:00 am

I absolutely love that the journal writing is working out so well for you. Prior to this course I had only met one other teacher who had tried journal writing in math and it tanked. It's great to see that if it's done right it can be really beneficial. You have totally inspired me to try it out in my own class... when I have one - in what feels like eons from now.

[delete]

re: 11/26/2009 – (Twelfth Week) Log Laws & Domain/Range

peterliljedahl Dec 22, 2009 7:24 pm

I agree with Danica. This is potentially the best example of a teacher making journals have intrinsic value I have seen. The students are buying in because they see that value ... for them!

[delete]

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Subject re: 11/26/2009 – (Twelfth Week) Log Laws & Domain/Range

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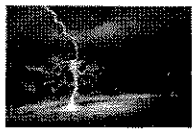

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01/03/2010 – (Thirteenth & Fourteenth Weeks)

skelin_m Jan 3, 2010 6:37 pm
01/03/2010 – (Thirteenth & Fourteenth Weeks)

During these last two weeks we have been finishing up our unit on Exponents and Logarithms. We spent our time working on solving logarithmic equations and application problems. Since many of my students are also studying Chemistry and Biology they really seemed to appreciate the pH and growth/decay problems.

We only had the chance to complete one journal entry in the last two weeks. The prompt was: "Create two logarithmic equations, one which has no solution and the second which has exactly one solution. One equation can have logarithms on both sides of the equation, however, the other equation must be 'different' (i.e: logarithms on only one side of the equation). Once you have created the equations, solve each of them and explain, in words, the solution path."

Initially the students had a bit of a difficult time getting started; however, I was impressed with their perseverance. As the months have passed by, I have observed that they have been more willing to work through a problem, instead of giving up after a few minutes. During this particular writing activity, I noticed that none of my students asked for my help initially; instead, they were moving around the classroom and asking their peers for help and clarification. As a result, I was able to wander about, silently observing. Gradually, I have begun to notice that my students are becoming more confident in their ideas and thought processes and are not coming to me as often for constant verification. I think that this is due in part to me trying to respond to their questions with a question of my own or with a non-committal comment. We are slowly shifting away from the idea of me as the "holder of all mathematical knowledge" to the students recognizing that they too, have valid mathematical knowledge and ideas.

While working on this journal prompt, one of the students eventually decided that the best way to approach the problem would be to "work backwards." Soon enough, the idea travelled throughout the class. As I looked through the responses, I once again noticed something that I commented on in my last wiki update: the students are writing more and are becoming more comfortable with explaining their steps/ideas (and these explanations are gradually becoming more eloquent). In addition, I think that the initial level of frustration that was sometimes present when I assigned a writing prompt is somewhat decreasing. I think that the students were initially frustrated because they had never really been asked to "write out their thoughts" and had a difficult time expressing themselves in words. Now, the students are taking more risks and willing to try different things; I think my students are encouraged by the fact that I do not assign any "marks" for the journal entries. At the same time, however, for students who sometimes "slack off" in their entries, my comments challenging them to put more effort into their writing seems to be working.

In the thirteenth week, I also assigned the students their final project for the Exponents and Logarithms unit. They were asked to resubmit two journal entries that were "re-worked" and that addressed my comments and questions. In addition, they were also asked to complete a Logarithms and Exponents Concept Map. I have posted the assignment and rubric on the wiki (one of my colleagues, Anthony Jay, created the rubric for "the concept map;" I borrowed it and modified it slightly). During the final week before the holidays, we will be having a review session and the students will be writing their Logarithms unit test.

[delete]

1 - 2 of 2

re: 01/03/2010 – (Thirteenth & Fourteenth Weeks)
peterliljedahl Jan 12, 2010 8:52 pm
Nice result - the greater comfort with writing part that is.

The part about handing in two (reworked to answer questions) journal entries is great. This not only values their efforts at journaling but it also allows them to showcase their best work. This is important in a field that is often assessed using a deficit model (trying to find what they CAN'T do).

