**Final Reflection Paper Kris Knickerbocker Summer 2011**

**Part I: What I learned, what it meant to me, and how I will use it in the future:**

Group Work: I must admit that I am not generally a fan of team-building activities. I personally find them uncomfortable and, because of this, I rarely assign these types of activities to my own students. Biology and Chemistry students regularly perform labs and experiments in groups, so I felt confident that this was sufficient. However, I was pleasantly surprised with how fun and beneficial it was, not only as a personal introduction, but also to build a level of comfort with my teammates. This class experience really changed my mindset about group activities and I plan to incorporate them as an initial team-builder in my classes.

Useful Tech Tools: Through the use of Google docs in MAET, I have reconsidered the functions it could serve as a classroom support tool: students could compile questions, give class feedback, or complete pre-lab preparations in their lab groups. Google calendar could be used for parents and students to let me know date-specific information. Students could post their athletic events, parents could let me know of upcoming vacations, I could post assignment due-dates, and this could all be done with a separate calendar for each hour of the day. Picasaweb was something I had no experience with and I was impressed with the simple and intuitive design as well as the usefulness of the resource. I often take pictures during work/lab time, and this would be a wonderful place to compile these and make them accessible to students and their families. Facebook, Twitter, and Skype are all programs that I hadn’t seriously considered for my classes. However, through their use in MAET, I realized that they may offer a workable solution to the problem of students wishing to contact me with questions or concerns after school hours. I plan to establish office hours and make myself “virtually available” for a certain time period each day. Dropbox is a resource that I’m excited to explore more. I do have some existing issues with media sharing between computers, so I am hopeful that would present a workable solution to that problem. RSS is certainly a tool that could be useful for the research and preparation aspects of Chemistry and Biology. Students could identify useful blogs and news sources, and then track them for new articles and postings as part of the class requirements. Weebly is the most intuitive and easily navigated website-building software I’ve ever used. This would be an excellent platform for students to format a presentation. PowerPoint is getting “old” for students and with boredom come shortcuts and less-than-impressive overall results. Creating a Weebly webpage could be a rejuvenating change for the better and would reinforce the current educational shift toward portfolios as capstone activities.

Points to Ponder : (Please note that related readings and commentary are found in the next section)

Behaviorism: I question how much room there is for this approach in my chemistry classes. Behaviors and rewards are practiced in a way that is removed from the context. Also, in this approach, teachers remove decision-making from the students and disseminate the information directly. Chemistry A/B is intentionally and specifically applied to real life. We spend a great deal of time making connections to everyday experiences. Also, students are encouraged to find their own path of exploration within a given topic. These aspects of the class make the use of behaviorist teaching a hindrance. However, one aspect of behaviorism that I regularly use and see as beneficial: extrinsic rewards. Stickers, point deductions, praise, a “teacher look”, grades … these are strong motivators.

Cognitivism: In our discussion about cognitive psychology, we discussed the fact that it is the scientific study of human information processing (acquisition, storage, and use). However, we also know that *all* learning cannot be explained by conditioning – the “aha” moment belies this supposition. Wolfgang Kohler worked with a chimp that was able to connect 2 sticks together to reach a banana. This happened completed spontaneously and without coaching. I am aware of a similar experiment where a chimp was given a tall, clear cylinder that was secured to the floor and had a peanut inside. The chimp could not reach the peanut, but desperately wanted to eat it. Scientists themselves had no set solution in mind, but wanted to see what the chimp might try. To everyone’s amazement, he finally got a mouthful of water and spit it into the tube, then noticed that the peanut floated to the top of the liquid. After several more mouthfuls of water spit into the tube, the peanut was within reach and the chimp got his snack! This is important to remember with our students. We give them tools, scaffolding, and methods of accessing and utilizing logic and reasoning, but what they do with those lessons is strongly subjective. Our responsibility is to bring out the highest potential in every student.

Piaget believed that “children are active thinkers, constantly trying to construct more advanced understandings of the world”. This is undoubtedly true, as the processes of assimilation of information and accommodation to new experiences are seen by educators constantly. I also concur that children think and reason very differently than their adult counterparts. However, Piaget also proposed a schedule of cognitive stages that children supposedly follow in their development. As educators, however, we must be very careful about holding students to such rigid expectations. Young people develop in different ways, at individual paces, and with different ways of expressing their abilities. Any time lines are drawn in the sand, students are left behind. This is detrimental to learning.

Creativity often falls to the wayside in Math and Science. Educators in these fields rely so single-mindedly on facts and procedures that we lose sight of this important aspect of learning and teaching. It folds so easily into the curriculum that it’s almost negligent to leave it out. The issue is time. The set up, the time to guide students back into the risk-taking and creative thinking that traditional classes have trained them out of, the modified grading rubrics … it all requires a great deal of front-loaded effort. However, once this is invested, the process pays off in amazing and abundant ways. And the beauty of it is that creative freedom addresses multiple intelligences.

