What Are They Actually Talking About?

Analyzing student discussions of clicker questions in MCDB

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Hurdles overcome to record conversations:

-- obtaining consent
-- equipment reliability
-- background noise
Recording Setup

- 3-5 flat microphones
- 6-channel mixer
- Video camera & tripod
- LP tape

Thanks to Erin Furtak and Ben Spike for equipment loans!
Overheard…

a productive clicker discussion
Clicker Question, Developmental Biology:

You have isolated three mutants that all have the same basic phenotype of excess cell survival (too few or no cell deaths). What are the normal functions of the corresponding gene(s)?

a) To promote cell death.
b) To prevent cell death.
c) Not yet enough information to decide.
Student 1: The question asks what are normal functions of the gene. It seems that if they get apoptosis normally then they would promote cell death. So I said A.

Student 2: That’s what I said, A.

Student 3: I said C, how do you know?

Student 1: I just assumed that if normally they get apoptosis and it’s mutated then it must be promoting it somehow.

Student 3: What if they are preventing it and they are super turned on or something?

Student 4: They could do either, it’s a trick question.

Student 1: I guess it’s possible.

Student 4: I guess you don’t have enough information...

Student 1: Yeah, so I guess we don’t know for sure then. I’ve been convinced.
Data Collected Fall ‘10:

- Developmental Biology
- 17 class periods
- 4 tables, ~4 students per table
- 2-3 clicker questions per class
- Average increase from 54% to 77% correct, following clicker discussion

- Total 102 transcribed conversations
- About 43 clicker questions
Making Sense of the Data

Focal Question:

What factors associate with students verbalizing their reasons, during discussion?
“Coding” Transcripts, Line by Line

- Based on Toulmin’s “Argumentation” coding
- Codes developed collaboratively by 4 raters
- Codes developed iteratively
- Interrater reliability (Cronbach’s alpha): .92
Reasoning Categories:
- Support for claim (S) – new idea justifying a choice
- Sense-Making (M) – any rephrased justification
- Incomplete (I) – inaudible or fragmented support idea
- Recap (R) – a complete explanation combining ideas
- Extension (X) – “above and beyond” conversation

Additional Categories:
- Setup/Background (B) – statements about question
- Claims (C) – voting choices
- Questions (Q)
- Not currently categorized (N)
- Ignoring social dynamics and distractions (for now)
### Coded Sample Transcript

<table>
<thead>
<tr>
<th>Transcript</th>
<th>Code(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1: The question asks what are normal functions of the gene. It seems that if they get apoptosis normally then they would promote cell death. So I said A.</td>
<td>B, S, C</td>
</tr>
<tr>
<td>Student 2: That’s what I said, A.</td>
<td>C</td>
</tr>
<tr>
<td>Student 3: I said C, how do you know?</td>
<td>C, Q</td>
</tr>
<tr>
<td>Student 1: I just assumed that if normally they get apoptosis and it’s mutated then it must be promoting it somehow.</td>
<td>M</td>
</tr>
<tr>
<td>Student 3: What if they are preventing it and they are super turned on or something?</td>
<td>S, Q</td>
</tr>
<tr>
<td>Student 4: They could do either, it’s a trick question.</td>
<td>S</td>
</tr>
<tr>
<td>Student 1: I guess it’s possible.</td>
<td>N</td>
</tr>
<tr>
<td>Student 4: I guess you don’t have enough information…</td>
<td>C</td>
</tr>
<tr>
<td>Student 1: Yeah, so I guess we don’t know for sure then. I’ve been convinced.</td>
<td>C</td>
</tr>
</tbody>
</table>

### Totals:
- 1 Background
- 1 Question
- 5 Claims
- 3 Support for Claim
- 1 Sense-Making

### Other features:
- -- students changed their votes
- -- table came to correct consensus
- -- no dominant speaker
Can Instructor Style Influence Discussion?

Jenny alternated two styles in Devo, week by week:

<table>
<thead>
<tr>
<th>“Answer Centered” style</th>
<th>“Discussion Centered” style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voting histogram revealed, after individual vote</td>
<td>“You guys are split, but I don’t want to bias you with the histogram. Go ahead and discuss, and focus on the reasons for your answers.</td>
</tr>
<tr>
<td>“Discuss with your table and revote, and after that I’ll explain it”</td>
<td>Histogram revealed after discussion ends</td>
</tr>
<tr>
<td>Tables not asked to contribute after revote</td>
<td>Tables asked to give reasons for choice</td>
</tr>
</tbody>
</table>
Reasoning Didn’t Differ by Instructor Style

<table>
<thead>
<tr>
<th></th>
<th>Answer-Centered</th>
<th>Discussion-Centered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean reasoning codes/transcript</td>
<td>4.85</td>
<td>5.85</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>3.05</td>
<td>3.61</td>
</tr>
<tr>
<td>Standard Error of Measurement</td>
<td>0.53</td>
<td>0.57</td>
</tr>
<tr>
<td>N (preliminary set of transcripts)</td>
<td>33</td>
<td>40</td>
</tr>
</tbody>
</table>

Unpaired, two-tailed T test: $p=0.21$
Interpreting Style Data

• upper division majors already have the skill and habit of discussing reasoning
  → do freshmen/nonmajors have this skill?
  → does LA modeling help students develop this skill?

• “Answer-Centered” cues may be insufficient to alter “Discussion-Centered” classroom norm
  → Would students in a largely “Answer-Centered” classroom verbalize more reasons as an instructor’s style changes?