I had a really hard time getting started on this paper. I felt the topic was so broad, and I didn’t really think I knew how people understood mathematics. I began by re-reading and highlighting things that we read for class. That was how I realized that although I agreed with parts of some and parts of others, I didn’t agree with anything completely. I decided that nothing can cover every situation that might come up, and most authors took a lot of liberty by assuming some things and ignoring others. That is when I decided that I would dispute everything that I disagree with and come up a few of my own ideas that I believe to be true in all situations. Well, I hate to say all because you never know what challenges you are going to face, and they always surprise you, but almost all situations anyways.

In my favorite article, Applications and Misapplications of Cognitive Psychology to Mathematics Education, it talked about the differences between the theories of situated learning and constructivism. They both make a lot of good points, but in my experience, neither of them could possibly be the gospel truth. Both theories are too specific to apply to every student in every learning situation.

Situated learning claims that all learning should be done in a context specific environment, and abstract learning is of little use. One of the claims is that knowledge does not transfer between tasks. If that is completely true, we would all be up a creek without a paddle. I think that this is probably true if and only if you teach solely in a context specific environment, and teach nothing of abstraction. A housewife can make some calculations faster than the average math student because she has had to in a
specific contest (the grocery store), but cannot transfer those skills. I believe that if she had learned the skills in an abstract setting in the first place, she could use those skills not only for grocery shopping but other applications as well.

Another claim situated learning makes is that real learning only occurs in real situations. I do think this is somewhat true, depending on what ‘real’ learning is. The fastest way to learn to perform a heart transplant is to observe and perform as many as possible, but wouldn’t one rather have a doctor who knows why they cut which artery where? Or one who is prepared for the unexpected? Or what if the doctor is the only one on call for an emergency; shouldn’t they have a little abstract knowledge about the subject? The point is, with the abstract knowledge, you take what you know with you everywhere instead of only being able to use it in one specific pre-programmed way.

The final claim of situated learning is that learning should always be done in a social environment, as most jobs are social. I completely disagree with this. First of all, I am not so sure that most jobs are social, but even in a social environment, calculations and knowledge have to be pulled from inside of your own head, no matter if any one else is around or not. Secondly, if all learning is done socially, it would be too easy for someone to hide their problems behind friends and classmates. I am not saying that social learning cannot be beneficial, it most certainly can, but nothing but social learning is going to be counter-productive for at least a few.

Overall, I disagree with situated learning. I do think that they make some good points. If we knew exactly what skills people were going to use and how they were going to use them, maybe we could make situated learning work, but it would probably be more profitable to open a psychic hotline. As I see it now, we need to prepare the students for
a thousand possibilities, and even that probably won’t cover half of what comes up. If we taught them in a context situation all of the time, a lot of students would be lost in the real world when something that they had never seen, or a situation they had never been in, occurs.

I am much closer, but not in sync with constructivism. Constructivists four claims are as follows: knowledge cannot be instructed, only constructed by the learner; knowledge cannot be represented symbolically; knowledge can only be communicated in complex learning situations; and it is not possible to apply standard evaluations to assess learning.

I suppose I will start with the first claim, knowledge cannot be instructed, only constructed. I find a fine line between the two. I am not sure that you can have one without the other; knowledge has to constructed and instructed. They are correct in the sense that without the student doing something inside of their own mind, a teacher cannot teach. This is purely a matter of motivation. If the student does not care and is not listening, a lecturer will get nothing through to them. But at the same time, a student can never just learn anything without someone teaching them. Yes, they can read about history, but someone had to write the book and someone had to teach the person who wrote the book and someone taught him also. We live in a world that teaches, learning doesn’t come from nowhere. We all learn something new everyday, but it is the teacher that teaches, we just have to have our minds open and ready.

