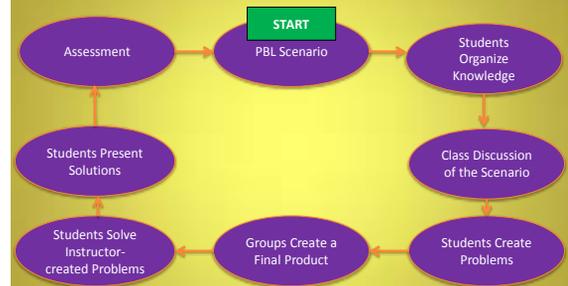


Problem-Based Learning (PBL) Is More Than Solving Problems

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A Problem-Based Learning Cycle



Pay My Bills PBL Scenario

TBR students started the 2011-2012 academic year with a 6.1% increase in tuition over the 2010-2011 academic year (<http://www.murfreesboropost.com/mtsu-tuition-to-climb-again-cms-17748>). Based upon the current economy, forecasts about the country's economic recovery are grim. Parents and students can anticipate a continuation of tuition increases over the next five years.

Initial Questions

Form groups and discuss what you know about the scenario, what information you need to know about the scenario, and where you could get that information.

Creating Problems

Individually write a story problem related to the PBL scenario and solve it (solve on a separate piece of paper).

Example Student-Created Problem

My sister, Stephanie is an avid coupon clipper and enjoys finding the best bargain in town. She travels to Publix and Wal-Mart to shop for her groceries each week. Wal-Mart is 11 miles away from her home and Publix is 5 miles away. She estimates that it costs her \$0.40 a mile to travel in her current automobile. Wal-Mart is on average 9% cheaper than Publix. Stephanie spends \$300 on groceries at Publix. How much money will Stephanie lose or save by going to Wal-Mart?

Solving Other's Problems

Exchange problems with a partner and try to solve their problem.

Example Instructor-Created Problem

The professors at MTSU decide that they would like to try to prevent the tuition increase for the students. The student to professor ratio at MTSU is 21 to 1. This year there are 26,442 students at MTSU. How many professors are there? If the average salary of a professor at MTSU is 78,245 then what percentage of the average salary will the professors need to give up so that the tuition will not increase? How much money per professor will that be? Is it reasonable for them to give up that much of their salary?

Example Assessment Problem

Tuition at MTSU increased by 6.1% for the 2011-2012 school year. The tuition for 2011-2012 was \$6682.18. The predicted full-time student enrollment for 2012-2013 is 18,230. The tuition is predicted to increase by 4.25% in 2012-2013.

The SGA, looking out for the students, wants to find an alternative way of increasing revenue for the school and thus stopping the increase in tuition for 2012-2013. The SGA has partnered with a local coffee roaster to offer a coffee blend called Raider Roast. The coffee sells for \$9.99 per 1 pound bag. The coffee roaster has agreed to give MTSU 75% of the profits from Raider Roast. How many bags of coffee must be sold to raise enough money to stop the increase in tuition for 2012-2013?

Is the number of bags of coffee to be sold a reasonable amount of coffee to sell?

Standards for Mathematical Practice

Discuss in your groups how learning mathematics through PBL provides students with opportunities to engage in the Standards for Mathematical Practice.

Standards for Mathematics Practice

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

How Can You Use PBL?

Discuss in your groups the potential ways that you could implement PBL in your classroom.

Research Results

Qualitative data were collected to gather students' perceptions about learning through PBL.

Many of the qualitative findings were supported by the quantitative data collected.

Working With Others To Solve Problems

"When we are in groups we get to understand how different people approach a problem. I might see it one way and another person might say, "Well you can do this too," so it is teaching you, while you are teaching others. You are learning and teaching."

"I knew [percents] when I was younger but I could not always do it in my head like a lot of people can do when they are paying a bill or looking at a sales rack.... A couple of my group members have been able to explain it in their own words. Which is closer to what I would need to hear."

Self-Directed Learning

"By me figuring out the problems on my own the material sticks longer. Being shown something once, as in my other math classes didn't help because I could not remember how to do it when I got home."

A Different View of Mathematics

"I have thought [outside of class] about possible problems I could make from real life experiences. I have found that after this class I see math everywhere and often think "I could make a math problem out of that." In other classes I've never done that because I really don't like math but this class made it more real life applicable."

Decreased Mathematics Anxiety

Realizing They Are Not Alone

"Learning this way almost makes me feel less stressed about revisiting all these elementary skills because everyone else is having the same troubles that I am."

Group Dynamic

"Me and my group got along really well and tried to help each other not be so stressed and anxious about the problems."

Focus on Multiple Solution Paths

"Before they [anxieties] were a lot higher than they are now. We have gone over a lot of different ways you can go into problems and different ways you can solve them."

Attitude Toward Mathematics

Confidence

"I enjoyed stepping out of my comfort zone and creating our own problems. Now I know that I am actually capable of writing my own work, which is a skill I will need as a teacher."

Value

"I don't think any other math class had made me question things like this. However, these are real-life problems that are important to be able to solve."

The Students' Progression to Acceptance of PBL

Excited and Hopeful

"I think I have the potential to be a better problem solver at the end of this semester. It's all just very new. Also, I think this type of learning could really help me retain the skills I will need as a learner and educator. In the past I've been taught to approach problems with a focus on whatever skill we were currently learning instead of accessing the broad, collective skill set I've been building since elementary school. I like the idea of trying new ways to solve for an answer instead of being given one path to follow to reach an answer."

The Students' Progression to Acceptance of PBL

Concern and Confusion

"Doing mathematics through PBL is really stressing me out. There are a lot of concepts I don't remember how to do and when that is combined with solving word problems, it makes it worse I'm mostly concerned about how we are going to create our own problems. I feel that I can hardly work the problems we are given, much less come up with new problems."

The Students' Progression to Acceptance of PBL

Acceptance

"I really did not enjoy this class in the BEGINNING; I felt that it was very stressful. Towards the middle and the end, my group really came together and learned how to work together, study, and to ask questions. I feel that the PBL's and learning to formulate our own problems will be beneficial to me. I enjoyed this class and I felt it has caused positive feelings about mathematics. I am slowly warming up to the idea of being able to work problems out on my own and actually believe that it will be beneficial to me."

Questions?

Thank you for coming!

If interested in more PBL lessons, e-mail me at banesbc@lipscomb.edu.

See the next slide for suggested literature.

Suggested Literature

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