Tanner Ragland's

Facilitating Adaptive Expertise: A Constructivist Approach
Can you imagine a school where the phrase “why do we have to learn this?” has never been uttered? A school where students complain when the bell rings because they don’t want to leave class? I have been experimenting with a classroom environment where these ideals are entirely possible.

Grades are poor long term motivators for students. The students that learn the most from a class are the ones who are active learners who are able to apply what they have learned to new problems and settings. My Action Research project is about pinpointing the source of prolonged motivation in students. I have found that if I can teach my students how to align themselves on the path towards expertise in learning, they will discover how to be expert learners who pursue subjects for the challenge of learning rather than a letter grade.

DESCRIPTION OF THE PROBLEM

I would like my students to be better prepared for college and the working world. I am trying to construct a classroom environment that is most conducive to creating adaptive expert learners so that my students are able to transfer what they have learned to new problems and settings. In past years, my students have graduated with extensive knowledge of computer programming; however, they have not been able to retain this knowledge nor apply the information they have learned to broader, more real-life projects. My students are far too reliant on me to deliver information and provide specific algorithms for solving problems. I would like them to be able to construct learning experiences for themselves and change my role into more of a facilitator.

I envision a classroom where students are efficient problem solvers. I hope that they will be able to look at problems from multiple angles, research approaches and alternative solutions, and use outside knowledge when necessary. I would like to develop a classroom that is a student-centered anchored by a community engaged in knowledge building. In the long run, I hope my students will learn to reflect process of problem-solving process of an expert in my class and transfer that knowledge to other classes and eventually in the work force, aligning themselves on the path to expertise in learning.

CONTEXT/FIELD OF ACTION

Buckley is a small, independent, co-educational school in Sherman Oaks, California. Buckley is one of a dozen highly competitive college preparatory schools in the area. Around 99% of graduating seniors matriculate to two or four year Universities. Buckley boasts a 4-Fold Plan of Education, emphasizing academic training, physical development, moral education and creative expression n. A typical Buckley student is well-rounded, caring, and studious. The academic program is rigorous – 40% of high school students take at least one Advanced Placement®
course each year, 95% of whom score a 3 or better. Although diversity remains a priority, Buckley’s community is made up mostly of Caucasian upper-class families.

Part of what makes Buckley unique is its close-knit community. Although Buckley spans from Kindergarten to Twelfth Grade, our student body is only 750 students. As a result, Buckley boasts an average class size of 14 in the Upper School, and a student to teacher ratio of 8:1. With classes so small, Buckley offers a unique experience because teachers are able to provide personal attention to every student - Buckley teachers know their students very well. In addition, Buckley’s size affords students the opportunity to interact across grade level and division.

Buckley’s Upper School Computer Science curriculum affords students every opportunity to pursue their interests with classes in Multimedia design, Programming, AP® Computer Science, and Advanced Video Game Construction. Fundamentals of computing are stressed at an early age and spiraled throughout each student’s career at Buckley. Students have virtually unlimited access to technology with computers in every classroom, laptops for loan, and a library with over 50 PCs. Although the curriculum is set in advance in consultation with the Department Chair and Principal, teachers have a significant amount of leeway to determine the preferred method of delivery, especially in Computer Science.

THE PATHWAY TO EXPERTISE

The goal of education is to move pupils toward being expert learners who are able to transfer skills (Bransford, et al, 1999). Overall, “the new science of learning is to improve significantly people’s abilities to become active learners who seek to understand complex subject matters and are better prepared to transfer what they have learned to new problems and settings” (Bransford, et al, 1999 p. 13). Adaptive expert learners are more likely to succeed in any class or field because of their unique skill set and higher efficiency rate (Hatano and Oura, 2001; Sternberg, 2003; Martin, 2005). Although expertise is a long process and not readably attainable for most students, working on a path towards expertise or becoming what Hatano and Oura call a “baby adaptive expert” is far more realistic within the short time frame that school imposes (Bransford & Schwarz, 1999 quoted in Hatano and Oura, 2003).

By examining the features of expertise, teachers can work backwards to create an environment that fosters expert learning skills and places students on the path toward expertise (Hatano and Oura, 2003). As a result, students may potentially work on a path toward expertise in any field through transfer, enjoying continual success with learning through adaptation (Bransford, et al, 1999). In short, teachers will be teaching students how to learn by helping students develop the ability to teach themselves. Three features of a classroom are key to fostering adaptive expertise – variety, metacognition, and real-life experience.
Martin (2005) discusses a shift necessary in school curriculums and instruction in order to create an environment more conducive to adaptive expertise. Currently, students have limited opportunities to understand or make sense of topics because many curricula have emphasized memory rather than understanding. “Many designs for curriculum instruction and assessment practices fail to emphasize the importance of conditionalized knowledge. For example, texts often present facts and formulas with little attention to helping students learn the conditions under which they are most useful” (Bransford, et al, 1999 p. 49). A shift in teaching style allows students to construct real-life meaning from the information in the curriculum by removing the teacher from the center of the classroom. Furthermore, this shift also allows students to transfer knowledge from short-term memory to long-term memory due to the interaction with the information. This, in turn, helps students utilize this knowledge to build new connections in the future.

