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

> Appeal to students’ “system of mental representations and knowledge” (Belote & Legarède, 1995, système de représentations-connaisances)

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
- Main Question (MQ)
- First Individual Anonymouse Vote
Introduction to the 3 thematic phases

YOUTALK - THEMATIC PHASES (3 x 20 min)
KQ (3)
- Reading and group discussion
- Individual vote
- Answer and explanation
- Reading and group debate
- Group vote and class debate
- Individual vote and results displayed

OQ
- Group and class debate about the MQ
- Class debate on an OQ
- Class explanation of correct answer
- Training,

YOUTALK - CONCLUSION (15 min)
Synthesis of class debates (3 OQ)
- Group and class debate
- Group vote and class debate
- Individual vote and results displayed

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)

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 process
- (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>Imitate 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>Repeated</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
- 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

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PIECES of KNOWLEDGE-BELIEF (Polo, 2014)

<table>
<thead>
<tr>
<th>Source(s)</th>
<th>Logical level</th>
<th>Degree of generality</th>
<th>Relation to target knowledge</th>
</tr>
</thead>
</table>

REFERENCE SOURCES: