

Session 2 Description:

The purpose of this session is to continue the conversation on the role of language in learning mathematics and to explore the various issues related to the learning of mathematics in a second language.

Session 2 Readings:

Students must have read the following articles before coming to class:
(you may go to the relevant link for brief summaries of each article)

Moschkovich, J. (2002). A situated and sociocultural perspective on bilingual mathematics learners. *Mathematical Thinking and Learning*, 4, 189–212.

Moschkovich, J. (2007). Examining mathematical discourse practices. *For The Learning of Mathematics*. 27, 24-30.

Moschkovich, J. (2005). Using two languages when learning mathematics. *Educational Studies in Mathematics*, 64, 121-144.

Perkins, I & Flores, A. (2002). Mathematical notations of recent immigrant students. *Mathematics Teaching in the Middle School*, 7(6), 346-351.

Saxe, G. B (1988). Candy selling and math learning. *Educational Researcher*, 17(6), 14-21.

Day 2 Lesson Plan:

1. Discuss readings: (60 minutes)
 - a. In groups of 3-4 students discuss the readings and jot down key points and any new insights they gained from the readings.
 - b. Groups share key points and insights in whole class discussion.Suggestion: Have each group write key points on poster paper and hang poster sheets on walls.

2. Baseball activity: (90-110 minutes)

The goal of this activity¹ is for students to experience what many bilingual children who have conversational fluency in English experience in the mathematics classroom. Specifically, students will discuss and solve a mathematics problem in the context of baseball. The mathematical skills required to solve the problem are simple. However, for someone who is not familiar with baseball and/or baseball discourse it is impossible to make sense of the problem. In other words, students will experience what it is like to have conversational fluency (the problem is in English) and know the mathematics content but not be able to solve the problem because of not knowing the specialized language of baseball and not being part of the baseball discourse community.

¹ This activity is an adaptation of the baseball activity developed by Dr. Aria Razfar who used it in a session on Discourse during the CEMELA School in June 2007.

Those students who are very knowledgeable about baseball and its language will see how difficult it is to have the rest of the students who are not part of the baseball discourse community make sense of the problem without having experience with baseball. Discussion around this activity will tie very nicely with the readings from both days and should touch upon issues such as specialized vocabulary, register, discourse, conversational language, academic language, context, etc. Please use the baseball activity power point as you go through the activity.

Guidelines for baseball activity:

1. Inform your students that they will be solving a baseball problem and ask them how knowledgeable they are about baseball. Hopefully not all of them will be...Divide the class in three groups:
 - a. Group 1 “Baseball experts”: Students in this group self identify as being very knowledgeable about baseball and can fluently talk about baseball.
 - b. Group 2: Students in this group have some knowledge about baseball but do not self identify as knowing all there is to baseball.
 - c. Group 3: Students with no or almost no knowledge of baseball, other than that it is a sport. Students in this group do not watch or play baseball and would have difficulties following what is going on during a baseball game.Groups 2 and 3 will be the “Baseball Language Learners” (BLLs) in this activity.
2. Ask students to discuss in their groups and define the following baseball terms, some of which are used in the problem they will be solving: bat, batting three hundred, ball, strike, diamond, base, steal, stealing home, hit & run, triple crown, run, out, balk, save, bean ball. Ask groups to share their definitions with the rest of the class starting from group 3, then group 2, and then group 1. This should spark some discussion about register (everyday register and baseball register). Have a student from the “expert” group write the agreed upon definitions of these terms on the board.
3. Pose the baseball problem and ask students to solve it collaboratively in their groups. As each group attempts to solve the problem ask the two BLL groups to monitor the process of trying to understand the problem. What resources do they draw from to make sense of the problem? Also, ask the “expert” group to think of how they would go about helping the BLL groups make sense of the problem.
4. When groups are finished solving the problem, have the BLL groups (starting from group 3) share the process they went through as they tried to make sense of and solve the problem. Then have these groups (not the “experts”) share their solution. The assumption is that the two BLL groups will not have reached an appropriate solution for the problem. If group 2 has a correct solution, don’t let them share it yet.
5. In a whole class discussion discuss the following:
 - a. Why was it not productive to go over key baseball terms (vocabulary) at the beginning?
 - b. Identify the “baseball register” in the problem.
6. Now, rearrange the groups. Have students form groups with at least one “expert” and one BLL. Ask “experts” to assist the BLLs in understanding and solving the

problem. The assumption is that the “experts” will try explaining the problem using various aids such as visual and/or physical representations. Another assumption is that the BLLs in group 3 will not fully understand the problem and would not be able to solve another similar baseball problem.

7. In a whole class discussion have groups share their solutions and the methods the “experts” employed to assist the BLLs. Also have the BLLs express whether after receiving assistance from the “experts” they fully understand the problem and its solution and whether they feel confident that they could solve a similar baseball problem if asked to do so.
8. Finally, discuss “lessons learned” from this experience, particularly as they relate to bilingual mathematics learners. Ask students to make connections with the readings from both days. The discussion should take its own course as students should have a lot to talk about. Possible questions include:
 - a. Why is conversational language important and where does it fall short when trying to make sense of the problem?
 - b. Is knowing the baseball register enough to understand the problem? Why?
 - c. What kinds of experiences would the BLLs need to make sense of the problem?
 - d. What would it take for BLLs to become members of the baseball discourse community?
 - e. Find a mathematical idea that is expressed in the problem in a way that is different from the way it is “usually” expressed*.
 - f. What kinds of insights have you gained from this experience that relate to the teaching and learning mathematics (to Language minority students in particular)?

* In this problem 800 means 80%. This can bring up the point that mathematical meaning is situated in the context and “universal” mathematical representations such as 100 mean different things in the context of baseball or in the context of a number system with base other than 10, for example.