I look forward to seeing how it turns out.
[delete]

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Subject re: 01/03/2010 – (Thirteenth & Fourteenth Weeks)

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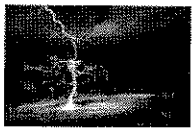

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01/03/2010 – (Fifteenth Week) Logarithms Review

skelin_m Jan 3, 2010 7:15 pm
01/03/2010 – (Fifteenth Week) Logarithms Review

Since I was ill during this week, I was in for only one Math block. During this block, we had our "review session" for the Logarithms unit test. Since it worked so well for the Transformations unit, I gave my students a copy of last year's Logarithms Unit Test and asked them to work through it and "rip it apart." As during the last unit, the students were very engaged in this activity and there was a lot of discussion and collaboration amongst the students. In fact, one student specifically sought me out to mention that she preferred this method of review and found it "very useful."
[delete]

re: 01/03/2010 – (Fifteenth Week) Logarithms Review
peterliljedahl Jan 12, 2010 8:53 pm
Interesting. So, do you think the students are more critical of your last year's tests because they demand greater coherence now?
[delete]

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Subject re: 01/03/2010 – (Fifteenth Week) Logarithms Review

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re: 11/01/2009 – (Eighth Week) Transformations Review and Test
peterliljedahl Nov 11, 2009 6:24 am
Nice extension suggested by Karl here!
[delete]

re: 11/01/2009 – (Eighth Week) Transformations Review and Test
DeannaBerg Nov 12, 2009 2:46 pm
It's good to hear that the new type of review was a success!!
I like how you're incorporating so much writing. Your students seem on the right track for thinking mathematically and being able to express their ideas and thought processes!
Oooo, that's a neat idea, Karl!
[delete]

re: 11/01/2009 – (Eighth Week) Transformations Review and Test
sean_mcgovern Nov 21, 2009 2:05 pm
Thanks for putting up the "59 writing prompts"! I finally got a chance to read them, and I plan to use some with math 9 class.
[delete]

re: 11/01/2009 – (Eighth Week) Transformations Review and Test
BeckTed Dec 1, 2009 9:20 pm
Could you give a little more detail about what it means to 'rip the test apart'? were they analyzing/re-working the questions or working their way through the test?

A question about journals, too. Is the writing about solution-processes a regular activity? I've never asked math students to write in a journal and I am curious.
[delete]

re: 11/01/2009 – (Eighth Week) Transformations Review and Test
skelin_m Jan 18, 2010 3:29 pm
I gave my students the Transformations test from last year and asked them in a sense to "rewrite it." That is, to assess whether or not the questions tested for understanding and how to modify/add to them if they didn't. Quite a few questions ended up being combined or replaced.

I try to do a journal writing activity at least once a week. Every once in a while I will ask the students to "write out their solution;" explaining each step in words. It's a good way to see why things "go wrong" when they do.
[delete]

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Subject re: 11/01/2009 – (Eighth Week) Transformations Review and Test

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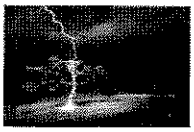

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01/10/2010 – (Sixteenth Week) Geometric Sequences

skelin_m Jan 10, 2010 7:13 pm
01/10/2010 – (Sixteenth Week) Geometric Sequences

I began the New Year by introducing the unit on geometric sequences and series. I also collected the Exponents/Logarithms projects I had assigned before the break. Although I have yet to assess them, the re-written journal entries appear to be of high quality and most of the concept maps look impressive.

In order to introduce sequences I started Monday's class with the Locker Problem that is posted on our Pot-Luck Problems page. I had my students working at the whiteboards and I found it to be an engaging way to start Math again after a break. All the groups managed to find the solution and were able to describe how further solutions could be generated. Two of the groups managed to develop a reasonable argument to explain their solution; I was quite impressed with their responses, their mathematical explanations are much more sophisticated than they were at the beginning of the year. I then had the students circulate and share their explanations with the other groups. We then spent some time exploring the Fibonacci sequence and the Golden Ratio which several of the students seemed to enjoy immensely; some of them came up to me after class asking more questions and for more information. I then shuffled the groups and had the students reviewing arithmetic sequences and exploring other recursive and explicit sequences.