Understanding: I have always before used the terms knowledge and understanding interchangeably, and never stopped to consider their differences. After this class, I will not make that mistake again; not in my speech, nor in my design of classroom activities and lessons. Knowledge is a set of facts. Most people can give you some information on most any subject, but that does not mean that they understand that subject. We found this to be true in our Understanding Understanding assignment. We must probe beyond facts or processes or ideas, challenge students with open questions and “what would happen if” scenarios. The goal should be the theories, the images, and the stories that convey deeper connections and applications. Knowledge is valuable as a springboard from which to reach understanding. But these two are not the same. Teachers, administrators, and teaching standards and benchmarks should keep this in the forefront of our minds.

Backwards Design: This topic flows so closely with the other topics we’ve covered that it almost feels repetitive. However, it’s actually just an extension of inquiry based teaching with the goal of true and applicable understanding. The idea is simple, although incredibly challenging when you’re not accustomed to it. Most teachers are used to picking a topic, choosing their resources, and then designing a lesson plan to deliver the information. Backwards design starts with careful consideration of the desired results *first*. Makes sense, right? It’s about figuring out where we want to *be* and then planning the path to *get there*. And taking the time to unpack your own hopes and goals for student learning is never a futile effort. I must admit that I find this a difficult process to complete, but I’ve also found it to be extremely useful in my professional development. I plan to continue using backwards design in my lesson planning.

Stand-Out / Transformational Readings:

Students enter the classroom with a pre-existing set of experiences, ideas, and opinions about a variety of topics. As teachers, we must be careful not to “pour into a full cup”. And the goal is not necessarily to debunk or purge those ideas in order to replace them, but to gather information that helps us deliver material more effectively. Shulman, L. (1999). What is learning and what does it look like when it doesn’t go well. Change, 31(4), 10-17.

Different people can, and invariably do, engage in the same tasks in very different ways. I have found this to be true, both in my classroom and in my personal life. For example, my nephew Ty was struggling with his math assignment recently. I patiently walked him through the “process” of subtracting a larger number from a smaller one, showing the written procedure and then moving on to a number line to better illustrate negative numbers. He looked at me through boredom-glazed eyes and then, at the very end, light up. He said, “OH, I GOT IT” and then proceeded to do the same problem in a completely different manner, much faster than my own, and it made absolutely no sense to me. Ty got the right answer, on many consecutive questions. This illustrates to me that there is no right way to complete any task, including math and science procedures. And that, fellow educators, is a lesson we need to keep at the forefront of our minds. Feynman, R. P. (1989). It’s as simple as one, two, three . . . In What Do You Care What Other People Think (pp. 54-59) New York: Bantam Books.

“Knowing more facts doesn’t necessarily mean greater understanding.” I’ve learned this lesson *the hard way* in my own teaching. I used to write assessments that were primarily fact-based, recall-style questions. I truly thought that if students had the “nuts and bolts” of a concept memorized, they would automatically have a better grasp on the meaning behind the concept itself. I made it a point to sit down with volunteer students after several assessments and ask them open-ended, application-based questions. I was shocked and fundamentally disturbed by the results. I’d reflected my own learning style on my students, and the result was an ineffective teaching style. When I revisited this experience in the reading, I made a fresh resolve to always design assessments (formal and informal) with conceptual understanding at the forefront. Levstik, L. S., & Barton, K. C. (1997). The theory behind disciplined inquiry. In Doing History: Investigating with children in elementary and middle schools (pp. 9-16). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Praise for intelligence. This was a point that I really had to “sit with” and digest before returned to read the article several more times. I’m a big believer in feedback and, while I don’t think empty praise is effective or helpful, I think consistent praise for desirable actions works. So where does the discrepancy lie? The defining issue is where your standards are situated. If you praise simplistic tasks and easy results, you’re effectively lowering the bar and quite possibly insulting your students’ intelligence simultaneously. I’ve seen this in my own experience. I had assigned a time-intensive, capstone activity where students applied their knowledge of cellular structures and functions to a working model. One student in particular had done what I considered to be an exceptional job. He was a high-achiever and consistently impressed me with his class performance. I gave him a high score and praised him on his work. He beamed a big smile, walked away, and quietly said to a classmate, “I didn’t even work that hard on it”. At first I thought he was being modest, but upon reflection I had to admit to myself that he was, indeed, capable of much more. My expectations were too low for him and I’d just given him a virtual “gold star” for what was, to him, minimal effort. Since that time, it has been my ongoing effort to praise often, but praise appropriately and with thought. Dweck, C. (1999). Caution: Praise can be dangerous. American Educator, 23(1), 4-9.