While it is impossible to guarantee that every student leave school an adaptive expert, or even that they work on the path towards expertise, certain curricular and teaching models can provide the best chance for success. Hatano and Inagaki (1992) proposed that exploration and reflection are two keys that must be considered in the design of school curriculums because they are likely to lead students to adaptive expertise. Gourgey (1998) agrees with Hatano and Inagaki along the lines of design and implementation of reflection, stating that students who use metacognitive strategies are more academically successful than those who do not. Helping learners to choose, adapt, and invent tools for solving problems facilitates adaptability (Bransford, et al, 1999). Lajoie (2003) agrees that expertise can be fostered through models of feedback and self-monitoring. She goes further to say that this can be most successful through experience based activities (Lajoie 2003). It seems that most researchers agree that metacognition is, at the very least a factor, and at most the determining factor, of adaptive expertise.

How students learn is at the heart of whether or not they will be on the path to adaptive expertise. Sternberg (2003) believes that to be experts, students must be trained to think analytically, creatively, and practically. Ertmer and Newby (1996) agree, stating that the goal of education is to create a learner who is “self-directed and goal oriented, purposefully seeking out needed information, ‘incorporating and applying a variety of strategic behaviors to optimize academic performance.’” (Ertmer & Newby, 1996, quoted Lindner and Harris, 1992). Variety seems to be a common denominator among the leading research. Brown (1989) asserts that the degree of variability is crucial (Brown taken from Barnett and Koslowski, 2002). In a study by Barnett and Koslowski (2002) they found that creating adaptive expertise relies on the extent to which the individual’s experience has encompassed a variety of contexts or forms that are substantially different from one another, but that share a theoretical base.
The instructional model most capable of promoting adaptive expertise incorporates variety, metacognition, and real-life experience (Bransford, et al, 1999; Hatano and Oura, 2003). In a study by Taylor Martin et al. (2005), they compared two groups of biomedical engineering students and the effect instruction style has on creating adaptive expertise. They found that teaching based on the approach outlined in Bransford, et al, 1999 was far more likely to promote adaptive thinking compared to a traditional lecture based model. The instructional approach was outlined by Martin (2005) as student centered, knowledge centered, assessment centered, and community centered – all of these seem to be encapsulated by variety, metacognition, and real-life experience. Schmidt et al. (2007) echoes the same findings as Martin - problem-based learning allows for flexible adaptation of guidance.

Schraw (1998) believes that the root of adaptation comes from how students are evaluated – the more emphasis placed on effort and persistence versus performance, the more likely the student is to use metacognitive strategies that resemble expert thinking. This, in turn, increases academic success (Schraw, 1998). This removes the focus on grades in a classroom, and defers the student’s attention to their process, putting metacognition at the forefront of evaluation. In addition, most tests assess students’ abilities to remember the facts rather than their ability to learn or understand (Bransford, et al, 1999). The predominance of multiple choice type tests told very little about student’s understanding and ability, they merely measured one’s ability to perform well on tests (Sacks & Gardner, 1999 p. 2; Sternberg, 2003). An emphasis on metacognition allows for emphasis to be placed on ability rather than sheer retention.

ACTION RESEARCH QUESTION

Can the facilitation of a community, combined with a focus on metacognition, align students on the path to expertise?

METHOD/ACTION CYCLE REPORTS

Action research is about self-awareness and institutional-awareness. The process begins with a problem – essentially anything within the researcher’s institution they would like to change or improve upon. It is called Action Research because the researcher is studying the outcome of an approach (the action) by assessing its effect on the overall problem. Actions can be of varying length and complexity; yet, the researcher is continually collecting and documenting the effect (or lack of) of the action on both themselves and the environment (the institution and the participants). Usually, the action provokes more unanswered questions about the problem and these questions can only be answered through more actions. Therefore, Action Research is considered an iterative process because the researcher’s next action is based on the effect of their first action - the cycle of problem, action and evaluation repeats itself.
I set out on my research project to improve my student’s ability to transfer knowledge and be better prepared for college. I wanted to develop learners who were able to solve problems and transfer their knowledge to new problems and settings. To do this, I tried to align each of my students along a path to expertise in learning. I studied three actions in this process – facilitating the development of a community, making my students’ metacognitive processes overt, and increasing student independence. The results and evidence of these action cycles are what follows.