The next class, we began the lesson by generating a geometric sequence and developing a formula for the n-th term of any geometric sequence. In previous years, I had simply provided my students with the formula; however, in the next few months I am challenging myself to provide as many opportunities as possible for my students to generate and develop their own mathematical formulae/algorithms. The students were then able to proceed to the examples without much instruction from me.

During the final class of the week, I assigned a journal entry. They spent most of their class working on various problems related to geometric sequences and the last 20 minutes were reserved for their journal entry. The prompt was:
1) What is a geometric sequence? Give one example of such a sequence and show/explain why it is geometric.
2) Write to explain the similarities and differences between a geometric sequence and an exponential function.

I expected that all of the students would respond to the first prompt fairly well. One student, however, confused geometric sequences with arithmetic sequences while another wrote in such a way that it appeared he thought geometric sequences were the only "sequences in existence." Several students also did not recognize how the common ratio was constant. The entries to this prompt reminded me how easy it is to miss student misconceptions when it comes to even basic terms and definitions (and thus making me once again realize the validity and usefulness of journal writing!)

The second prompt came for the Addison-Wesley Mathematics 12 textbooks. I particularly liked this prompt because it encouraged students to explore and discuss some of the relationships between their current unit on geometric sequences/series and their last unit on exponential/logarithmic functions.

While I was reading the set of responses to the second prompt, I was surprised by the number of misconceptions that were revealed. The majority of the students commented on how the

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"common ratio" of a geometric sequence and the "base" of an exponential function were constant; however, although many noted the differences in the "exponent" of an exponential function and geometric sequence, not one of them explained the difference (which I addressed with a question in my comments). While reading the entries, most of the written work indicated that many of the students considered geometric sequences as a list of numbers, while the exponential function produced "just one term." Several students surprisingly stated that in contrast to a geometric sequence which exhibited patterns, there were no patterns "between the terms" of an exponential function.

When responding to and reflecting on these journal entries, I recognized once again, how useful they are for determining exactly what my students understand. Although certain relationships and connections may be obvious and clear to myself, they are often not so to the student. I think that the journal writing for my students is one of the most challenging activities they undertake in my class, but at the same time, the most rewarding. It forces them to grapple with ideas that they oftentimes may not encounter when simply doing examples from the textbook. I think that the students are also starting to recognize the validity of the journal writing; I overheard one of them stating that "he obviously didn't know as much as he thought he did about exponential functions."

I have updated the "Math 12 Prompts – 2009/2010" document.
[delete]

re: 01/10/2010 – (Sixteenth Week) Geometric Sequences
peterliljedahl Jan 12, 2010 8:57 pm
The reason the journal entries are useful for determining exactly what your students understand is that they are generative prompts.
[delete]

re: 01/10/2010 – (Sixteenth Week) Geometric Sequences
karlhk Jan 15, 2010 3:37 pm
By locking their thoughts in to words they give their thoughts form that has borders and definition. This allows each student to better use these thoughts and ideas.

I have always found that no matter how well I think I know something it gains clarity when I change these thoughts into words.

Is there a worry of making borders? In Math 10 Chapter 1 there is Arithmetic Sequences. Much later is Chapter 5 Linear Functions. The Textbook separates them and called them different things. Is there a worry that words will make barriers between then? or will journals make more bridges?

Sorry Melanie I was just thinking about the power of words. Your stuff is great.
[delete]

re: 01/10/2010 – (Sixteenth Week) Geometric Sequences
skelin_m Jan 19, 2010 8:10 am
At least once a unit I ask my students to reflect on previous "mathematical concepts" they have learned and write a journal entry connecting these ideas to their current unit. For most of them it is quite difficult, they tend to "compartmentalize" the mathematics, but it's useful; they're starting to "see" the connections. I agree, things certainly gain clarity when you try to put them in words :)
[delete]

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Subject re: 01/10/2010 – (Sixteenth Week) Geometric Sequences

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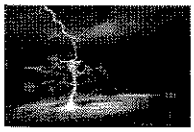

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Looking Back

skelin_m Jan 17, 2010 6:57 pm
Looking Back

As I look back on my wiki updates from the last few months, I realize what a valuable role journal writing has played in my classroom. Although the research I conducted over the summer supported writing in the mathematics classroom, I was unsure as to how my field study would progress. I was worried that a group of Grade 12 students who had never really participated before in writing activities in the mathematics classroom would not buy into the idea of "journal writing."

