Teaching Astronomy Using Visual Methods

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Using qualitative and quantitative data, we examine the role of visual methods in helping students learn concepts in introductory astronomy. Visual methods are defined as student-generated work of a visual nature, including drawings, graphs, and concept maps. Visual methods can be a valuable addition to other aspects of the teaching/learning process. Students find that visual methods not only help them establish a foundation of astronomy knowledge, but also help them synthesize formerly disparate pieces of information into a more holistic, 'big picture' understanding of astronomy. Furthermore, students perceive visual methods as an effective alternative or complement to mathematical approaches to learning astronomy.

What Are Visual Methods?

Visual activities used by students to understand and communicate concepts

• Seeing with Intention
• Learning by Synthesis
• Assessing Learning

Seeing with Intention

• Viewing and drawing images through color gels
• Different colors indicate different physical conditions

Assessing Learning

• Lecture and activities focus on star formation process
• Students create concept maps to show their understanding of relationships between concepts

How do visual methods help non-science students learn complex science concepts?

• Students see visual methods as an alternative to mathematical methods
Visual methods allow students with limited math skills to understand concepts
“I was able to get an introduction to the main ideas in astronomy, by using graphs and visuals...”
Students with high math skills found visual methods helpful to their own learning
“...it was much more influential than a heavily math based class.”

Visual methods helped students connect concepts together
“...the class tied together the major concepts ...in a very clear coherent way.”
“(The concept map) forced me to think about the big picture with detail, which helped me get a better broader understanding.”

Research Questions

• How do visual methods help non-science students learn complex science concepts?
• How can we assess the effectiveness of visual methods for student learning?

Learning by Synthesis

• Student drawings bring together the physical processes, relationships, and complexity that characterize our galaxy

Comments from Students

“Visual learning... was very effective for me personally. The activities I remember best used visuals...”
“Plotting all the nearest & brightest stars helped me visualize the main sequence, white dwarfs, & supergiants much better.”
“I understand parallax after experiencing it and plotting both the stars and the Milky Way center helped me visualize these concepts.”