CYCLE ONE

I have been experimenting with my role as a teacher in the classroom. I started by facilitating the construction of a community where knowledge building can take place. I moved myself away from the center of the classroom by using discussion boards, wikis, and group projects as tools to help the students learn how to leverage each other rather than relying on me. At first, my students struggled to break through the border of a “traditional classroom” - they longed for rubrics, templates, and step by step instructions that they could follow in order to “complete” an assignment. They had a lot of trouble making decisions; however, as time progressed, they got better and better at putting the pieces of the puzzle together independently. The amount of conversations between students continually increased throughout the quarter and served as the largest evidence of change over time. The classroom was becoming a collaborative environment where confusion was a puzzle for the group to solve.

CYCLE RESEARCH QUESTION: If I teach using wikis and discussion boards in a constructivist environment, will my students engage in knowledge building?

ACTION:

The action I decided to study was to implement new teaching tools in the classroom such as wikis, discussion boards, and projects to see their effects on knowledge building in my students. All of these tools leverage a constructivist learning environment with the student at the center.

I designed my classroom so that the students were responsible for knowledge building by substituting projects for lectures and introducing collaborative tools to aid in the construction of knowledge for the class. I wanted to see if these tools would help my students move away from their reliance on the delivery of information strictly from the teacher.
EVIDENCE USED TO EVALUATE THE ACTION:

- Conversations with each of my classes
- Observations
- Blog entries evaluating both the change in my students and the change in myself

Blog entries about my observations were the most crucial evidence I collected. I was able to document the continual increase in dialog and discussion as I moved away from the center of the classroom.

DATA ANALYSIS:

I watched my students change their ideas of a classroom over the course of the semester. The students began to rely on each other as opposed to me and the volume of interaction increased exponentially over time. A community of learners soon arose as a result of this reliance on each other.

My students had a lot of trouble adjusting to a constructivist classroom environment with the teacher out of the center because of their past educational experiences. In conversations with my classes, most of the students complained about having to adjust to such a different style of teaching where they were not given explicit instructions. They found it very hard to create their own standards for assignments and to complete projects without explicit grading rubrics. The root of a lot of their struggles stemmed from grading. Students were so consumed with not getting a bad grade that they had trouble focusing on what would help them get a good grade. For instance, when students had to decide on the structure of a report handed in, none were confident that their report was a success, they were anxious about what they would get “marked down” for.

Working together also proved to be quite challenging. Students would constantly duplicate work in the group because they didn’t know who was working on what. Contributions on wikis were continually overlapping because students were focused on maintaining a high volume of contributions in hopes of a good grade, rather than contributing for the betterment of the group. Furthermore, students were more interested in divvying up work rather than discussing and working with one another.

Breakthroughs came about only when I refused to answer questions. Students realized that the decisions of the group affected everyone, and the only way move the class forward was to work together. The path for my students became clearer when they spent more time discussing the problem than producing a product because emphasis shifted from a grade to the process.
To bridge the gap between the “old classroom” and this “new classroom” with the teacher out of the center, we spent significant time discussing the practical applications of each project. For each assignment, we discussed whether it was pertinent to the real world and why. This helped the students understand the danger in relying on rubrics. Having the skill to research, discover, and make decisions on their own, in the words of one student, “is crucial to actually having a real job.”

The most consistent and surprising complaint was that students didn’t know what to do with the freedom that they gained. Based on their concerns, I wanted to find out in cycle two if I made their metacognitive strategies overt, they would gain a better grasp of expertise now that they had established a community together. Some other questions for cycle two emerged as well. If the students are able to focus more on process, would their process improve over time? If they are more aware of how experts approach problems, will they be more likely to emulate this process?

This cycle showed great progress with respect to knowledge building in the community. I observed my students changing from dependent adolescents to problem solving independent young adults because they were able to distribute their understanding amongst the community.

One of the most important factors in knowledge building is trust. By working together on projects, my students were able to develop trust and begin to respect each other’s opinions. Furthermore, as time went on, students began to trust me more as a teacher. This was crucial because the students entered the class hyper-focused on grades; which, admittedly, they had been conditioned to do from their previous experiences at the school. Discussion boards were remarkably useful in clearing the barriers of a “traditional classroom” by placing a greater emphasis on knowledge building in the group instead of grades.

As the cycle moved along, I could see the development of a community- students were starting to rely on each other, conversations during class were vibrant and engaging, and students were organizing and discussing problem solving techniques with each other. This became most obvious when students would come to me to show their work as a matter of accomplishment and pride rather than for approval. This shift also signified the pursuit of knowledge for something other than a grade – a key component to knowledge building in a community. To encourage independence in my students and move myself away from the center of the classroom, I stopped answering questions. Whenever they asked me a question, I would simply defer them to their classmates. They learned that turning to their peers was more fruitful than asking me, so they stopped asking me questions. Asking their peers questions provided an opportunity for each member in the community to contribute and to be considered an “expert” on a subject. The change was incredible. Problems were being solved as a team rather than by
competing individuals. My students realized that they were not dependant on a teacher for answers – they were capable of constructing their own answers.

