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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”)

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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 exageration: 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 $L_s$

- Use this framework (likely extended to variables like position, noise level) to investigate notions in educational psychology ($L_s$ 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