Money Makes the World Go Around: Adventures in Problem-Based Learning

All semester long I waited, planned, wrote, re-wrote and questioned myself about this project I had hatched during the summer PBL institute. I wasn't sure how it would work, wasn't entirely sure it would go off without too many hitches.

While there were some small hitches, I was amazed at the results. Maybe it wasn't the perfectly executed exercise, but I was very pleased with not only the student reaction to the exercise itself. I was even more pleased with the way it transformed the atmosphere in the classroom for the remainder of the semester to a much more congenial, talkative, intellectually curious and engaged with the subject at hand. You know, the kind of classroom everyone dreams about.

The project itself was kind of odd, I suppose, but I like a challenge of this type. My project was centered on the Marshall Plan. Yes, the Marshall Plan. That one. The goal of the project, from my perspective, was to give students a chance to learn more than I could tell them in 15 minutes about the state of Europe in the aftermath of World War II, why our country believed it imperative that we step in, what we gained, what they gained and to walk away with some inkling of how war not only affects the ones doing the fighting, but their children and grandchildren in direct and indirect ways.

What the students themselves got out of it was more, however. On reading their reflection papers, most of them really enjoyed the experience. Many commented on how much they now knew about the Marshall Plan, but more surprising were the positive comments on how they felt about working in groups, responsibility to one another, hands-on learning being much more interesting…I couldn't believe what I was reading. Of course not all of them were quite so glowing, but overall, the response was positive. And no one who participated, not a single last one of them, got the Marshall Plan questions on the next test wrong.

The exercise itself went like this: students were assigned to groups I chose. I specifically wanted people to work with other people that they usually didn't interact with. Each of these groups was assigned a country that benefitted directly from funds from the Marshall Plan. They needed to come up with a request list of funds that they could use for specific projects to get their country on the road to recovering from the war.

But what did they need? I led an introductory round of question creation, but it didn't take long for the questions to be generated by the students themselves. What was the state of society in their country? What shape was the infrastructure in? How many dead? Was there a significant population of displaced persons? What were population demographics? What were some of the pre-war sources of income for the country and could any of those be retooled with Marshall Plan dollars?

The groups then got the next two class periods to continue their research, and I noticed many groups sharing information they'd gathered during the non-classroom hours. Once

they got a handle on what shape their country was in, and had a general idea of what they were looking to do with Marshall Plan dollars, I gave them a price sheet.

This was no ordinary price sheet however. It was like a shopping list in a Sim City game. I've included that price sheet so you can see it, too. And the prices on that list? Not just made up, but after spending some quality time with my calculator, internet accounts of construction costs of everything from hospitals to 10 miles of road for dates as close to 1947 as I could find, these were fairly (that's about as much as I can claim) reasonable estimations of what things *may have* cost.

Their job was this: using the figures on the sheet, and the amount of money their country actually received from the Marshall Plan fund, they needed to choose how best to spend that money to place their country on the most promising financial footing, and be able to explain their choices. They were graded on visionary spending ideas, how their choices would affect the future of the country in the long-term (this point was very, very important to this exercise) and do the most good for the most people.

Then, the big switch up. Once everyone had made their budgets and were happy with them, these groups were disbanded. Some of them actually seemed disappointed to be moving to new groups. They liked their little country groups and some even had taken to joking about their national identity. The Belgians even brought in chocolate one day (but pointedly refused to share with the Germans because…well, *you know*.)

The next groups were made up from representatives from each country. Since there wasn't a representative from every actual country that got financial assistance from the Marshall Plan, when we compared the actual overall total spent during the program's existence and the total of funds each country in the room had received, there was obviously going to be a difference in those numbers. So we engaged in a little round of haggling. No, this wasn't precisely how the Marshall Plan funds were allocated, but it seemed like an interesting exercise to have country group members come face to face with others and justify the reasons they should get more of the extra funds. This part revealed more to me about who really knew what about their individual countries, which helped in the final analysis of the whole experience. That was quite accidental, but very useful.

It was a second round of quick decision making, learning to work with another group of unknown folks to make a deadline and reach a goal that everyone could live with and to come up with more intricate justifications for money allocation choices. German representatives were made to say they were sorry in one of the groups, and promise not to start any more wars before they could submit their proposal.

Some unexpected problems seemed to sort themselves out. In one multi-national conference, the representative from Italy did not show up to the second round of negotiations. The other countries promptly divided up the Italian funds amongst themselves. Since I hadn't explicitly made provisions for a situation like this one, I allowed them to solve the problem themselves. Italians from other groups let the missing Italian representative know that he had let their team down.

