

FINDING PATTERNS IN TEACHERS' AND STUDENTS' ICT USE

Philippe Dessus, Univ. Grenoble Alpes,
LaRAC (EA 602), Inria & Espé

 @pdessus



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LaRAC



DAILY USE OF ICT IN EDUCATION...



- Which **patterns** may emerge from the **analysis** of this use?
- Use of diverse methods to uncover those patterns and a **multidisciplinary** approach (psychology, education, computer science, linguistics)

OVERVIEW

References: <https://frama.link/cokleeco>

1. DESIGN

2. ATTENTION

3. PRODUCTION



TEACHER



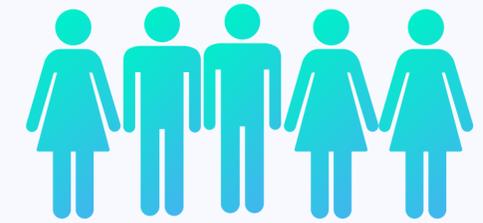
Representing routines



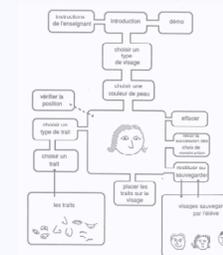
Supervising students



Philosophical discussion



STUDENTS



Building constructivist environments



Viewing MOOCs



Vita analysis

INSTRUCTIONAL DESIGN PATTERNS

- Instructional design is an **overlooked** question in classrooms
- Every teacher makes use of “**routines**” in classroom lessons
- **Ways to express** these routines with ICT support?



METHOD

3	CORR. DEVOIRS	Le maître	contrôle	le travail fait	puis	les élèves	corrigent	le travail
4	TRANSITION	Le maître	ordonne de	faire des actions	pour		préparer	la seq. suiv.
5	NOUVELLE LEÇON	Le maître	présente	la leçon	pendant que	les élèves	écoutent	attentivement
6	PRÉSENTATION	Le maître	présente	un matériel	pendant que	les élèves	participent	en répondant
7	EX. RÉPÉTITIF	Le maître	interroge	rapidement	pendant que	les élèves	répondent	sur ardoise
8	EX. CONTRÔLÉ	Les élèves	travaillent	sur des exercices	pendant que	le maître	contrôle	le travail
9	EX. GUIDÉ	Les élèves	travaillent	sur des exercices	pendant que	le maître	guide	les élèves
10	EXPOSÉ	Un élève	présente	l'exposé	pendant que	les élèves	écoutent	
11								
12								

Context: Novice ($N=8$), experienced ($N=10$) and expert ($N=9$) teachers used the software to plan lessons, either from the predefined schemas or new ones.



RESULTS

- Experienced and experts were more **action-based** (choosing and redefining existing actions) than novices were
- The more experienced, the more **novel actions** were built
- Experienced and experts can use their action repertory; novices cannot



DISCUSSION

- Teachers design courses in using efficient routines to **lessen their cognitive load** and make them available to other duties: assessment, interaction with students. In short, **individualization**
- Working and reflecting on routines help teachers become more efficient



- **Which instructional design environment would you use, if any?**



Readings

Musial, Pradère & Tricot (2012) (in fr.)

Sobreira & Tchounikine (2012)

Law (LDSHE) : <https://ldshe.cite.hku.hk>

Hernandez-Leo *et al.* (LDShake) : <http://ldshake.upf.edu>



UNDERSTANDING CONSTRUCTIVISM TO BUILD LEARNING ENVIRONMENTS

- Constructivism is now **mainstream** in education, despite some **criticisms** (Kirschner *et al.*, 2006; Petraglia, 1998)
- **Research question:** How university students apply constructivist principles to design computer-based environments?



METHOD

- **Context:** 37 students built constructivist-based learning environments in a course unit, using ToolBook, an authoring environment
- **Instrument:** The Crossley and Green (1990) method was used, prescribing 3 main principles:
 1. **Authenticity:** the learning activities have to be related to daily life
 2. **Manipulation:** the learner has to manipulate knowledge objects, take initiatives, not just read-and-repeat
 3. **Interactions:** foster learner's participation and interactions outside the computer environment (with peers, teacher)



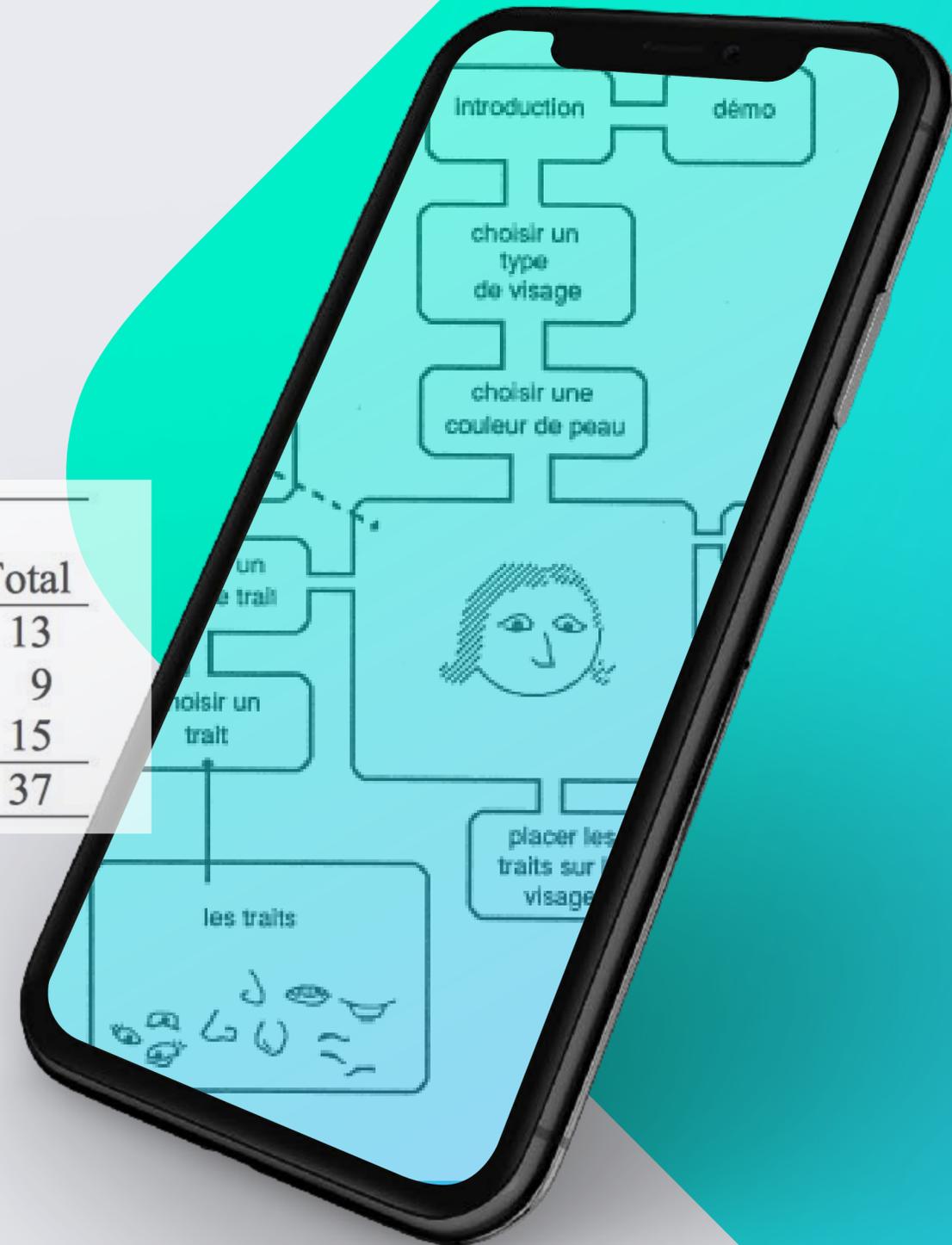
RESULTS

#1 & #2 Principles (Authenticity & Manipulation)

Principle 1 Authenticity	Interpret	Principle 2 Representations			Total
		Move symbols	Manipulate	Construct	
Tutorial	7	1	5	0	13
Game	2	5	2	0	9
Authentic	1	0	11	3	15
Total	10	6	18	3	37

#3 Principle (Interactions)

- 23 (out of 37) environments do not plan any interaction between learners or between teacher-learners. 11 of them mention "come and fix" interactions



DISCUSSION

- Building constructivist environments is not an obvious activity
- The advent of “programming activities” (e.g., Scratch-based) makes **game building easier**. But their **paradigms** remain difficult to grasp and to implement



- **How would you manage to design such constructivist games/environments? To which purpose?**



Further Reading

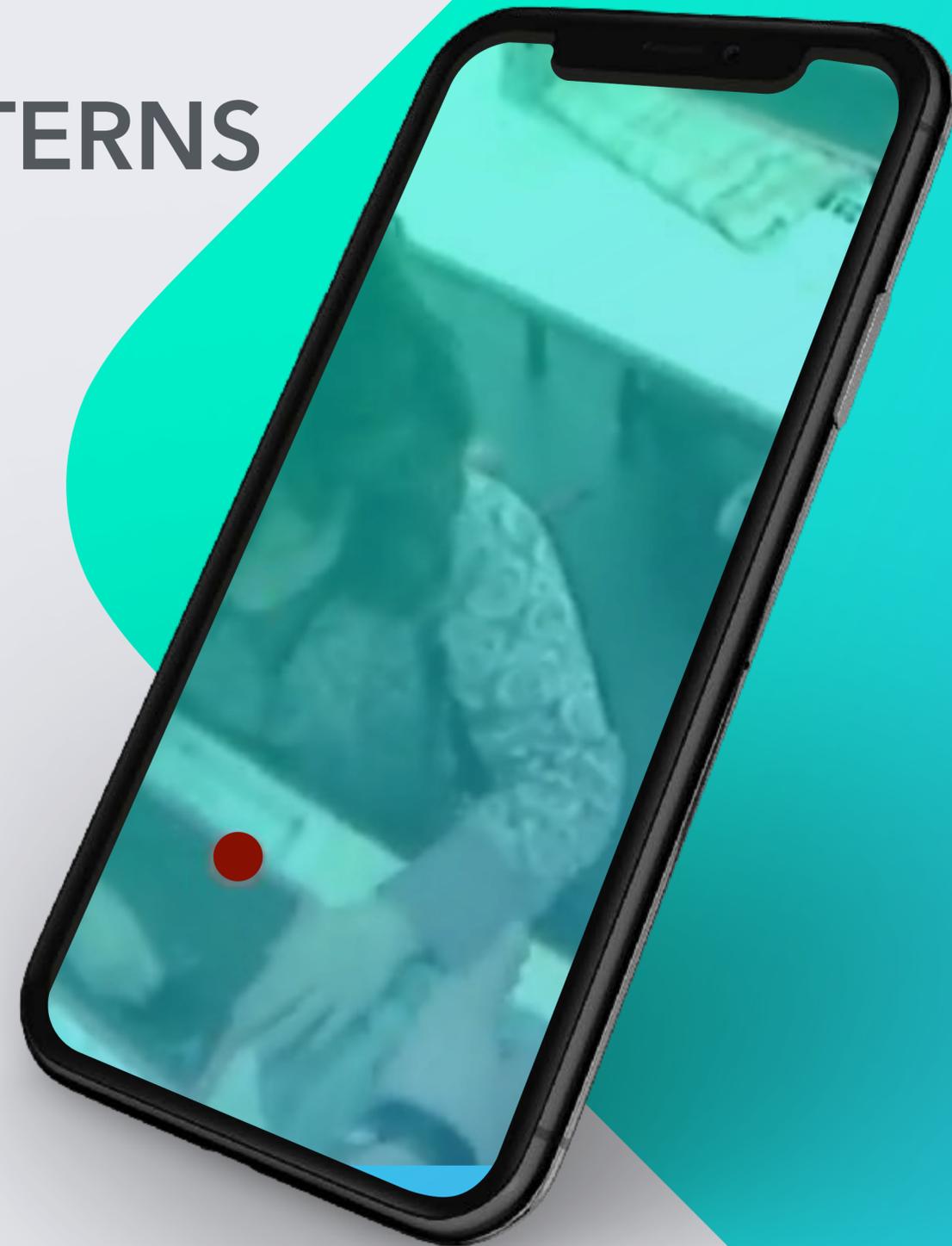
Kirschner *et al.* (2006)

Tobias and Duffy (2009)