REFLECTION:

Now, more than ever, I have been able to work towards creating a deeper learning experience for my students based on building knowledge through a community. One of my first missions with every class I teach will now be to facilitate the creation of a community among my students. The sooner they are able to trust one another and not look to the teacher for answers, the faster they will be able to construct their own meanings from course materials. Building my students’ independence and undoing their reliance on the teacher is the first step toward aligning them on the same path as an expert. Because learning is a social process, students must utilize as many resources as possible. I have found the most glaring weakness in the kids I teach is their inability to use one another in equal proportion to the textbook and the teacher.

I am still the same teacher I was before I started my action research project; however, I am far better equipped to ask and answer my own questions about teaching environments. The learning process has always been important to me as a teacher and I have always emphasized making mistakes – understanding learning theory has reinforced this process for me. What I realize now is that mistakes for my students equate to lower grades. If I am able to displace the weight of grades and distribute a greater emphasis toward knowledge building within community, my students will be more likely to experiment and experience the course material. Although this is a scary prospect for students, being members in a knowledge building community can alleviate some of the trepidation.

I have found my thinking to be far more grounded in research and theory since I started this project. I have discovered “official phrases” and terms for my casual thoughts on learning. What’s more is that if I am not sure about how my actions might affect my students, I feel comfortable looking for research on the topic. Although my project is about aligning students on the path towards expertise, this project has allowed me to change my path as well. While my values as a teacher have remained the same, my process has become infinitely better and I continue to iterate through problems everyday in my classroom.

CYCLE TWO

For the second cycle, I tried to make my students’ metacognitive strategies overt. The more control I gave the students over their learning, the more they needed to know about what to do with that control and what it means to have control. I utilized the new found trust they had in each other (cycle one) by having them analyze each other’s metacognitive strategies. I did this as a way to emphasize their process over the end result (the grade). We also analyzed the
features of an expert, and the method experts use to solve problems. Through observations, I could see my students’ process more reflective of an expert’s compared to the first quarter. In addition, I saw them utilize their freedom to explore and construct their own personal learning and problem solving style. By making their metacognitive process overt, they were then able to iterate over their course of action and discover what helps them learn best, the best angle to approach a project, and how to move the pieces of a problem around to plan for a solution.

CYCLE RESEARCH QUESTION: If I make my student’s metacognitive skills overt, will this lead to adaptive expertise?

ACTION:

The action I took was to facilitate dialogue with my students about learning theory and expertise.

As a class, we took time to explore topics so that the students could construct their own definitions of each based upon what they already knew; however, all of these lessons were in the context of projects about computers and technology. For example, we talked the most about learning theory when the students were assigned a project to devise a way to teach Microsoft Office to other students. This project led naturally into a discussion and study of how students learn and an analysis of how students are taught in school. We talked the most about expertise when the students had to present a report on the future of technology at the school. I used this project to juxtapose my student’s process with that of an expert. We talked at length about process and the difference between being and expert and being a person on the path towards expertise throughout the sixteen week term. My goal was to see if the students would align themselves on the path toward expertise in learning if I made their thinking process overt.

EVIDENCE USED TO EVALUATE THE ACTION:

-I surveyed the students to gauge their understanding of expertise and the change they did/did not see in themselves

-Blog entries evaluating both the change in my students and the change in myself

-Conversations with each of my classes

Class observations were the most crucial evidence I collected because they gave me a chance to watch my student’s metacognitive strategies and at times, discuss it with them individually and as a group. The changes in my students were both gradual and obvious. The survey I collected at the end of the semester served as an objective way to reinforce some of the observations I made in my classroom and a way to convert observations into workable numeric data.
I evaluated the outcomes of this action by breaking down the student surveys to find trends. I was also looking for changes from the beginning of class to the halfway point of the class (the point at which the survey was distributed). Using this data, I tried to get to the source of change, or lack of. Namely, I want to find out whether or not my students felt they were on a path towards adaptive expertise when they started this class compared to now. If so, I want to know what contributed to the change.

Survey Questions:

Are you an expert learner?

Were you on the path toward expertise before this class?

Do you consider yourself on the path toward expertise?

DATA ANALYSIS:

The data from the survey yielded a substantial shift in my students’ thought process. While 26% percent of my students considered themselves on the path toward expertise before this class started, 70.5% of students who did not previously consider themselves on the path toward expertise now consider themselves on the path toward expertise. Although I would have liked to poll the students about whether or not they consider themselves on the path towards expertise as soon as the class started, I decided not to because the students’ understanding of expertise is quite different compared to the time point at which the last survey was given. In other words, their understanding of expertise was bound to change over the course of sixteen weeks and it makes it hard to compare those two data sets.