There were some fairly Machiavellian deals being made, and I was pleased to see some of the more reticent students stepping up and being a part of the negotiations. As I watched Germany get swatted down once again, I made a mental note to completely explain the notion of *realpolitik* while it was still fresh in everyone's minds.

At the end, each multinational group had five (or so) minutes to present their spending plan, and explain why they divvied up the funds as they did, and summarize their goals in doing so. I, as the sole arbiter of the final allocations, chose the winning proposals.

Students turned in all work they had done individually, and each group their price sheets, calculations, notes taken by scribes while negotiating and notes used for final presentations. They were also required to write a reflection paper as part of their grade, and their group work was graded partially by their fellow group members and partially by my own observations.

While I was very happy at the demonstrated knowledge gained by these students as they learned about their countries after the war, as well as how the Marshall Plan worked and its long-term effects, that result paled in comparison to what the whole exercise seemed to spark in the classroom for the rest of the semester. I am also pleased at how many students from that particular course stop by my office to talk about what they're doing, comparing the PBL project to what they're currently doing in their classes this semester, and just generally touching base. In all, I think that while my first attempt from far from flawless, it created a learning environment in my class that before this I had always hoped for, but never quite achieved in such a dramatic way.

If you're reading this, and are thinking about joining a future PBL cohort, I can't say enough about it. I'm not one to chase madly after every new idea that comes down the road, but this one is different. It hooks people like catfish on a line, it's fun, students can't help but get into it and it's transformative. Join. You won't be sorry.

I consider it my sworn duty as a history professor to not only unroll the scrolls of what many students come in believing to be a dead subject, but to get them to see that they are part of it. Stars, bit players or stage hands, they're part of history. Once this exercise was part of our class history, the majority of the participants were more eager to get their hands on the scrolls. And I was very happy to hand them over, because those things get heavy after a while.

First Faculty Cohort on Problem-Based Learning at Palo Alto College
End of Fall Semester Report
December 12, 2012

This Fall, 2012 semester I implemented my first Problem-Based Learning (PBL) exercise in three of my Music Appreciation courses at Palo Alto College (MUSI 1306, Sections 003, 007, and 039). I set aside two weeks to fully implement this exercise, from October 17-31, 2012. It actually took a little bit longer than two weeks to see everything through to its completion (an extra class from what was originally anticipated). Below is the PBL exercise I implemented:

Problem Title: "Romantic Rap: Gangsta of Love"

Radio Station KLUV, an alternative rap and hip-hop station, is sponsoring a very different type of songwriting contest: write a song that combines rap music and lyrics with music, subject matter, and musical forms from the Romantic Period. First prize is $5,000, a recording contract to record the winning tune, and a showcase performance of the song at the First Romantic Rap: Gangsta of Love Concert. You decide to get together with various friends from your music and music appreciation classes at Palo Alto College and participate in the contest by writing some songs.

Class 1: 20-25 minutes - Group Discussion on what do we know and what do we need to know to solve this problem of creating this song? 20-25 minutes - Student Groups report back and present Learning Issues. Prioritize. Assign research topics to individuals that will research and report back next class period.

Class 2: 20-25 minutes – Report back on assigned research topics to groups then to entire class. Identify any unresolved Learning Issues. Assign any research necessary on unresolved issues. Create document on Rap and Romantic Music.

Class 3: 20-25 minutes – Report back on any unresolved Learning Issues. Begin brainstorming creation of the Romantic Rap song and elements needed. Assign songwriting tasks.

Class 4: Work on creating songs.

Class 5: Present original songs and class judges the different group's songs and selects one winner to enter the radio contest.

General PBL Objectives:

- Teamwork
- Communication
- Critical Thinking
- Social Responsibility
- Creative Thinking

Specific Content Objectives:

- What is Rap and Romantic Music (characteristics)?
- What subject matter was/is important in Romantic and Rap Music?

- What musical forms were used in Romantic Music?
- Who are some important composers and songwriters of Romantic and Rap music?
- How can Rap and Romantic Music be combined in one song/composition?