One of the initial challenges I encountered was deciding whether or not I should assess the journal writing with a numerical mark. I was tempted to assign the mark in order to "motivate" my students to spend time on their entries and to put effort into them. Yet by assessing them in this way, the students would be tempted to write what they thought they wanted me to read instead of sharing their true thoughts, ideas and struggles. In retrospect I am glad that I did not assign any marks for the journal writing; four months later, I can recognize that the students are beginning to find intrinsic value in these writing activities. For the times when students neglect to put much effort into their writing, usually a comment in their journals sparks a renewed sense of vigor.

Another initial challenge that I faced is how to integrate the journal writing while still "covering" all the material in the Principles of Mathematics 12 curriculum. An article I had read in September, explicitly stated that journal writing should not be added in addition to the students' current workloads but in place of something, such as homework questions. This was challenging for me, because I wanted my students to be able to solve all types of problems that might appear on summative assessments. Upon further consideration, however, I realized that journal writing activities could allow students the opportunity to engage in and reflect on many of the big ideas that I hoped my students would come away with from the mathematics classroom. I also recognized that if I wanted my students to become true problem solvers, I should instead be providing them with opportunities where they could grow in their confidence to engage in the problem solving process (which would often be with problems they would have never seen before).

While looking back over the last few months, I recognize that although challenging my students to explain their thoughts in writing and to reflect on the "why" of certain mathematical concepts is useful, it is just as important for me to provide them with constructive feedback. Instead of just responding with a "good work," it is more valuable to write relevant comments and to question my students (and to expect responses back). I try to pose questions that challenge my students and probe for deeper conceptual understanding. Granted, I only have 13 students, so this is not as arduous of a task had I a class of 30 students, but I can see that my students appreciate the effort and take the time to read my comments, reflect on their work and respond to my questions.

Each week, I have continuously been impressed with the amount of useful feedback that the journal writing has provided for me as an educator. After reading even a few journal entries I have a general idea of what my students' understandings are and this provides me with countless opportunities to guide my instruction; the entries allow me recognize misconceptions or interesting mathematical ideas that may not have been revealed in other classroom activities.

At the beginning of the year, many students struggled with the journal writing. Their initial entries

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were algorithmic and some barely scratched the surface of mathematical ideas and concepts. I have, however, noticed a marked improvement in their writing over the last four months. While in the beginning of the year I consistently had to ask the students to elaborate on their thoughts, their journal writing now reflects more willingness to explain their steps/ideas (and these explanations are gradually becoming more eloquent). I have also noticed that there has been an increase in how much effort the students are putting into their work; their entries consist of many diagrams, examples and words indicating that although they are struggling, they are struggling to understand. In addition, I think that the initial level of frustration that was sometimes present when I assigned a writing prompt is somewhat decreasing. I think that the students were initially frustrated because they had never really been asked to "write out their thoughts" and had a difficult time expressing themselves in words. Now, the students are taking more risks and are willing to try different things.

An interesting byproduct of the journal writing is the amount of communication that occurs in the classroom as a result of it. When the students are beginning the writing process they tend to migrate around the room, having discussions with one another and bringing their journals along with them. Near the beginning of the year, the students would come to me first for assistance, but they are now instead asking their peers for help and clarification. I have also noticed that they are becoming more confident in their ideas and thought processes and are not coming to me as often for constant verification. We are slowly shifting away from the idea of me as the "holder of all mathematical knowledge" to the students recognizing that they too, have valid mathematical knowledge and ideas.