The second claim confuses me. Knowledge cannot be represented symbolically? On the contrary, I find that most knowledge is represented solely symbolically. Many people cannot grasp things they can’t see. When we first learn to speak we have to see a
picture of a dog before we can learn the word. Even in math, think of the unit circle. It is a way for anybody to think about the sin and cosine functions in a simplified setting. And that leads me to claim three, (which also makes little sense to me); knowledge can only be communicated through complex learning situations. Maybe to really have a grasp on a complete schema, you need to have been in a complex learning situation. But how do you get the basics? There are millions of simple ideas that make up a big picture, and once you have almost all of them, you can begin to see the big picture. However, if you start with the big picture, and you need a small piece of it for something else, you couldn’t find it in a million years. You wouldn’t even know where to look. Furthermore, how long until the big picture falls apart without having all the pieces?

The final claim of constructivism may be the only claim out of eight that I can say I agree with; it is not possible to apply standard evaluations to assess learning. Although I think I would have to change it to: it is not possible to apply standard evaluations to correctly and completely assess learning. The current standardized tests only hinder our teachers. A teacher wants to make sure that student know how to do specific problems in a specific form for these tests, instead of assessing real progress of learning, and depth of subject knowledge. The sad thing is that I don’t have anything close to an answer to the problem. I think we as a country should continue to monitor schools and how the students are respectively doing, but I can’t come up with a single plausible alternative, or even a way to improve today’s tests. Perhaps we could have a test with crazy questions on it, questions that no one could have seen before. This way it would all be transferred knowledge. We could grade it generously, but I doubt anyone would do well. The SATs apparently attempt to test capability instead of simply subject matter (I don’t know
because I never took them), but the ACTs do not. All in all, I think maybe it is impossible
to use standardized test to assess learning. I just think that we should all be aware that
the tests are not very accurate.

Speaking of standardized tests reminds me of the articles we read by Schoenfeld,
specifically, When Good Teaching Leads to Bad Results: the Disasters of Well Taught
Mathematics Courses. In that article he spoke of how a relatively good math teacher
spent ample time on teaching the specific form of a proof that was going to be on the
standardized tests the students would be taking mid-spring. Schoenfeld talked about
what a waste it was and I almost completely agree. To take a quote right of his article:
“Students fail to use information from formal mathematics when they are in problem –
solving mode.” I think I could vouch for that. It wasn’t that long ago that I was in high
school, and there were many formalities that I have long since forgotten after taking the
ACT. My teachers could have spent more time on transfer and control, or gotten into
more complex subject matter if it weren’t for them felling the need (or pressure from
school board perhaps) to prepare everyone for the standardized tests. I would like to
note, however, that it is nice to have a formal form for certain things, so that we can
understand each other universally.

Schoenfeld’s first article was all about control, the benefits, and the teaching of it.
This was one thing I found to be totally agreeable. I think that obviously the more
control you have the better of you are going to be in any problem solving setting.
Showing students control is necessary because although some may find it natural, most
students are too busy trying to solve each individual problem to think about a faster way
to go about solving all of them. Studies have shown that this will lead to an undeniable
advance in transfer when compared to students who did not study control, but just the subject matter. Plus, teaching control is a good guide in case students find a ‘control path’ on their own that is incorrect or time consuming. As a teacher I plan to implement control into my curriculum, I can’t imagine how it wouldn’t be valuable.

After our last discussion in class, I have decided it would be best for me to talk about Skemp, Van Hiele, and Dubinsky all at once. I find that they all make very interesting points and I use pieces of all of their work to develop my own notions about understanding mathematics. I would like to begin by saying that I don’t think that there are exactly eight levels, nor do I believe they are even definable. Some times it takes more levels on certain subjects to really form a schema, and fewer levels to fully comprehend others.