The most compelling factor from the data is not necessarily the total percentage but the percent change. Almost 50% of my class felt they had changed their path towards expertise in learning. Although I am not sure of my students’ definition of “path,” they did demonstrate at least a surface understanding of expertise because only 13% of students consider themselves to be expert learners. While I am not sure what accounts for the number, I can assert that my student’s understanding of expertise has to do with it. If most of my students considered themselves expert learners, I would be quite concerned because that demonstrates a misunderstanding of expertise. However, since most of them do not see themselves as experts, I can make an assertion that their understanding of expertise led them to the conclusion that they were not at that level.

It seems now that the task before me is to figure out what caused this change in my students. I would like to get to the root of expertise as my students understand it so that I am able to gauge their knowledge of the subject. If they are able to define expertise at a competent level, I
would then like them to describe what has benefitted their development as a learner, what has not benefitted their development, and what has hindered their development. Based on these results, I can formulate a new research question.

REFLECTION:

The goal of my survey was to see where my students’ understanding of expertise stood. I wanted to see if my students saw themselves as expert learners given their new understanding of expertise. I was hoping that my students would not consider themselves expert learners; however, they would consider themselves on the path towards expertise. This would confirm their knowledge of expertise and an attainable process but also affirm the fact that it takes more than just time and knowledge to be considered an expert.

The most common complaint from my students was that they didn’t know what to do with the freedom that class and coursework provided them. The process of “mapping the terrain” on assignments helped them to envision the larger context – my students were no longer trying to find the straight and narrow path their teacher marked with letter grades, but were beginning to understand that many parallel paths customize the experience to personal and group interests. They were pushed to think about the best way to present their project according to the standards they set for themselves. The critical factor of this process was to have my students think about how an expert or professional would approach the project and mimic the same approach – this would provide data for comparing students based on process rather than product and would allow the students learn from one another’s approach to problem solving. Helping each other, working in groups, and discussing methods was never ruled out of the process and was only possible because of the community they had developed in the first quarter.

Questioning the real world application of each assignment provided a great starting point for conversations with my students. They identified themselves as “smart” but inept in the “real world” because they lacked the ability to adapt. As a result, we were able to talk at length about how to change that and how they could align themselves on a different path as learners. This logically led to conversations about expertise. The students started to see the distinction between routine and adaptive expertise because they experienced it firsthand. For example, most of the students could successfully answer a plethora of multiple choice questions about some advanced computer science concepts; yet, the same students didn’t know where to start when it came to creating a simple Tic-Tac-Toe game.

When I started teaching, I was always aware of the seemingly “magical” balance between skills and content; however, I never fully understood their relationship. Although I am still green in the field of learning theory, I have moved toward a better understanding of the relationship
between the two. Furthermore, I am now able to see how expertise marries these two together. An expert must be both creative and efficient. Expert students are able to learn the content of the curriculum with the skills they have learned. As the student’s battery of skills expands, so too does his ability to learn more information at a faster pace. An imbalance of content versus skills in a curriculum hinders a students’ advancement of problem-solving skills, causing them to learn and retain less information in the long run. The more varied approaches to solving problems a student understands and is able to apply, the more complex problems they are able to solve.

As I reflect on my teaching, I have found that the most capable advanced placement computer science students are not the ones with gifted abilities with computers; they are the ones who are able to solve complex problems. As a result, I plan to work on my students’ problem solving techniques iteratively throughout the year so that they can be more successful. In addition, it is critical for beginning computer science students to be able to practice their thinking skills and work together in a community to improve their approach. This removes a reliance on the teacher and places students in control of their own learning; thus, moving the teacher out of the center of the classroom.

I have found that two components of a classroom are absolutely essential for aligning students on the path toward expertise – the presence and development of a community of learners and metacognition. Furthermore, these two components build upon one another. Making students’ metacognitive skills overt will not be very successful without the presence of a community – the learner needs to discuss, digest, and learn from alternate approaches.

CYCLE THREE

I set out in my third cycle to assess my students’ commitment to learning. I wanted to learn more about their approach and how they would construct learning experiences for themselves without guidelines and with a large amount of freedom. I was wondering if they would pursue learning with the same passion as compared to earlier in the year when they had less freedom. The true test of adaptive expertise is if students are able to make and understand connections outside of the context of the original problem. Essentially, I changed “the problem” for my students to see if their process would still reflect that of an expert. I watched to see if motivation on a project would start high, but quickly dissipate as the novelty of the project wore off. What I found was that my students worked harder this quarter than any others. Students created extra work for themselves, came in during lunch and free periods, and stayed after school to work on their individual projects. In the future, I hope to learn more about the connection between autonomy and motivation and what role expertise plays in the relationship.
CYCLE RESEARCH QUESTION: If I let my students create their own projects, will they maintain motivation and still engage in knowledge building?