Meaningful inferences are evidence of understanding. The ability to take factual knowledge and apply it to new situations demonstrates mastery of that topic. Answering open-ended questions, forecasting response to changing situations, and extrapolating results into the future … these are the benchmarks of true understanding. Further, taking that to the next level by applying mastery of one concept to a different, even seemingly unconnected one, demonstrates that your mind is manipulating, testing, and evaluating the understanding already achieved. Understanding seems to self-generate lifelong learners. The feeling that comes with understanding is self-empowering and makes you desire more. I found it interesting that the reading told us to beware of thoughts like “But it's so obvious!” as these moments are likely an indicator that you’re no longer looking at the concept with the eyes of an outsider. We must not take our own understanding for granted and assume a concept is “easy”. The path to understanding is longer and more difficult than knowledge. Wiggins, G., & McTighe, J. (1998). Understanding by Design. Alexandria , VA : Association for Supervision and Curriculum Development. Chapter 2: Understanding understanding

**Part II: My Personal Learning Program**

Key Topics:

Expanding the experimental repertoire: Chemistry classes have a standard set of experiments that are broadly used in classrooms across the country. These are considered “standards” because they are simple, readily available, easily repeatable, and produce reliable results. Unfortunately, this leads to a type of “teacher fatigue” where it seems so *easy* (because we’ve done it a thousand times) that our delivery and handling of the process becomes stale. Teaching suffers. There are, of course, endless ways to present an exploratory lab on a single concept. These new and different experiments, while invigorating us as teachers, also inevitably offer different insights for learners as well.

**Resources**

* National Science Teachers Association (NSTA) and Michigan Science Teachers Association (MSTA) conferences, newsletters, and online websites. These organizations are run *by* teachers *for* teachers. They are not interested in selling anything to you. The entire goal of these organizations is to better the craft of teaching and improve science education through teacher support.
* Flinn Scientific is one of the most reputable and widely-used chemical supply companies in the nation. They have online resources, hard-copy materials, and offer email updates and notices upon request. They publish chemistry labs that are innovative, well-tested, and are accompanied by detailed procedural instructions, safety warnings, and supply lists. Also, they have detailed and reliable MSDS (Material Safety Data Sheets) that cover everything from care and handling to proper disposal of waste products. They are second-to-none in the realm of for-profit teacher resources.

Ongoing professional development: An important part of every teaching career is educating oneself. Science is a subject that is constantly changing. New discoveries, once accepted theories that have since been disproven, and evolving methods of teaching make continuing education vital. I plan to complete my Masters degree in Educational Technology and seriously consider going on to a PhD program. I feel that this will make me a better student of Chemistry and Biology, and a better educator as well. Plus, as with any learner, the confidence that comes with understanding is a key component in my ability to take risks and be creative.

**Resources**

* MSTA and NSTA conferences: These resources are all local and easy to access. MSTA and NSTA are affordable and reputable. Plus, many teachers from all area schools attend these conferences. They offer continuing education credits upon request (and purchase) which help to keep teaching licensure current.
* Michigan State University: The teaching program at MSU is lauded as one of the best in the country. I had the privilege of earning my undergraduate degree from MSU and plan to continue my education there. Also, I live in Lansing so it’s convenient for me. Lastly, I have been able to get student loans through MSU for my continuing education, which I would not be able to do without.

Networking: Professional support and cooperation are a key component in building and maintaining an effective teaching career. The opportunity to discuss subject-specific lessons, techniques, challenges, and successes allows for growth of everyone involved. Also, the emotional support of talking with someone who understands your journey can be essential to a healthy mindset.

**Resources**

* Daily lunch with science colleagues: East Lansing High School is fortunate enough to have a small planning room which is accessible only by the science teachers. This allows us to have subject-specific, student-specific, and activity-specific conversations. We are able to debrief incidents, ask one-another questions, and brainstorm solutions together. This daily 40 minutes allows us to feel closer to one another both personally and professionally. It is truly edifying.
* Again, MSTA and NSTA: These organizations provide great support, both virtually and in-person. They can put you in touch with other local science teachers that you may otherwise not find, based on a specific question or idea. Also, members of these organizations pay dues and invest time in the teaching-and-learning process – simply for resources and support of a learning community.
* Meetings, conferences, and lectures with/by local chemistry teachers: Teachers in the greater Lansing area are particularly vigilant about networking. There is a strong communication system by which teachers from many different districts regularly invite one another to panel discussions, guest speaker events, trouble-shooting and idea-exchange meetings, and lab demonstrations that are occurring. This chance to build a professional support network with local teachers comes highly recommended by my colleagues who regularly attend the events. I am making it my goal to seize the opportunity.