The very first thing you learn about anything, you learn through empirical thinking. Your mom shows you a picture of a dog and says dog until you repeat her. Then, maybe you see a dog on TV or maybe your neighbors had a dog and all the sudden it becomes pseudo-empirical thinking, observations that now include inner thoughts. Then you begin to wonder if all dogs act the same way, and this is reflective. You’ve passed a level. Finally you get a book on dogs and you see that there are hundreds of breeds of dogs, not to mention all of the possibilities for mixed breeds. You are back to empirical and pseudo-empirical thinking as you read the book. Then as you see people walking their dogs and you see cats and you think about the differences, you begin to form a schema for dogs. Well, you had begun to form the schema when you first said dog, but now you have what can actually be considered a fully developed schema, a rather complete collection of knowledge that relates to itself and other schemas (which
could be developed or not). Suddenly, you can act like a dog and know that you are not acting like anything else, but a dog. And your dog schema will eventually be a small part of a larger schema that may be called mammals, which in turn would be a small part of a huge schema called living things.

In non-example terms, what I believe is that you begin by thinking empirically about something you have seen. Then you reflect about it and can see it as its own object. This is how you raise a ‘level’. Then you begin thinking about the new object as a whole empirically and thinking about other things that you find to relate to it, which in turn takes you up another level and so the cycle goes on until you get to state where a full blown schema has been created. I also think there are schemas inside of schemas. The entire mind makes up the largest schema which connects everything you know with everything else you know. A far as learning being quantum, I think that when two schemas find a connection, that is quantum. That is the light bulb you can see turn on in a student’s eye. However, when you learn something new it takes practice, use, and time to engrave it into your mind. There is only a quantum connection.

To best describe my theory I have decided to make four claims about what I like to call erikaism. My first claim is that an unmotivated student will not learn. I am not saying that you cannot motivate a student. I am only saying that if you haven’t motivated them, there is no point in trying to teach them, they have to be willing to construct. Warning: Some students may appear less motivated than they actually are. I would also like to note that I am not saying every motivated person can learn. I don’t know, and as far as I can tell, neither does anyone else, so I just won’t go there.
My second claim is that you need to learn the abstract and practice the basics for proper transfer. Too much practice can easily get boring though, so I suggest finding problems that are more complex which use the basics you’re trying to teach. This way, eventually a student won’t be worrying about the exact formula equation to find the answer, but they can focus on ways to manipulate the information they have in the problem that they are dealing with. Abstraction can be taught many different ways, but without it students will only know the context that they have dealt with. Everyone could just wait to learn what they need to know until after they pick their job, but then they would never know all the other possibilities, nor could they ever explore other options. If you have the proper abstract knowledge you can apply it to anything.

Claim number three is that you can be taught control, and need to be. As far as any problem solving goes, it is beneficial to have a few ideas on how to start. It is also beneficial to know the signs to tell if the ways you’re going about doing a problem are inefficient. I think it could cut back significantly on the time it takes students to do problems and also I think control could be transferred because they may think about creating control in other areas also.

My fourth claim is that knowledge creates schemas, which create schemas, which connect to schemas to create the schema (everything you know). I truly believe that as a whole, everything connects. Maybe the specific equation for static friction in physics has nothing to do with how to balance your checkbook, but basic ideas behind both of them are closely related. To really understand mathematics is to have all the connections (which I don’t think any ‘expert’ even has), but before that can happen, you have to have all the knowledge there (relating to claim two).
Those are my four claims, but what I think the erikaist of the future will be known for is their attention to the individual. You can know exactly how the average student works, but the fact remains that you are not going to have the average student most of the time. More often than not you are going to have someone unique, who just needs a little individual attention. Actually, I guess it’s a lot like problem solving, if you have a schema large enough you can transfer your knowledge even to the student who seems to break all the basic claims, the secret is having bendable schemas with nothing set in stone.

I think I have hit upon all the main ideas we talked about, and broke them down as best as I could. You will notice that I used a lot of examples that weren’t math specific. I did that to make the essay easier to read, not that I thought you needed it, but I had to have some of my friends proof it. Although I have some main points that I do believe (as of now) to be true in all situations, I want to express how important I feel it is to assess each individual differently, and teach them individually. Even in a larger classroom, I think it would be hugely beneficial to make yourself aware of each student’s needs and teach accordingly. In conclusion, you can create and dissect as many theories as you want to, but it all comes down to the relationships between the teacher and each student, my only hope is that I never forget this.