ACTION:

The action I took was to remove formal assignments from the curriculum this quarter. Instead, students were told that their only assignment was to “work” – how they chose to work was up to them. I tried to utilize the community the students had developed as well as the metacognitive skills we worked on in the first semester to see if they could create successful learning experiences for themselves without formal guidance or assignment frameworks.

EVIDENCE USED TO EVALUATE THE ACTION:

- Conversations with each of my classes
- Observations
- Blog entries evaluating both the change in my students and the change in myself
- Student Interviews
- Student survey

DATA ANALYSIS:

100% of my students went outside the bounds of the curriculum and used a different software program to learn computer programming. Instead of continuing to use Alice (a program designed to graphically teach students computer programming which they used for three weeks previous to the beginning of this cycle) my students set out to teach themselves java programming – a more advanced topic. They employed the help of other classes and worked collaboratively to learn the language. The establishment of a community in my first cycle was crucial to students working collaboratively. In addition, the students problem-solving strategies seemed to flourish in this setting – they thrived from the challenge of learning something new and difficult.

73% of the students continued working on java for a prolonged period (over four weeks); however, every student experimented with java for at least two or more weeks. From student interviews and class conversations, I learned that most students who chose to revert back to Alice found java’s syntax to be too tedious or less stimulating since Alice is graphically-based and their programs in java were text-based. I found that most of the weaker programmers struggled with motivation. Their overall motivation improved this quarter compared to last because of the group’s mentality – I found they felt “left out” if they were not working because the rest of the class was hard at work. However, over time, these students lacked the
motivation to push themselves – most of them chose to work with partners and maintain on the periphery rather than engage in problem-solving individually. I found that most students chose partners so that they could appear to be working rather than engaging in knowledge building together – rarely did the less motivated students offer insight into the problem. Through my observations, I found the two most prominent reasons for students choosing not to continue working on java was because they were weaker problem-solvers or that they did not consider themselves part of the “club” that was good at programming.

Although individual students struggled to solve problems at different time points, each community’s problem solving approach was nearly perfect. They worked out problems together, explored alternate approaches, and took turns teaching each other concepts – all are reflective of expert learners. Even the students who struggled with programming had shining moments when they were asked by one of their peers for assistance on a problem. I found that I helped the struggling students the most by providing them “inside tips” so that they could share and teach the class. This was my attempt to bring them into the center of the classroom maintain membership in the community.

My students described their process of learning java as a fun, challenging game. The students used a software program that successfully provided scaffolding for each project; however, allowed for users to “graduate” to more difficult topics with the completion of each assignment. They found the challenge of java to be a major draw – Alice felt too easy for them (although both programs teach the exact same concepts). They quickly established an inner community within the class that was passionate about studying programming. I found that they competed with one another to further the knowledge of the community – they always wanted to be the first one to discover something new.

At the conclusion of the term, I surveyed the students to see if the processes of building a community, refining their metacognitive strategies, and increasing their independence had an effect on their understanding of learning and expertise. I used three questions:

Has this class changed the way you approach other classes? If so, how?

Has this class changed the way you approach learning? If so, how?

Can you name one thing that was different about this class and how that "thing" might affect your future schooling?
I compiled the student responses and calculated word frequencies to access their use of language. “Learn” was the most frequently used word with a frequency of 43; the next closest was “understand” with a frequency of 14. I have included a chart of all the words of frequency 6 or greater; however, I have omitted “student” from the chart for scale purposes.

I can assert from the data that the students have become more aware of their thinking process because of the frequency of words such as “think,” “expert,” “change,” and “understand.” Words such as “independence,” “try,” and “experience” were close behind with frequencies of 4 and 5. Most importantly, higher level words are being used to describe the learning process such as “understand” and “think.” The use of these words demonstrates a shift in verbiage from when students began the year. Although they started the year focused on grades, rubrics, and memorization of material, they seem to be moving toward a process-centered view of learning highlighted by change, understanding, and thinking – these all reflect the path an expert takes to solve a problem.

REFLECTION:

My students demonstrated a passion to learn programming unparallel to any previous classes I have taught. Most critical to this change was my students’ ownership of their education. The development of a community immediately signified the end of their sole dependence on the teacher. Instead, they looked to each other to build, grow, and piece together knowledge.

