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

**A great heterogeneity**
- Interdisciplinarity: science teaching (e.g., Driver, Newton, Osborne, 2000; Sadler & Zeidler, 2005) + citizenship education (e.g., Legardez & Simonneaux, 2006)
- Subjectivity: (e.g., Oulton, Dilton, Grace, 2004) socio-ethical beliefs + values + interests
- Controversy: (e.g., Albe, 2009)

**PEDAGOGICAL SETTING: the YouTalk Scientific Café**

- **Participants:** 12-14 year-old students
- **Specially trained student moderators:** 15-17 year-old students
- **Schools:** 2 in Mexico, 1 in USA, 1 in France, 2 in Brazil

**MODERATORS TRAINING (1 day)**
- To lead the YouTalk Scientific Café about Drought Water Management in pairs

**YOUTALK - INTRODUCTION (10 min)**
- Game rules:
  - Multi Question (MQ)
  - First Individual Anonymous Vote
- Introduction to the 3 thematic phases

**YOUTALK - THEMATIC PHASES (3 x 20 min)**
- **KQ (K)**
  - reading and group discussion of individual vote
  - answer and explanation
- **OQ**
  - reading and group debate of group vote and class debate of individual vote and results displayed

**YOUTALK - CONCLUSION (15 min)**
- Synthesis of class debates (3 OQ)
- MQ
  - reading and group debate of group vote and class debate of individual vote and results displayed

**FIRST RESULTS FROM THE US CORPUS:**
- Different spatio-temporal localizations associated with different scenarios of material environment exploitation

- **Mainly 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 interactional function)

**Exploitation of the material environment mostly occurs at the group level**
- Initial group discussion for quiz elucidation (KQ)
- Reinvestment in group debate to select an answer (OQ)
- Supporting meaning-making processes (mostly referential functions)
- Appeal to authority and interactional functions

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

<table>
<thead>
<tr>
<th>“Virtual water”</th>
<th>Price / Cost</th>
</tr>
</thead>
<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

- **Are emergence and trajectory features knowledge-specific?**
- **Focus on units of different epistemic status**
  - Knowledge piece specific to environmental education
  - Aim at changing practices with new conceptions
- **Virtual water**: water for the production of other goods
- **Comparison of emergence multimodal features and spatio-temporal trajectory**

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