Pieces of Knowledge: Multimodal Emergence and Trajectory in Socio-Scientific Educational Debates
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**ARGUMENTATIVE RESOURCES IN SOCIO-SCIENTIFIC EDUCATIONAL DEBATES**

**INTERDISCIPLINARITY**
- science teaching (e.g., Driver, Newton, Osborne, 2000; Sadler & Zeitler, 2005)
- + citizenship education (e.g., Legardez & Simonneaux, 2006)

**SUBJECTIVITY**
- (e.g., Oulton, Dillon, Grace, 2004)
- socio-ethnic beliefs + values + interests

**CONTEXUS**
- (e.g., Albe, 2009)

<table>
<thead>
<tr>
<th>PIECES of KNOWLEDGE-BELIEF (Polo, 2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source(s)</strong></td>
</tr>
<tr>
<td>1. Own experience</td>
</tr>
<tr>
<td>2. Testimony</td>
</tr>
<tr>
<td>3. School</td>
</tr>
<tr>
<td>4. Previous café steps</td>
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<tr>
<td>5. Family</td>
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<td>6. Media</td>
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</tbody>
</table>

**PARTICIPANTS**
- 12-14 year-old students
- Specially trained student moderators

**SCHOOLS**
- 2 in Mexico, 1 in USA, 1 in France, 2 in Brazil

**PEDAGOGICAL SETTING: the YouTalk Scientific Café**

**MODERATORS’ TRAINING**
- To lead the YouTalk Scientific Café about Water Management

**YOU TALK - INTRODUCTION (10 min)**
- Game rules
- Main Question (MQ)
- First Individual Anonymous Vote
- Introduction to the 3 thematic phases

**YOU TALK - THEMATIC PHASES (3 x 20 min)**
- **KQ**: reading and group discussion
- **OQ**: reading and group debate
- **MQ**: synthesis of class debates

**YOU TALK - CONCLUSION (15 min)**
- Class debate on an OQ
- Group debate about an opinion question (OQ)
- Class debate on an MQ

**YOUTALK - INTRODUCTION (10 min)**
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**YOU TALK - THEMATIC PHASES (3 x 20 min)**
- **KQ** (x3): reading and group discussion
- **OQ**: reading and group debate
- **MQ**: synthesis of class debates (3 OQ)

**YOU TALK - CONCLUSION (15 min)**
- Class debate on an OQ
- Group debate about an opinion question (OQ)
- Class debate on an MQ

**FIRST RESULTS FROM THE US CORPUS**

- Different spatio-temporal localizations associated with different scenarios of material environment exploitation
  - Mostly consists of:
    - Reading the slide or referring gesturally to the screen
    - Using something to point
    - Handling the clicker to display determination to select an option or emergency to get to a conclusion (positioning or/and interactional function)

<table>
<thead>
<tr>
<th>Exploitation of the material environment mostly occurs at the group level</th>
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<tbody>
<tr>
<td>Initial group discussion for quiz elucidation (KQ)</td>
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<tr>
<td>Supporting meaning-making process (mostly referential functions)</td>
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</table>

**Different knowledge units associated with different gestural scenarios**

<table>
<thead>
<tr>
<th>“Virtual water”</th>
<th>Price / Cost</th>
</tr>
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<tbody>
<tr>
<td>- Imprecise gestures</td>
<td>- Less and smaller gestures</td>
</tr>
<tr>
<td>- Referential function</td>
<td>- Diversity of functions</td>
</tr>
<tr>
<td>- Little redundancy with speech</td>
<td>- More redundant with speech</td>
</tr>
<tr>
<td>- Repetitions</td>
<td>- Reinvestment with other words or gestures</td>
</tr>
</tbody>
</table>

| Exploitation of the material environment is not very sensitive to the knowledge content. |

**HOW DO THE STUDENTS CO-CONSTRUCT AND REINVEST MICRO-UNITS OF KNOWLEDGE-BELIEF?**

- **Temporal tracking** (Transana)
  - Training, YouTalk pedagogical sequence

- **Spatio-communicative specificity**
  - Group discussion on quiz elucidation
  - Class explanation of correct answer
  - Group debate about an opinion question (OQ)
  - Class debate on an OQ
  - Group and class debate about the MQ

- **Multimodal characterization** (ELAN)
  - Verbal lexical elements
    - Gesture features (Kipp, Neff, Albrecht, 2006)
  - Use of material environment
    - Functions
    - Relation to speech
    - “Record” status

- **ARE EMERGENCE AND TRAJECTORY FEATURES KNOWLEDGE-SPECIFIC?**

- **Focus on units of different epistemic status**
  - Knowledge piece specific to environmental education
  - Aiming at changing practices with new conceptions “Virtual water”: water for the production of other goods
  - Classical distinction between the cost and the price of a good or service, both school target knowledge in economics and part of daily life vocabulary

- **Comparison of emergence multimodal features and spatio-temporal trajectory**