Journal writing has been quite successful so far in my classroom; writing has become a part of the culture of our classroom. The challenge is to continue to integrate writing activities in the classroom and to provide useful feedback, particularly during times when I feel that "I am behind" or when I am challenged by those who believe writing does not belong in a senior mathematics course. I want to also continue to impress upon my students the validity of writing in the mathematics classroom, by continuing to integrate it in other activities and assessments such as final unit projects, tests and corrections. I would also like to continue to challenge myself to incorporate more problem-solving activities/sessions and to continue to work towards more student-generated notes; increasing my students' confidence in their ability to engage in mathematics.

[delete]

re: Looking Back
peterliljedahl Jan 19, 2010 3:06 pm
The work you have done is exemplary in (at least) three ways:

1) building a culture of journaling in your classroom
2) building intrinsic value in journaling (no small feat)
3) decentralizing the knowledge away from you

Now - here is the $64000 question - what if someone (or you) wanted to give these students credit for the hard work they have done. I said credit rather than a mark because you are already giving feedback and they are doing it and learning from it. Thus a mark serves neither the purpose of feedback or motivation. Could you/would you do it? If so - how? And - when?

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Subject re: Looking Back

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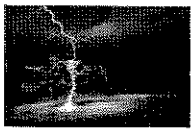

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02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series

skelin_m Feb 8, 2010 10:14 pm
02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series

This week (seventeenth) we continued our unit by exploring finite and infinite geometric series. In the past, I have found that students have a difficult time grasping the idea of an infinite geometric series having a finite sum. They find it fairly easy to complete the practice problems, but I frequently suspect that they do not have an understanding of the concept. As a result, the journal entry for my students this week was:
"Write to explain what it means when we say that an infinite geometric series has a sum even though it is not possible to add the terms. Give an example and explain."

In class, we had already discussed the example of having a gold brick and doling out half, then half of that half, etc...forever. For their journal entry, I challenged the students to come up with another example that could illustrate an infinite geometric series with a finite sum. Although most of their examples were based on the gold brick, there were some very creative responses (one student had quite an elaborate and descriptive pizza party with an infinite number of guests). The majority of the entries were fairly well done. As I have mentioned before, the students are putting a lot of effort into explaining their ideas and attempting to use correct mathematical terminology. There were a few misconceptions (confusion between the common ratio and common difference, and incorrect conditions on the common ratio).

At the beginning of the next week (eighteenth) I was able to address some of these misconceptions in class. Although I have yet to respond to the journal entries, reading them only takes a few minutes and gives me a fairly accurate snapshot as to what needs further clarification. After a bit of discussion amongst themselves, I allowed the students a few minutes to revise their journal entries. I hope to comment on them sometime this weekend.

During this week, we also began to explore applications of geometric sequences and series problems. Instead of going over them as a set of notes, I split the class into groups and gave each group a problem to solve. After a bit of coaxing I managed to get them all at the whiteboards. I found that it was an engaging activity for the students and they hardly needed any input from me. I think that many of them were surprised that they already had all the knowledge in order to complete the problems even though they had never seen them before. I also overheard some discussion relating some of the problems to their previous work on Logarithms and Exponents. As the groups finished their respective problems, I had them travel around the room, looking at the other problems and solutions. I also pulled out my digital camera and took photos of their solutions and then had the students pose with them. I think this was the first time I have tried this with this group of students; they were pretty excited about the 'photo op.' :)

The next class, we formalized the work the students had done on the boards into written notes. Most of the students were able to generate their own notes since they had engaged in the activity during the previous class. As mentioned in the previous paragraph, I think that many of my students were impressed with their ability to persevere through the problems with little assistance from me. During the last class of the week, the students wrote a short quiz on geometric sequences and series.

