Embodied Cognition and Technology in STEM education

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ILT/ECE
## Research Areas

<table>
<thead>
<tr>
<th>Learning Environment Design</th>
<th>Preservice Teacher Education</th>
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<tbody>
<tr>
<td>The use of technology for instructional embodiment in STEM education.</td>
<td>PD for teachers’ technology integration</td>
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<td>Factors’ affecting technology integration</td>
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</tbody>
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Embody Cognition

Barsalou, 2008; Gibbs, 2005; Lakoff & Johnson, 1999; Smith & Gasser, 2005; Wilson, 2002

- Traditionally, perception has always been considered as bodily in nature while conception has been seen as purely mental and independent of our abilities to perceive.

However, embodied cognition suggests,

- Our thought and knowledge emerge from dynamic interactions between our body and a physical world.
- Perceptual experiences are key elements to reach conceptual understanding.
Cognitive Linguistics: Metaphorical Mapping

John exploded when he failed his exam.
Mary flipped her lid over Bush becoming President.
Bill got hot under the collar during the argument.
It made Sally’s blood boil whenever she saw litter.

(Gibbs, 2003, p. 5)

the fluid gets heated in a container (source domain)  Metaphorical mapping  Angry (target domain)
Cognitive Psychology: Perceptual Simulation

Striped Lavender Sofa
My Research

• Providing perceptual experiences
• With technology
• For STEM education
<table>
<thead>
<tr>
<th>Topic &amp; Subject</th>
<th>Perceptual Experiences</th>
<th>Use of Technology</th>
</tr>
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<tbody>
<tr>
<td><strong>Study 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Study 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Study 3: proposed</strong></td>
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Understanding physics with force feedback

8-tooth gear x 16-tooth gear combination
Rotate the 8-tooth gear on the left with your joystick

Input Force
- High
- Medium
- Low

Output Force
- High
- Medium
- Low
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<td>Haptic feedback in addition to visual and auditory information</td>
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<td>- Understanding how simple machine works</td>
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**Study 2**

**Study 3: proposed**
VR for structural understanding
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<td>Mechanical engineering for hearing impaired adult learners</td>
<td>Eye-hand coordination</td>
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<td>- Structural understanding of CNC machine</td>
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Study 3: proposed
Multi-touch app for teachers’ use of gestures

Q: Meilin saved $184. Betty saved $63 less than Meilin. How much did Betty save?

Step 1: Draw a tape representing the amount Meilin saved.
Multi-touch app for teachers’ use of gestures

Q: Meilin saved $184. Betty saved $63 less than Meilin. How much did Betty save?

Step 2: Show the amount that Betty saved less than Meilin.

Meilin $184

STRECH and PINCH

$63
Multi-touch app for teachers’ use of gestures

Q: Meilin saved $184. Betty saved $63 less than Meilin. How much did Betty save?

Step 4: Draw a tape diagram corresponding to the amount Betty saved.
Thank you!

Interested in technology??