ADAPTIVE LEARNING ENVIRONMENTS: Motivation, affect, etc.

February 11th, 2014
Alyssa Alcorn / (aalcorn@ed.ac.uk)
Change of plan!

• Will NOT start new topic Fri, right before ILW
• Instead, will spend more time on topic B (dialogue/motivation/affect)
• Will continue the activity begun on Friday the 7\textsuperscript{th} both today, and then have short lecture on motivation and affect
• On Friday, will extend activity to also look at motivational and affective goals in the system
Back to dialogue and teaching activity!
Dialogue & teaching in core systems (see your handout)

1. **TEACHING**: identify the view of teaching (or balance of the views) that appears to be implicitly or explicitly present in that system.

2. **DIALOGUE**: What type(s) of dialogue-based interactions are present in the system?

3. **TEACHING VIA DIALOGUE**: How does the dialogue in the system embody that view of teaching, and work to achieve the system goals?
FRIDAY: We will extend this activity to also consider motivation and affect.
Warning! Ambiguity ahead

• A disputed area with many competing terms, theoretical orientations (aka one of the most fun things)

• Surprisingly little agreement on issues of...
  o How, when, why motivation may impact learning
  o How, when, why it may impact/ be impacted by affect
  o Whether learners have any reliable access to their own motivational states

• No way we can cover everything; we will not try!

→ We are staying very high level, with some general ideas/terms to help you understand your other readings.
Motivation: Looking for definitions

• Like “intelligence”, a word that gets bandied about in the literature without an agreed definition of what it means!

• **Mini-activity:** Take 2 quiet minutes and write down some thoughts about what you think “motivation” means in an educational context
Looking for definitions

From the OED, “Motivation” definition 1b.

“The (conscious or unconscious) stimulus for action towards a desired goal, esp. as resulting from psychological or social factors; the factors giving purpose or direction to human or animal behaviour. Now also more generally (as a count noun): the reason a person has for acting in a particular way, a motive.”

OED online: http://www.oed.com/view/Entry/122708?redirectedFrom=motivation#eid
Bad researchers, bad!

• Many papers may not explicitly operationalize motivation, or the relevant sub-concept thereof.

• In a large review from 2000 (when there was much less literature), Murphy & Alexander say that out of 120 items in review:
  “51...used the word motivation. Yet, only in 4 (8%) of those occasions was this term explicitly defined.... An implicit definition was provided in 17 (33%) of the studies, whereas no definition was evident in 30 (59%) of the documented cases.” (p. 33, emphasis added).
Looking for definitions

A comprehensible research definition (re: education)

“Motivation can be broadly defined as the force behind action that explains why a person acts in a particular way.” (du Boulay et al, 2010, p. 200)

“What drives the learner to learn or not to learn, what they think they are going to achieve, why they are learning at all and the social and temporal milieu within which the learner is learning.” (same paper, Table II, page 214).
We’ve heard this before

• Betty’s Brain: Big on motivational aspects

• Taking on teaching role that may drive student to expend additional care and effort
  • “There is a strong motivation component of teaching where the teacher needs to take responsibility (and joy) for the learning of their pupils.” (Biswas et al, 2005, p 366)

• Also, (simulated) social interaction with Betty as designed to increase the engagement, level of investment in the learning
We’ve heard this before

- Crystal Island frequently discusses motivation as a facet of learner *engagement with system*

- Team points at presence of an interesting (but not overly complex) *narrative* as a factor in students being *driven to actually finish the game* and its embedded content/tasks (see Rowe et al, 2011)

- Game elements such as *immersive graphics* as positively contributing to motivation, at least for some students

→ Next slide: Screenshot of interaction with character in Crystal Island camp kitchen
We've heard this before:

- Crystal Island frequently discusses motivation as a facet of learner engagement.
- Points at presence of an interesting (but not overly complex) narrative as a factor in students being driven to actually finishing the game and its embedded content/tasks (see Rowe et al, 2011).
- Game-like elements as positively contributing to motivation, at least for some students.
On to the feels
Defining affect

• This is a little simpler than defining motivation
  • Better agreed WHAT it is
  • Less agreement on which aspects are relevant, and when, and to whom

• For educational context, in plainest English:

  AFFECT = emotions related to learning; how learner feels about learning task or context
Mini activity: Which emotions do you think might be most relevant to learning?
Emotions for learning?

