Nicole D. LaDue, M.A.T., Ph.D.
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...and here's a chart that shows what you might see if you looked at a mountain range through a tennis racket.
Research Themes

- Visual-spatial thinking
- Confidence & Interest
- Active Learning

Academic Success
Research Themes

- **Cognitive**
  - Visual-spatial thinking

- Confidence & Interest

- Active Learning

- Academic Success
What is visual -spatial thinking?

- Recognizing patterns
- Integrating parts into whole
- Mentally animating
- Inferring 3D from 2D
Importance of Spatial Skill

Spatial Skill

Patterns 3D Animation

STEM Careers

Shea et al., 2001; Wai et al., 2009
Research Themes

Confidence & Interest

Visual-spatial thinking

Active Learning

Academic Success
Fostering Spatial Skill

Clicker Study: Top Hat web-based system for smart devices

Prompt: “Click within the layer that is liquid”
Fostering Spatial Skill

Prompt: “If the block represents a reverse fault, click where the X will move after faulting”

Pre-instruction

Post-instruction
Fostering Spatial Skill

Scores increased
Significant gains

Prediction + Feedback

Learning

Pre- and Post-TMA-B Scores by Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-TMA-B</th>
<th>Post-TMA-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>3DC</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>3DD</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>2DC</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>2DD</td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

Error Bars: 95% CI

OSEEL Student Engagement Fund Grant & CISLL Pop Grant
Research Themes

Confidence & Interest

- Visual-spatial thinking
- Active Learning

Academic Success
BELONG in STEM Scholars

Building Engagement in Laboratories, Networking and Peer Groups (BELONG) in STEM Scholars

$1M in funding
$5,000 scholarships
Academically successful, financially struggling

Research Experiences | Professional Development | Peer Mentoring

NSF #1834076 Lead-PI Ralph Wheeler, Chemistry & Biochemistry
Engaging community college students and teachers in field- and laboratory-based research on climate change

- 10-week international research experience
- 2 semester mentored research experience
- Team approach with grad student mentors

Science Identity

Confidence

Peer Mentoring

U.S.–Estonia Research Partnership

NSF #1827135 Lead-PI Nathan Stansell, Geology & Env. Geosciences
STEM Education Research

NIU Student Success

- Interest
- Confidence
- Career Readiness
- Equity & Inclusion
- Skill

STEM Education Research

Persistence

Quality of Instruction
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