This last week, I also marked the final project that I had assigned the students for the Exponents and Logarithms unit (the concept map and two "re-worked" journal entries). I was quite impressed with the high level of quality work that my students produced. Some of the concept

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maps were amazing! Several of my students came up with profound cross-links that I did not anticipate. I was also pleased to see some references to their previous unit on Transformations. The "re-worked" journal entries were also impressive. The new responses were much more sophisticated and developed than their initial work. They had clearly spent the time reviewing my comments/questions and reflecting on their work to come up with deeper and more intricate responses.
[delete]

re: 02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series
peterliljedahl Feb 10, 2010 8:09 pm
There is lots of good stuff in here. The piece about the students taking their own notes was especially interesting. Do you think it was effective?
[delete]

re: 02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series
skelin_m Feb 10, 2010 11:40 pm
Definitely. There was so much more "thinking" involved by having the students make their own notes as opposed to copying stuff from the board. They had to choose how to organize the information and which would be the best examples to include. And it was a much more active process; most of the students were gathering input from their peers and looking at "different ways" to solve problems.
[delete]

re: 02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series
DanicaMatheson Feb 11, 2010 7:29 am
I love the idea of students making their own notes. It definitely turns it into a thinking process. I have a few students in my memory banks though that I could see being really uncomfortable with this. Mostly, this would be a result of them seeing me as the "provider of knowledge". Do you think it was successful because you have already worked to change this conception? Do you think it would have worked equally as well at the beginning of the year?
[delete]

re: 02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series
skelin_m Feb 23, 2010 10:49 pm
I think it boils down the culture that I have been trying to create/have created in my classroom. Although I was lucky to have received a group of students I already knew at the beginning of the year, and therefore this task was not as challenging perhaps, we have come to the point where the students are willing to "go with the flow" and to try different things. I also think that through the journal writing, the students have engaged in experiences where they have had to organize their thoughts and write to explain; skills that are helpful when generating their own notes :)
[delete]

re: 02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series
atootian Feb 24, 2010 8:06 pm
Do you offer a template to those who have difficulty to start making their own notes? I have about five of them in my grade 9 class that are waiting for me to start. I was thinking of starting with a couple of sentences to lead, and leave the rest of it, as blank, to be completed by students, or drawing vertical and horizontal lines to organize their pages for correct location of graphs and amount of written materials. A math 12 teacher in our school does it to save time in note taking and is happy with the result of it.
[delete]

re: 02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Series
skelin_m Mar 7, 2010 10:48 pm
I generally use a template for notes but when I ask the students to write their own I do not give them anything. I find that they have been taking notes for so long that they have a generally good idea as to what they should include. I walk around and may give suggestions but I'm trying to encourage students to make meaning for themselves.
[delete]

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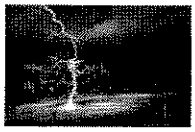
Subject re: 02/08/2010 – (Seventeenth & Eighteenth Weeks) Geometric Ser



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02/08/2010 – (Nineteenth & Twentieth Weeks) Semester Break & Geometric Sequences & Series Test

skelin_m Feb 8, 2010 10:19 pm
02/08/2010 – (Nineteenth & Twentieth Weeks) Semester Break & Geometric Sequences & Series Test

Nineteenth week: Semester break

Twentieth week: During the first class after the students returned from the semester break, we reviewed for their upcoming test on Geometric Sequences and Series. As with the previous two review sessions, I handed out last year's test and asked the students to "re-work" it. The next class the students wrote their test. Since Friday was a pro-d day, we only had two classes this week.

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Subject re: 02/08/2010 – (Nineteenth & Twentieth Weeks) Semester Break &

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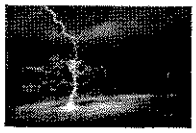

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03/07/2010 – (Twenty-First & Twenty-Second Weeks) Trigonometric Functions

skelin_m Mar 7, 2010 5:38 pm
03/07/2010 – (Twenty-First & Twenty-Second Weeks) Trigonometric Functions

This week we started our unit on Trigonometric Functions. Although the idea of radian measure was new to the students, I decided instead to focus this week's journal entry on the "big ideas" of trigonometric functions. I was curious to see what they understood about trigonometric functions. Although they have spent some time working with them in previous grades, I have always suspected that their understanding may be somewhat 'slippery,' especially when beginning to look at trigonometric functions of angles greater than ninety degrees. Therefore, the journal prompt for this week was: "What are trigonometric functions?"

