

## **Ceres and Pluto: Dwarf Planets: A New Way of Thinking about an Old Solar System**

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John Ristvey, McREL, Denver, CO, Joe Wise, New Roads School, Santa Monica, CA, Lucy McFadden, U. Maryland, College Park, MD.

The decision by the International Astronomical Union in 2006 to redefine the term "planet" has caught the attention of the public and students from grade school to graduate school. The Education and Public Outreach (E/PO) team from NASA's Dawn mission to Vesta and Ceres, developed an educational activity using a research-based, instructional strategy called direct vocabulary instruction to help students understand the IAU definitions of planet and dwarf planet (<http://dawn.jpl.nasa.gov/education/index.asp>) enabling students to participate in the debate that continues about the definition of planets and dwarf planets. Use of direct vocabulary instruction has proven to be effective and more enjoyable for students than just looking up definitions in a dictionary. The six step approach proposed by R. J. Marzano (2004) "Building background knowledge for academic achievement." Alexandria VA: Association for Supervision and Curriculum Development, includes the following steps:

1. The teacher provides a description, explanation, or example of the new term.
2. Students restate the explanation of the new term in their own words.
3. Students create a nonlinguistic representation of the term.
4. Students do activities that help them add to their knowledge of vocabulary terms.
5. Students are asked to discuss the terms with one another.
6. Periodically students are involved in games that allow them to play with the terms.

By giving students opportunities to engage with the terms in various ways, direct vocabulary instruction increases the likelihood they will internalize accurate, meaningful definitions. As students use oral language, visual representations, and social interaction to learn new terms, "direct vocabulary instruction has an impressive track record of improving students' background knowledge and comprehension of academic content" (Marzano, 2004). This exercise also addresses the following National Science Education Standards:

### **Science as Inquiry (Grades 5-8)**

Understandings About Scientific Inquiry

- Scientific investigations sometimes result in new ideas and phenomena for study, generate new methods or procedures for an investigation, or develop new technologies to improve the collection of data. all of these results can lead to new investigations.

### **Earth and Space Science (Grades 5-8)**

Earth in the Solar System

- The earth is the third planet from the sun in a system that includes the moon, the sun, eight<sup>1</sup> other planets and their moons, and smaller objects, such as asteroids and comets.

### **Language Arts Standards Addressed**

**Standards 7: Uses reading skills and strategies to understand and interpret a variety of informational texts (Grades 6-8)**

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- Uses new information to adjust and extend personal knowledge base