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Visualization for Spatial Comprehension

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Visualization for Spatial Comprehension

**Spatial Instruction Challenge**
Mapping and understanding spatial data are fundamental necessities for geographers, yet challenging for many students (Rapp et al. 2007).

Spatial is a separate category of mental ability (Ishikawa and Kastens 2005)
I. Representational correspondence (Ability to find locations on a map)
II. Configurational correspondence (Ability to ID relationships among objects on a map and the real world)
III. Directional Correspondence (Ability to align a map with directionality in the real world)

**Augmented Reality Sandbox**
I developed an innovative augmented reality sandbox to help students connect form with representation on an enhanced and interactive sand surface
- Manipulated by students (hands-on)
- Vivid projection of colorful topographic map on sand surface in real-time
- Computer-run simulation software, Xbox 360 Kinect and projector

**Graduate Assistant Response**
“Every student…showed enthusiasm…. This made teaching the lab a much better experience….answering questions and watching them enjoy geography.”

**Student Response**
What was the most difficult part?
- “…stopping playing with the sandbox.”
- "Nothing. We enjoyed the exercise.”
- "It was easy to use.”

Making it engaging and employing 3D representation is known to assist with spatial instruction and learning (Rapp et al. 2007)

**Incorporating Visualization in Instruction Across Disciplines**
- Use existing visualization techniques
  - Google Earth
  - ArcGIS Explorer
- Data graphing programs, iterations illustrating change over space and time
- Construct your own use-specific tool
  - Physical materials like images, objects or models
  - Other digital programming

**Types of Applications for an Augmented Reality Sandbox**
- Recruitment and promotion of sciences
- Enhancement of student engagement
- Topography education (contour lines)
- Landform studies
- Mass wasting events
- Rainfall and runoff simulations
- Stream flow simulations
- Watersheds and catchment areas

**Bringing Visualization Techniques to the Students**
Consider where the students might benefit from an interactive and hands-on experience with visualization for learning.

Our sandbox visualization unit was designed to be mobile to come to the students on a wheeled base, with a laptop and a overall design to allow for easy entry and exit from most classrooms.

**Broader Applications of General Visualization Techniques**
Use of visualization techniques, particularly the interactive technologies of augmented and virtual realities opens new educational opportunities to address curricular deficiencies and enhance engagement.
- Addresses separate spatial abilities
- More natural and “easy” interaction
- Disruptive pedagogy and engaging...