I followed the above timeline and broke down my classes of approximately 25-30 students into 6 groups of about 5 students each. We did a group introduction exercise where each group got to know its members briefly, and wrote down each others e-mail addresses and telephone numbers. Then I handed out a page with the PBL problem and exercise on it and asked each of the groups to discuss and identify what they knew and what they needed to know to solve the problem. Each of the groups reported back to the larger class and I wrote down on the board what they knew and needed to know. Some of the things they knew were more associated with Rap music, such as: it has a heavy back beat; comes from the African-American experience; poetry and song of the streets and ghetto; it's more talking with a rhythm than singing; etc. They also identified some of the popular Rap performers and songwriters such as Tupac Shakur, Run DMC, Eminem, Lil Wayne, etc. They didn't know very much about Romantic Music and some of the things they needed to know were: Romantic Music characteristics, subject matter, musical forms, and composers. These issues were prioritized and each of the group members were assigned some of these important issues to research and to bring back their findings at the next class.

In the initial PBL class, I also let them know that each of the members in each group were going to be evaluating and grading each others participation and performance in their group, so that they should start thinking about the criteria for evaluating each other. Also, that the entire class was going to be evaluating the presentations and performances of each individual's group's Romantic Rap songs, so that they should also think about the criteria for evaluating these.

At the next class, they broke down into individual groups, discussed their research findings within the group, then each group presented these findings to the larger class. This research was written on the board and also written down by the students. Romantic subject matter, for example, included nature, romantic love, the supernatural, dreams, the diabolical. Romantic major musical forms included the art song, nocturne, etude, program music. Romantic composers included Chopin, Schubert, Liszt, Tchaikovsky, etc. And some of the important characteristics, such as individuality of style, nationalism and exoticism, program music, and expressive aims and subjects, were discussed. We also discussed and wrote down ideas on how Romantic and Rap music could be combined, such as sampling of Romantic music and combining it with a Rap beat; and Rapping over a Romantic musical form. We also discussed and wrote down the criteria for evaluating the individual members of each group (attendance, participation, collaboration, motivation, creativity); and the criteria for evaluating the Romantic Rap presentations/performances (creativity, originality, performance/presentation, fulfillment of requirements for exercise, organization, entertainment value, etc.). Besides selecting the criteria for evaluating, the students also decided to use a letter grade, A through F, to grade the individual members of the group; and a numbering system, 0-5, to grade the performances/presentations.

The stage was set. Each group discussed and decided how they would combine Romantic and Rap music, and how they would create their Romantic Rap songs. The next two classes were dedicated to the individual groups creating their Romantic Rap songs, however, various groups met outside of class to

create their songs, co-write the lyrics, and some even went into a studio and recorded their songs, or recorded them on a computer recording program. I ended up giving them an extra class time to work on finishing their songs. Finally, each of the groups in all three classes presented their Romantic Rap songs during class and the students evaluated each performance and graded them. We tallied the individuals group's scores at the end of class and came up with the Overall Winning group and Romantic Rap song. The students and groups then evaluated each individual member of their group and did a blind grading on paper, I then collected these papers from each group and averaged each individual's grades. I used this average for the grade I gave each student for this PBL exercise. The great, great majority of the students received A's, with a couple of B's and a few F's for those students who just never showed up.

The students had a lot of fun with this project, though there was great apprehension at first. They couldn't believe that I was asking them to write a song that combined these elements. There were initial comments such as: "Sir, we're not musicians and songwriters!" I assured them that I knew that most of them were not musicians and that what was important was not necessarily how good the song or production was, but the process. Once they got into the creative part, there was a lot of positive energy and "buzz" amongst and within the groups. Some of the groups collectively wrote the lyrics, while other groups decided that only one person within the group would write the poem. Another group decided to use an existing poem, "The Raven" by Edgar Allan Poe, a Romantic period writer, and rapped this poem over a Romantic composition. It was interesting to see how the groups organized themselves and presented their finished product: in some groups there was only one individual on "stage" doing the rapping, while in other groups everyone was on stage, some doing hand drumming on the classroom table, and in another group, a couple of the female students did background rapping. It was also interesting to see how the individual groups used technology to present their Romantic Rap songs. Many of the groups just used youtube for the background music while they rapped over it; while others used computer programs to combine rap beats with romantic music, recorded it, then played it back in class while they rapped over the music. As I mentioned above, one group went into a friend's more professional recording studio and recorded and mixed the song and presented a CD of the recording in class and their final product. Also, I enlisted the aid of a couple of students and these students and I videotaped these final presentations on our cell phones so that I have documentation of these.