<table>
<thead>
<tr>
<th>Axis</th>
<th>-1.0</th>
<th>-0.5</th>
<th>0</th>
<th>+0.5</th>
<th>+1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety-Confidence</td>
<td>Anxiety</td>
<td>Worry</td>
<td>Discomfort</td>
<td>Comfort</td>
<td>Hopeful</td>
</tr>
<tr>
<td>Boredom-Fascination</td>
<td>Enmui</td>
<td>Boredom</td>
<td>Indifference</td>
<td>Interest</td>
<td>Curiosity</td>
</tr>
<tr>
<td>Frustration-Euphoria</td>
<td>Frustration</td>
<td>Puzzlement</td>
<td>Confusion</td>
<td>Insight</td>
<td>Enlightenment</td>
</tr>
<tr>
<td>Dispirited-Encouraged</td>
<td>Dispirited</td>
<td>Disappointed</td>
<td>Dissatisfied</td>
<td>Satisfied</td>
<td>Thrilled</td>
</tr>
<tr>
<td>Terror-Enchantment</td>
<td>Terror</td>
<td>Dread</td>
<td>Apprehension</td>
<td>Calm</td>
<td>Anticipatory</td>
</tr>
</tbody>
</table>

Figure 1 – Emotion sets possibly relevant to learning

- A proposal from Kort et al. (2001). *Short (4 page) and highly recommended paper.*
- To paraphrase them, this diagram is theoretical only and needs evaluation to see if these emotions and their organisation are the “right” ones
Autotutor to the rescue

• Autotutor has extensively studied which emotions present when learning with an ITS. See D’Mello & Graesser (2012) required reading for summary of this research, its methods.

• They propose set of relevant, frequently present learning-centred emotions:
  - boredom
  - flow/engagement
  - confusion
  - frustration
  - delight
  - surprise

→ They do NOT claim list is universal for all learners, contexts!

Any surprises about this list?

Note the differences from Ekman’s “basic emotions” heavily used in psych.
Who cares about feelings?

• Various research suggests that we cannot separate motivational, affective, cognitive aspects of learning
• These matter both in the classroom and in a computer-based learning context
  • There are lots of papers—sugg. to start with Autotutor
  • This question is mostly left to your independent reading because it is also a HUGE field, a course in itself

• Generally learning contexts (classroom, system, etc.) more likely to address affect, motivation as a means to some end that has to do with learning gains (*More on this momentarily*)
“We should not lose sight of the fact that most systems are designed...to improve the cognitive state of the student. They employ motivational, metacognitive and affective reasoning as a means to this end. So their pedagogy focuses on diagnosing the student’s state, and if that state is sub-optimal with respect to learning, helping the student move into a state more conducive to learning. Once the student is in a good state for learning the pedagogy aims to maintain that state.”

(du Boulay et al., 2010, p 205, emphasis added)
As though following du Boulay et al. like a script, here is some commentary from Autotutor on this very point:

“...affect-sensitive variants of AutoTutor detect and respond to boredom, confusion, and frustration. Appropriate responses to these states could potentially have a positive impact on engagement and learning outcomes.... AutoTutor [has] a set of production rules that were designed to map dynamic assessments of the student’s cognitive and affective states with tutor actions to address the presence of the negative emotions... Hence, the learner and the tutor are embedded into an affective loop that involves detecting the learner’s affective states, responding to the detected states, and synthesizing emotional expressions via animated pedagogical agents.”

(D’Mello & Graesser, 2012, p. 130) This was required reading
Back to modelling-for-doing

Crucial underlying assumption within this picture from du Boulay et al (2010) and Autotutor studies is that we can MODEL these various states (cognitive, motivational, metacognitive affective...)

When we are modelling we are *modelling for reasoning and for doing something*. Per du Boulay et al, we might want to reason about:

- **Causes of these various states**, because different causes will almost certainly necessitate different actions (e.g. bored because problems are too easy, versus bored because so hard as to be meaningless)
Modelling-for-doing, cont’d

- Aside from causes, might reason about:
  - How various events may affect the states (e.g. successfully solving a problem)
  - How or whether system actions that could change the student states (generally from less-desired state to one “more conducive to learning”), and thus which action to do.

- This should sound similar to the steps/types of actions we discussed re expert human tutors: diagnosis, planning, action (and adaptivity in all these). See L8.
Next week:

• More on *how* to target affect and motivation like the sneaky, sneaky manipulators we are

• Will go back to our core systems activity, part 3
  • Look for evidence about using motivation, affect toward pedagogical goals
  • Report back on some “key findings”