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A Framework for a Multimodal Analysis of Teaching Centered on Shared Attention and Knowledge Access

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The Activity of Teaching: A Social Learning Strategy

- Everybody can try to learn anything alone, but some content is better learned socially (time, energy, opportunities, danger) (Kendal et al., 2018)

- Teaching, a.k.a. social learning with explicit instructions, is a form of social and cultural learning that relies on domain-general abilities
Heyes (2018) argues that ability of teaching is built on top of social faculties like:

- Selective social learning
- Imitation
- Mind reading
- Language
In which Occasions does Teaching Occur, Actually?

- When a Learner encounters 2 kinds of difficulties (Kline, 2015), either
  - to have access to the Content, or
  - to focus her attention to C
- And when a Teacher can allocate some time to help L (even it’s costly)
Some Cues to Trigger Access or Attention

- **Communicative and attentional** cues are crucial in social learning, to make teaching easier
  - Visual or vocal priming: e.g., T pointing to C in presence of L
  - Joint attention to C (in some cases, parallel)
  - Action and speech contingencies
  - Adapted communication (“teacherese”)
Research Questions

- Which framework for accounting teaching processes?
- How to capture (part of) teaching processes by eye-tracking and signal processing tools?
- Which experiments using this framework to deploy in classrooms?
Components of the Teaching Process

- **Two steps**: Initial situation (without social help) and teaching situation (with social help)
- **Determination criteria**: how this teaching situation can be automatically determined?
- **Five levels of teaching**, of increasing complexity (from Kline, 2015)
Level 1 – Social Tolerance (Teacher as a model)

- **Initially**: L can perceive C but its access depends on T’s willingness
- **Teaching**: T tolerates that L observes her during standard activities, without modifying anything
- **Criteria**: L visually tracks T frequently; T doesn’t track L at all
Level 2 – Opportunity Provisioning (a.k.a. Playground Making)

- Initially: L would be able to perceive C, but its access is difficult.
- Teaching: T devises specific activities so that L can learn (play, chores, etc.).
- Criteria: C is modified by T; T doesn’t track L; parallel attention towards C (is the task completed?)
Level 3 – Teaching by Stimulus or Local Enhancement (actual teaching)

‣ Initially: L can access C but lacks attention to it
‣ Teaching: T points towards C, slows down her action and speech
‣ Criteria: Frequent reciprocal gazes between T and L, “teacherese”, action exaggeration: T’s larger body’s bounding volume
Teaching: Higher Levels (not detailed there)

- Teaching by **evaluative feedback** (L accesses C but lacks information on her performance) or by **direct explanations** (L lacks both attention and access to C, and needs explicit information)

- Involves **mind reading** more intensively, and **language**, so more difficult to be captured by eye tracking tools only
Understanding Classroom Situations

- Capture teaching levels in a “smart classroom” context: cameras, mobile eye-tracker for T, camera glasses for Ls

- Use this framework (likely extended to variables like position, noise level) to investigate notions in educational psychology (Ls time on task, or steering group, T immediacy, etc.) (Cortina et al., 2015; Dessus et al., 2016)
Thanks for your attention!

Any questions?

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References @ https://frama.link/eye-mov