While I was looking through their entries, I noticed that although there was some discussion of ratio, some students simply wrote down SOHCAHTOA accompanied by a diagram. It appeared that for many of them this acronym was the 'big idea' of trigonometric functions. I was not overly surprised and was glad that I selected this prompt. Most of my comments included challenges relating to SOHCAHTOA and asking students to extend their ideas to trigonometric functions of angles that are not acute. When reading the responses I noticed that several students were dissatisfied with their understanding of trigonometric functions; they expressed how they were trying to explain what they were but realized that they did not really understand 'the trigonometric function.' This was one of the first times that a student actually posed a question to me in their journals.

I think this journal entry was rather significant because it revealed a real lack of understanding of trigonometric functions. Next week, I plan to readdress some of the issues that arose in the entries and ask the students to write another prompt that is revised but similar to this week's. Reflecting on this journal prompt makes me really wonder how many students have passed by in my classroom in the previous years, knowing how to 'do the algorithm' without really understanding the concept.

During the next week, we started looking at the graphs of sine and cosine functions. I provided my students with some angular measures and asked them to generate the graphs of the functions. This was a surprisingly confusing activity for my students. They did not really 'get' what to do, which emphasized or perhaps explained some of the challenges they experienced with last week's journal entry. There seemed to be some sort of disconnect; many of the students did not see the sine and cosine functions as 'functions.' Although they have spent so much time working with functions in general (and I feel the students have a generally good grasp of the concept), they did not consider sine and cosine functions as 'functions,' but rather as tools simply useful for finding "missing sides and angles of right-angled triangles." So I took a step back and recognized that now would be a good time to discuss their journal entries and the 'big ideas' of trigonometric functions. After a fair bit of discussion, I then assigned their next journal entry:
"The sine, cosine and tangent ratios were originally defined for acute angles in a right triangle. Write to explain how these ratios are defined for any angle in standard position. Include an explanation of how the extended definitions are consistent with the original definitions for acute angles. Include diagrams with your explanations.

After the in-class discussion and taking note of the comments I had included in their previous journal entries, the students were able to articulate their thoughts fairly well for this entry. While I was reading the entries and commenting, I was quite impressed with their explanations and extensions of the original definitions.

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Near the end of the week, we returned to graphing sine and cosine functions. This time around, generating a graph for the basic functions was a fairly straightforward activity. We then pulled out the laptops to explore the relationship between the unit circle and the graphs of the trigonometric functions. I remember using technology earlier in the school year, but the use of it in my classroom has waned in the last few months. The student response to the activity was overwhelmingly positive so I hope to focus more on the integration of technology in my classroom sometime in the future.

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Subject re: 03/07/2010 – (Twenty-First & Twenty-Second Weeks) Trigonome

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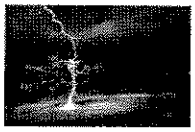

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03/07/2010 – (Twenty-Third & Twenty-Fourth Weeks) Graphs of Trigonometric Functions

skelin_m Mar 7, 2010 5:39 pm
03/07/2010 -- (Twenty-Third & Twenty-Fourth Weeks) Graphs of Trigonometric Functions

After last week's introduction to the graphs of sine and cosine functions, I started this week with the following journal prompt:
Compare the graphs of the sine and cosine functions. In what ways are they similar? In what ways are they different? Write to explain the similarities and differences. Use examples to illustrate your explanations.

The responses were very well done. Most of the students explained how sine and cosine functions differed by a phase shift and discussed how therefore any sinusoidal curve can be expressed as a sine or cosine function. They also articulated why the functions were periodic and some related this idea back to some of the work they had done in Physics 11. Two students expanded their discussion to include the relationship between the unit circle and the trigonometric functions and one student included an explanation of how transformations could be applied to the functions. While responding to their entries, most of my comments included clarifying questions about terms/definitions and asking for a discussion of the relationship of the unit circle and how to apply transformations.