Our study of metacognition reinforced the importance of learning skills – students realized that they were not just in school to soak up information; they were there to learn how to learn. They became very excited when they realized they only had to learn this one – once you are an expert learner, you can learn anything. This placed more of an emphasis on their processes than their product and also served to stimulate their motivation because what they were learning had real-life application.
My students’ independence came full circle at the end of the term when they relied on me to let them know what more they could learn. They were hungry for a new puzzle to solve and a new challenge to think through. Time and again I witnessed students avoiding help because they wanted to get better at the process. It is rare to be in a classroom full of kids repeating the phrase “Don’t tell me the answer; I want to figure it out myself.” The challenge of learning really took root inside my students. Quite strangely, I found myself longing to be involved after a while – my students could come into class, work for 50 minutes together and leave without asking me one question. I found it hard to sit back and watch them struggle with a simple solution staring them right in the face; however, I knew it was best to allow them to fail. After all, this is the puzzle that I created for them in the first place.

I have found that moving out of the center of my classroom has been one of the most productive things I can do for my students. In a highly competitive independent school, grades seem to be ever present in the students’ minds. Coming into this project, I was unsure if I could shake this obsession and get my students to focus on the process. I found that this is a long process that can only get better. For instance, I hope that my students can learn even more than this year’s students. With the help of a community, it is entirely possible. My current students are excited to work with next year’s class. Therefore, I think the facilitation of a community will be much easier. Connected to the community is a will to be a member of the “club” – that will probably prove to be one of the best recruiters of kids into the computer science program.

CYCLE REFLECTION SUMMARY

From my research cycles, I have found that the potential for learning is infinite. My students learned more this year than ever before; however, the total instruction time (time spent teaching) was far less compared to years’ past. Freedom and independence only led to my students doing more work, given the right foundation. This process has opened up new ways for me to present information to my students. It has also allowed me to put the pieces of a community together that will last far longer than just a school year. My students are excited to come back to TA for next year’s classes – not for school credit (they get none), but for the opportunity to engage with other learners and build and extend the knowledge of the community.

FINAL REFLECTIONS

Part of solving a puzzle is dumping all of the pieces on the table and assessing the problem. When starting a puzzle, the sense of excitement I feel is generally accompanied with a total of bewilderment until I am able to pull out the border pieces and then separate the rest by color. When I was deciding what to do for my action research project, I felt like I was looking at
all of the pieces out on the table without a plan. I couldn’t separate the pieces at all. As I trudged through books on teaching and learning theory over the summer, I started to group some of the pieces of the puzzle together. I was still trying to organize the pieces, but at least I had found a couple that fit together. I knew I wanted to change my classroom to help my students become better prepared for the real-world. Alas, I had a starting point. I felt like my students were able to create algorithms for wonderfully complicated data searches; however, they could not apply far simpler concepts to real-life situations. We once spent an entire day relearning long division because my students had trouble writing a cash register program even though most students were in their second year of calculus. Clearly, I needed to find a way to bridge the gap between “school knowledge” and real-world problem solving so that my students are able to adapt and thrive as they move on in life.

I needed to change my style of teaching because I was relying too heavily on grades to motivate my students. Although grades can provide an extra motivation for students, it should not be the only motivation for learning. When students place too much of an emphasis on grades, they cram for tests and create projects based on specific rubrics – very little information is transferred from short-term to long-term memory. I knew I had to stress their thinking process over the end product, but I wasn’t sure how to change the culture of my class. The picture became clearer when we began researching and discussing distributed learning and distributed cognition in OMET. I realized that my student’s motivation had to come from within. Furthermore, that motivation is likely to be stronger when responsibility is tied to a community or group.

I had to make sure I stayed one step ahead of my students; however, I felt like we were engaged in quite similar learning experiences – myself in OMET and my student’s in the “new” style of teaching I was employing. For the first three months, I felt entirely lost and frustrated in OMET – this proved to be crucial to my understanding of communities. In order for me to buy into the program, I found that I needed to have justification of why we were doing things. I realized I was putting my students in the same position during my first cycle – I had them engage in knowledge building through wikis and discussion boards; yet, they had no idea how to approach the problem nor why they were doing it. Thus, I concentrated on educating them about what we were trying to do through conversations and class discussions. This “inside knowledge” (or meta-knowledge) helped my students understand the process that was taking place and where we were heading as a community.

I found that I was far more nervous about moving myself out of the center of the classroom than my students were to partake in the experiment. Kids are very resilient. What proved to be one of the most important factors in my project was giving students a “behind the scenes” look at what I was trying to do. I was straightforward with my failures and complemented the class
on their successful steps forward – the students enjoyed the fact that I was part of the process and just as capable of failure as they were. One student summarized it best after a lengthy discussion of knowledge building, “So, we are all on the same team, including you?” My students enjoyed the fact that we were discovering information together instead of their teacher having all of the answers – it is quite exciting to find something out that your teacher did not know.

I was quite surprised to find out that my students did not really enjoy having control over the classroom and their learning. This control was scary for them; however, as time went on, things turned around. By the end of the semester, my students preferred creating their own projects and pursuing their own interests to formal assignments. In fact, they would constantly ask for advice on creating challenging projects – they seemed to be addicted to problem solving and obsessed with finding solutions, even multiple solutions to the same project. Every success meant they could move on to something more challenging. I could see their knowledge progressing.