Ultimately, I think that this first PBL exercise was a resounding success, which is not to say that it didn't have any drawbacks. Some of these drawbacks included: 1) the fact that this exercise took much longer than I would normally spend on this particular unit; and 2) I think that some of the specific subject content objectives were lost on the larger process of collaborating and creating a Romantic Rap song that they then presented in class. However, I feel that this exercise really pushed the students to accomplish something that many of them may have felt they couldn't accomplish before this exercise; and the General PBL Objectives of Teamwork, Communication, Critical and Creative Thinking Skills, and Social Responsibility, were tremendously played out and met on a much grander scale. The students and groups had to really work, get organized, communicate, research, collaborate, think and create to finish this project. Not only that, but a lot of higher order learning took place within these students with this exercise, which among others, included the creative and evaluation aspects. This exercise also really bonded these students in the group.

I'm already thinking about my PBL exercises for the Spring, 2013 semester. In my Music Appreciation courses, for example, the first 11 chapters are dedicated to learning the elements of music which consist primarily of learning various words, terms, and their definitions, such as what is pitch, dynamics, tone color, rhythm, notation, texture, etc. How would I develop a PBL problem whereby I would have the students research and learn these elements of music which includes over 100 words and definitions? Is this possible? I think the other sections dealing with different historical musical stylistic periods and my Mexican-American Studies courses will be easier. And while this first PBL exercise that I implemented this semester took a lot of time, primarily because I had them create Romantic Rap song, present it and evaluate them, I don't necessarily need to take all of my PBL exercises to this creative level and still have them solve the problem and deal with the course content.

Problem Based Learning in Mathematics – Fall 2012 – Interim Report

1. Three Problem Based Learning (PBL) projects are being carried out this semester in two mathematics courses. In College Algebra, the projects are "Yes...It's Rocket Science" and "DeciBels" In College Algebra In Context, a course which emphasized applications, "Yes...It's Rocket Science" and "The Gold Mine" are being used.

2. So far, the students have had a three hour block dedicated to identifying the knowledge elements needed to solve the problem. There will be another group exercise and the students will turn in the completed product on the day of the final exam.

3. In "Yes...It's Rocket Science" (YIRS), the parameters of a model rocket are given. This problem was presented to the students after study of the parabola. The students are expected to know all the formulas associated with the parabola and to be able to draw an appropriate graph with the aid of a graphing calculator. However, the formulas tell only how long the flight of the rocket was. Without one other piece of information (the down-range velocity of the rocket), the impact point of the rocket cannot be determined. This piece of information was provided, but very few students recognized how it should be used. Newton's standard formula was used to determine the time (t) at which the rocket hit the ground and the formula $x = 64t$ to determine how far the rocket went before impact. The ability of the students to identify the essential elements of information was poor. This project was based on a movie in which students were accused ot setting a fire with their model rocket and they proved mathematically that this could not have happened. In this problem, extraneous information about the angle at which the rocket was fired was given. Not one student noticed this fact or questioned the value of the extraneous information.

4. The problem on decibels looked very difficult. It was essentially "The Radar Problem". A radar signal of a certain number of Watts is transmitted. It is subject to various gains and losses in the process of being reflected off an airborne target back to the radar. Some of these gains/losses are from the parabolic shape of the antenna and atmospheric attenuation. The students are shown how to represent the power of the radar in dBm. This requires knowledge of the rules of logarithms. Then ratios representing gains and losses are given in the form of dB. The students are not told how to combine dBm and dB and what the resulting combination would be. The objective is to determine the number of Watts of power what makes its way back to the waveguide in the antenna and whether or not this amount of power exceeds the minimum discernible signal, i.e. whether or not the radar will see the target. The point of using dB instead of Watts is that the arithmetic is rendered very simple by doing this. DB corresponding to gains and losses are simply added to the power in dBm and the result is in dBm which is changed into Watts using the laws of logarithms. The essential elements f information are the laws of logarithms and the rule for combining dBm and dB. The students were expected to find

December 19, 2012

Final Reflection Fall 2012:

This semester I taught 3 developmental math classes and was not able to complete the PBL problem I created at our workshop in May. So far it seems I will be teaching College Algebra in the spring and therefore I will do that problem, or perhaps create a new problem. I did complete a few activities that I will share.