The next class, I returned their journals and allowed them some time to discuss amongst themselves how transformations could be applied to the functions. Without giving the students any notes, I put up several transformed sine and cosine functions on the board and asked the students to graph them. For the rest of the class, they worked in groups to generate graphs of the functions. The next class, we looked at the graphs and formalized some notes together on graphing transformations of sine and cosine functions. This 'backwards-type' of lesson was just as successful as the few times I have tried them before. In addition to integrating more technology in the classroom, I'm looking forward to trying more of the 'backwards' lessons in the future.

During the twenty-fourth week we spent some time reviewing for a test on the material we had discussed on Trigonometric Functions. We completed the usual review activity with a test from the previous year. I also handed out the rubric for this unit's project (I have attached it).

—

During the last two weeks I have been having many interesting conversations with a colleague who is working on a Master's in Imaginative Education. I'll post some questions in the Discussion Forum; I'd be interested in hearing some of your thoughts.

I have updated the "Math 12 Prompts – 2009/2010" document.
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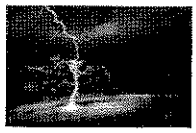
Subject re: 03/07/2010 – (Twenty-Third & Twenty-Fourth Weeks) Graphs of



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04/07/2010 – (Twenty-Seventh & Twenty-Eighth Weeks) Trigonometry & Physics

skelin_m Apr 7, 2010 11:19 pm
04/07/2010 – (Twenty-Seventh & Twenty-Eighth Weeks) Trigonometry & Physics

The first day after coming back from spring break, I had my students in groups, working on 'Applications of Trig Functions' problems. Unlike in years past, where I have explicitly gone over the 'different types' of applications problems on the overhead, this year, I just gave my students the problems and let them work through them together. Every group experienced some degree of success in solving their problem and as with previous 'backwards-type' lessons, the students were quite active in constructing their own knowledge; they were able to generate notes the following class.

For the last two weeks, I have been trying similar 'backwards' lessons in my Physics class. The students are spending more time in groups, working through problems, and experiencing success. Given enough time, they are able to use what they know and problem-solve through different types of situations. I have been giving them 'never-before-seen' problems in my formative and summative assessments, and unlike in previous classes, where they would complain because they "had never seen that type of problem before," they are now instead approaching each problem in a more positive manner. They are engaging in these activities with the mind-set that they have the tools and the ability to solve the problem, and are comfortable with problems that take time to solve and do not offer instant gratification.

For my Math 12 class, I've recently been thinking about their final project. I like the project that Sandra implemented in her Calculus class and posted on her wiki a little while ago. A few of my students will be away on a Europe trip for two weeks in May so I'm also looking forward to doing some fun problem solving activities with the ones who aren't going. In addition, this week I plan to have my students write a journal entry on solving trigonometric equations.

As of late, I've been thinking a lot about assessment (as mentioned in several of my article discussions). The journals have been an effective formative assessment tool so I certainly will be continuing with them next year. Although my Physics students do not have a coil journal, I have been giving them writing/discussion prompts and have been commenting on them. Like in my Math class, I have noticed a marked improvement in my students' ability to explain their understanding and to get at the 'big ideas' of physics. This summer I hope to rework some of my ideas around assessment.

Last week, I borrowed Sean's 'Blocks on an Incline Activity' for my Physics class (thank you Sean :)). Instead of giving the students a prescriptive procedure and/or data collection chart like I usually do in labs, I gave the students the purpose of the lab and asked them to devise a method on their own. Within their groups, they were all able to come up with a reasonable procedure and implemented it. Although it took a little longer than it would have had I provided the students with the explicit task, they were quite engaged and were having some great conversations based around physics :) I hope to implement some other activities where the students will have to come up with their procedure/method on their own.

I marked the rewritten journal entries and projects that were assigned just before spring break. As with the previous journal rewrites that the students have done, I was very impressed with the quality of work produced. In addition, many of the projects were absolutely phenomenal. I've posted some pictures for your perusal.

[delete]

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