One of the turning points in the class came from a very simple question – “Do you think Tiger Woods is an expert?” It was from this question that students grasped the concept of knowledge building as a group. Each student had an opinion on the topic; however, their opinions were based on shallow evidence. I pushed the students to provide more evidence for their assertions. What resulted was a fun, heated debate. Students were researching expertise and substantiating their claims. Even students who weren’t researching were still participating in the discussion thread. When we reflected as a class after the project, my students started to see how much they had learned from each other – it was at exactly this point in time that I realized how important a community was to knowledge building. My students were finally comfortable with each other, and this comfort led to better discussion. I became conscious of how important the weeks leading up to this point were, even though they could be painful due to failed discussions and knowledge building opportunities.

Intuition is a powerful sense, but it doesn’t provide concrete evidence for an action. When I look back on my teaching over the last six years, I found that I have been using intuition to construct and guide my lessons. I was teaching and presenting concepts in a certain way because it “felt” right. What I have found is that my intuition was correct more often than not, but it did not allow me to iterate over my curriculum and make things better each year. Studying learning theory allowed me to have a concrete base from which to build my lessons. This helped me break down my curriculum and focus on more details, but grounded in learning theory. I would ask myself questions like “how can I make this activity lead to more knowledge building.” Previous to OMET and my Action Research Project, I would try to figure out how to “make my students work together more fruitfully.” By starting small, I found I was
able build far more momentum for change. This big to small approach also gave me ideas to constantly revert back to when constructing new lessons, rather than a mixture of ideas floating around in my head – everything related back to a concrete concept of learning theory. I felt like each lesson I constructed had a very specific purpose and related to a larger goal at the same time. I found teaching this way rid students from asking “Why do we have to do this?”

By the middle of the year, I could really see a change in myself. One of my students summarized how I was feeling best – “I believe that a teacher is someone who must guide you to learn the material, not just spoon-feed it to students. That is what happened in this class; I had my teacher walk along side me, not hold my hand.” I could see my students seizing class time to figure things out for themselves. I felt myself strutting proudly walking around the classroom as my students worked independent of me. One of my proudest moments as a teacher came towards the end of the year when some alumni dropped by to visit during one of my classes. My students barely flinched. They had a perfect opportunity to slack while I was distracted for 25 minutes; yet, they never wavered. I couldn’t believe their discipline and drive. I caught myself bragging to my fellow teachers about how amazing my kids have been. Once again, one of my students summed up my sentiment beautifully. “Having independence as a student, in my opinion, is a crucial asset to being successful. This independence will greatly alter my future schooling by making me a better and more self-reliant student.”

Because such a solid foundation had been laid during the first two cycles, I felt like I was watching my students fill in the last few pieces of the puzzle during the third cycle. During the first two cycles, my students did a wonderful job building a community, refining their understanding of expertise, and embracing independence. The third cycle was really a chance to put everything together. I trusted my students with more freedom. Most importantly, I felt comfortable giving them such a large amount of freedom because they had the foundation of knowledge to know what to do with it. My students produced work far better than I have seen in my seven years of teaching. I would have been happy had we ended class after cycle two; however, you never want to stop doing a puzzle with only a few pieces remaining.

The most challenging part of being a teacher is that your work is never done. The best teachers are the ones who are excited to get back into the classroom to attack the challenge of teaching – implementing something new only enhances that excitement. I am thoroughly excited for next year because this research project will never end. I know I can do a better job facilitating the creation of a community, and my mind has been racing with different ways to increase metacognition. Although my students graduated with a better understanding of expertise, I know I could do a better job teaching them the process of problem solving. My work is never really done.
Just like my project will never end, so too will my growth and learning as a teacher. From actions come questions, and to answer these questions, more actions must be analyzed. Every time I go through an action cycle, I find myself transforming as a teacher in thought and in action. My blogs truly brought this change into focus. I could see and hear my thoughts transforming over time. I will remain both teacher and student for the rest of my life.

One of the greatest parts of my research project is that things have now come full circle. Most of my students are interested in being Teaching Assistants next year for my classes, and my Advanced Placement class will begin a class with me next year on learning theory and educational technology. They will be working with faculty on implementing technology during the second half of the year. Once again, I am seeing the power of a community. By creating a student technology “task force” I will be moving myself out of the center. My students, in turn, will be moving into a new dual role as student and teacher, one I am sure they will do a wonderful job in. I felt more pride in my teaching and my students than I have ever felt in the past. I think that pride is directly related to the community that has emerged and continues to grow. I am eager to build on my Action Research Project for the rest of my career, and continue moving toward a solution to this living puzzle.
REFERENCES