In Math 0302 we teach a lot of the algebra "rules" that students will use in higher level math classes. When students finish this class it is imperative they know how to factor polynomials. You must understand that I do make my own tests but the final exam is created by the math department, so I do need to stick to the curriculum if I want my students to be successful on the final. In Ch. 5 students learned how to multiply and simplify polynomials. In Ch. 6 they factored, which is doing what they learned in Ch. 5 in reverse. Before teaching them anything I handed out a worksheet with simple problems and had them complete the worksheet with partners. I did not preteach, I simply asked them to use what they had learned in Ch. 5 to help them complete the factoring exercises. I set up the problems in an orderly fashion so they would see some patterns. One of my older students was very unsure about the activity. She is clearly a traditional learner who had been unsuccessful in 0302, but because I did not teach the lesson first, she left class very frustrated. I must say she came back the next day with a better attitude. I told her she needed to trust me and that whatever activities I chose to do with the class were to help students better learn and retain the material. She did end up finally passing 0302. The younger students were more willing to complete the activity. This meant helping each other and perhaps getting frustrated, but perseverance paid off.

As we worked through Ch. 6 and factoring I was ready to show the class a method of factoring called the AC method. It works for all standard polynomials but can be complicated when the numbers are large. Not all students use this method but I knew many of the students in this class would depend on the method since so many of them really struggled with math concepts. Even some of the best students used this method for the remainder of the course. For the next activity I gave them 2 problems to complete using the AC method. Each row received one paper and each student had to complete one part, pass the paper to the next person who checked their work and completed the next step. This method has many steps to it, but without this method many of the students would not have learned how to factor and therefore would have failed the class. Having taught 0302 many times before, I know how important this concept is to success, not only in 0302 but also in 0303 and College Algebra.

As you can see my strategy with both of these activities was to remove myself from the traditional teacher role, where I spit out the information and they follow my lead. I wanted them to struggle and even fail, but hopefully in the process learn and retain. Many of these students were very unsure of themselves and needed constant reassurance. At the end of the semester I did another group activity. I assigned them to groups of 3 or 4 and had them at the board around the classroom. They had to take turns with the dry erase pen. I read out a problem to the whole class and it was a competition to get the answer first. I kept track of the results and they all participated and helped each other. It was a good, low stress review activity. Lots of adults do not like to get up in front of the class, but they were all at the board together and I chose the groups.

In the end, most of the students were successful and passed. There were some who received IP or F, but some made a B instead of a C because of their good score on the final. I wish I could have done more activities with this class but they were very fragile and so many had been unsuccessful in the past. I will continue to try new activities that will motivate my students and help them to be successful in these developmental classes. They not only need to pass but they need to retain what they have learned and bring that knowledge to their next class.

From:
Sent: Saturday, December 01, 2012 9:25 AM
To:
Cc:
Subject: End of Semester PBL reflections

Importance: High

Hi

Here it is. I posted it on AlamoShare this morning.

PBL projects were implemented in two courses. One project (the bully project) was designed for students to learn conflict resolution and interpersonal communications, culminating in an on-campus event about bullying and communications. The other project (the Denmark project) in another course was designed to learn persuasive techniques for developing motivational products. The students produced several stand-alone PowerPoint presentations and a video for the International Studies program to use to promote the upcoming Denmark study abroad.

For both projects, the students were enthusiastic and jumped right in, especially when they recognized their projects had a relevant application that could help other students. Several times, I was asked to reserve rooms so they could have extra time outside of class. However, although they were enthusiastic about the projects and learned required content, there were some challenges.

Once the projects began, both classes were very focused on the end products. They gained momentum quickly and were a challenge to rein in so they could complete other class assignments. I will discuss this matter with colleagues to identify how this could have been managed more effectively.

Another challenge developed because each PBL project was introduced differently.

The bully PBL was introduced slowly to the class, giving the students plenty of time to acclimate to the new teaching methods. The students were asked if they wanted to participate, getting their buy-in early in the semester. Then, once their teams were well-formed and they had been introduced to a few very short PBL-style exercises, they began the larger project. This class was amenable to changes in the PBL problem. When there was a new direction, they tackled it and kept going.

Some students reacted differently to changes in the Denmark project. It was introduced as a module for the students' group presentation without preparing the students for PBL-style instruction. The students were not asked if they wanted to participate in a PBL project and did not have time to get used to a PBL approach. Several students strongly resisted changes in the problem. Although the majority of the class adjusted well to changes, three students were highly resistant and vocal, saying the class was unpredictable when the problem took new directions. They expressed their extreme frustration about not knowing exactly what to expect and said it was not a good experience for them.

In one of the PBL cohort meetings, it was suggested that we identify what courses implement PBL-style instruction. The reaction of the unprepared students who worked with the Denmark project confirms the necessity to notify students that a course will use PBL and what to expect.

In spite of the challenges, these PBL efforts were successful. The students enthusiastically researched and learned course content and developed projects they are proud of that will help other students. Next time, PBL implementation will be much more thought out and all students will be prepared for their PBL experience.