Education Seminar # 2: Science Misconceptions

Speaker: Dr. Andrea Burrows, GK-12 and RET Grant Coordinator, University of Cincinnati
Date: June 30, 2010
Time: 11:00 to 12:00 PM
Venue: 757 Baldwin Hall

Prepared by:
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This seminar was given by Ms. Andrea Burrows, Coordinator for the NSF GK-12 Fellows STEP Project and the RET Site and a doctoral student in the College of Education, Criminal Justice, and Human Services (CECH), University of Cincinnati. Ms. Burrows covered following topics:

- Background
- Just what are misconceptions?
- Examples from Science and Math
- Two contemporary views
- Two more examples
- Take-home messages from this talk

Ms. Burrows used a Power Point presentation as visual aids. She initiated the session by distributing a list of science topics and asked the participants to, working in groups of two, identify a misconception for each topic. Participants then described some of their listed misconceptions.

The definition of a misconception was discussed. Examples of math and science misconceptions were presented and discussed. In particular, two examples from Mechanics, the FCI (Force Concept Inventory) and FMCI (Force and Motion Conceptual Inventory), were presented. One was the trajectory of a cannonball fired from horizontal cannon, and the other was the trajectory of a bowling ball dropped from a plane. These examples lead to spirited discussion. Other examples were also presented, which included the following for Physics:

- Force of the hand acting on a ball tossed in the air.
- Bigger objects exert larger forces on lighter objects when they interact.
- Heavier objects fall faster than lighter objects.
- Blocking the top half of a lens while an image is formed results in only half the image.
- Other topics: Relativity, thermodynamics, etc.
- The FCI example amplified following points:
- Brought home the fact that students emerge from physics classes with poor conceptual understanding.
- Forced Physics faculty to think of ways of teaching that help students acquire conceptual understanding.

- Made the value of physics education research more apparent.

Two popular theories about misconceptions were identified. They are: misconceptions as personal theories, and misconceptions as activation of knowledge pieces in response to context.

Ms. Burrows summarized the “misconceptions as personal theories” theory, including misconceptions, are complex cognitive entities that are applied wholesale. She summarized the “activation of knowledge pieces in response to context” theory, including misconceptions result from the compilation of knowledge pieces activated in real time in response to context.

One more example, a racetrack and balls scenario was presented and discussed. Participants then went to a website, http://helloquizzy.okcupid.com/tests/the-physics-misconceptions-test, and took the quiz on science misconceptions. Ms. Burrows fielded questions and the session ended.