ADAPTIVE LEARNING ENVIRONMENTS:

Bringing topic B together

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Quick overview: Student seminar series 2 (SSS2)
Mapping the range of ALE techniques

• Goal: each group (3 people) will do some “detective work” in the literature and will present an overview of an “tool” available to researchers developing ALEs/ITSs
  • What is it?
  • Where/how/why has it been used?
• This should not just be a list of examples but needs to have some synthesis. Group should be able to make some general statements about the tool and how it is used.
SSS2 contributes to assignment 2

• Assignment 2 asks you to compare the methods and goals of two core systems in much more detail than required in Assignment 1, and then use one of them as the basis for a new design.
• New design must include at least 1 technique covered in SSS2 (doesn’t need to be your group’s technique).

• Also... It’s more fodder for the open-ended exam questions...
SSS2 topics

Provisional topics list
1. Use of agents and avatars
2. Simulations (simulation-based learning)
3. Use of/ consultation of human domain experts (including teachers/tutors)
4. Collaborative learning (either real or simulated collaboration)
5. Sensors, cameras, eye-tracking, tangibles, and other non-traditional hardware
6. Use of Bayesian modelling, Markov models, and/or data mining

Backup topics: Case-based learning, Vicarious learning
Use of the semantic web.
Back to “doing things” with dialogues
“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)
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**
  - different causes will almost certainly necessitate different actions
  - e.g. bored because too easy, vs. way too hard
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.
Tutor tasks are also ITS tasks

**Diagnosis**: the ability to diagnose the student *in a specific context*

**Planning**: the ability to plan *appropriate actions* based on the diagnoses

**Action**: the ability to act upon their diagnosis and plans

PLUS **adaptivity** to unfolding interaction, **iteration** of diagnosis, planning, action.

But what are these?
Human tutors are indirect

- **Remember**: Big benefit of using natural language is that we are already “expert users”. Already understand many strategies for doing things with language.

- ONE key strategy for effectiveness of human tutoring is the **indirectness of dialogue moves** (there are other strategies!)

- **Consider the impact of the tutor saying**:
  
  “No, that’s completely wrong!”

  *versus*  
  “Hmm, why do you think the answer is 42?”
Why indirectness?

• Helps to facilitate the “balancing act” between student doing the work, and just-enough, just-in-time guidance.
  • Signal that there may be an error (but not what)
  • Re-directing attention to relevant concept or problem, rather than giving answer

• Indirectness (of tutor) has **important affective and motivational benefits** for learner
  • Leaving “the work” to student (e.g. help them to identify and correct own error) leaves them the control
  • In plain English: *we feel better about ourselves and our learning when we have that indirect guidance*
Example of feedback variation

Tutor’s question: What is needed to light a light bulb?
Student’s answer: Heat. (incorrect)

Tutor’s possible feedback:
1. No, that’s incorrect.
2. Try again.
3. Well, why don’t you try again?
4. Are you sure about that?
5. Well, if you put the light bulb in the oven it will certainly get a lot of heat, but is it likely to light up?
6. Is it the heat or the source that are needed to light a light bulb?
7. Why?

From Porayska-Pomsta (2004), Helen Pain’s previous ALE slides
Factors determining response form

• “Face”, in the sense of the student’s self-image
  • Need for approval, maintenance of positive image
  • Need for autonomy, freedom to discover knowledge

• Context (tutor’s/ITSs awareness of)
  • student’s characteristics,
  • the characteristics of the material taught,
  • time and place of teaching, etc.
  • (e.g., Lepper and Chabay 1988; Graesser 1995; Person 1995; deVicente 2003; etc.)

• Situational variables (next slide)
Situational factors (via teacher studies)

1. Temporal factors: remaining material, available time

2. Characteristics of the material taught: (Lepper and Chabbay 1988; Person et al. 1995; Chi 2001)
   - difficulty of the material
   - importance of the material

3. Characteristics of the student: (Lepper and Chabbay 1988; Person et al. 1995; Chi 2001; deVicente 2003)
   - student’s ability
   - correctness of student’s answer
   - student’s confidence
   - student’s interest
Remember: Dialogue for DOING

• Different responses are different dialogue “tools”
• They allow the tutor to achieve slightly different communicative and educational goals to various degrees:
  • **Tell** the student his answer was problematic
  • **Prompt/guide** the student to make further attempts at finding a solution.
  • **Motivate** the student; **boost** the student’s confidence and curiosity

→ In our activity, we have been “working backwards” to see what dialogue choices can tell us about system goals
And now, back to our regularly scheduled programme
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?

   PLUS

4. **AFFECTIVE AND MOTIVATIONAL GOALS**: What are they, and how does dialogue work to achieve those goals?
Sharing your findings

1. Your group pairs up with another system group

2. Report your “key findings” from the exercise, and your key evidence

3. Groups discuss similarities, differences, and any unanswered questions

*Please write out your key points on a handout to turn in to me. I will put these online as a resource.*
ILW next week

Don’t come here or you will be forever alone