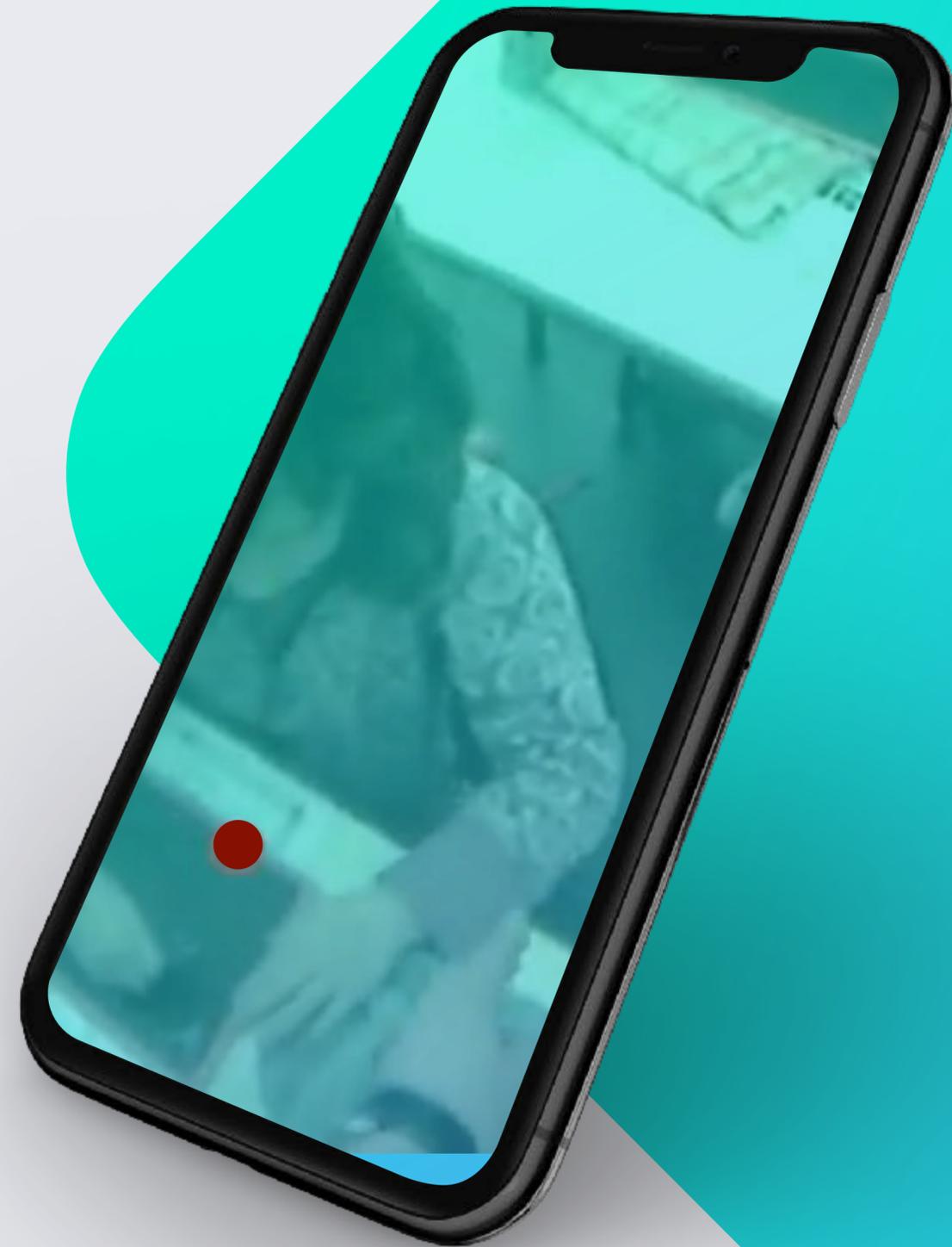
TEACHERS' ATTENTIONAL PATTERNS

- **Research questions:** How do teachers supervise their classroom? Which attentional patterns may reveal **supervision strategies**? Attention is an important yet **transient** and **mainly unconscious** process. Need for new tools to study it
- **Research Funding:** Pôle Grenoble Cognition of the Univ. Grenoble Alpes
<http://www.grenoblecognition.fr>



METHOD

- **Context:** 4 elementary teachers (2 novices and 2 experienced) wore mobile eye trackers during maths lessons
- Report of which pupils are **most often** gazed, and which are their profile (in terms of **academic performance and behavior**)
- Novice-expert comparison



RESULTS

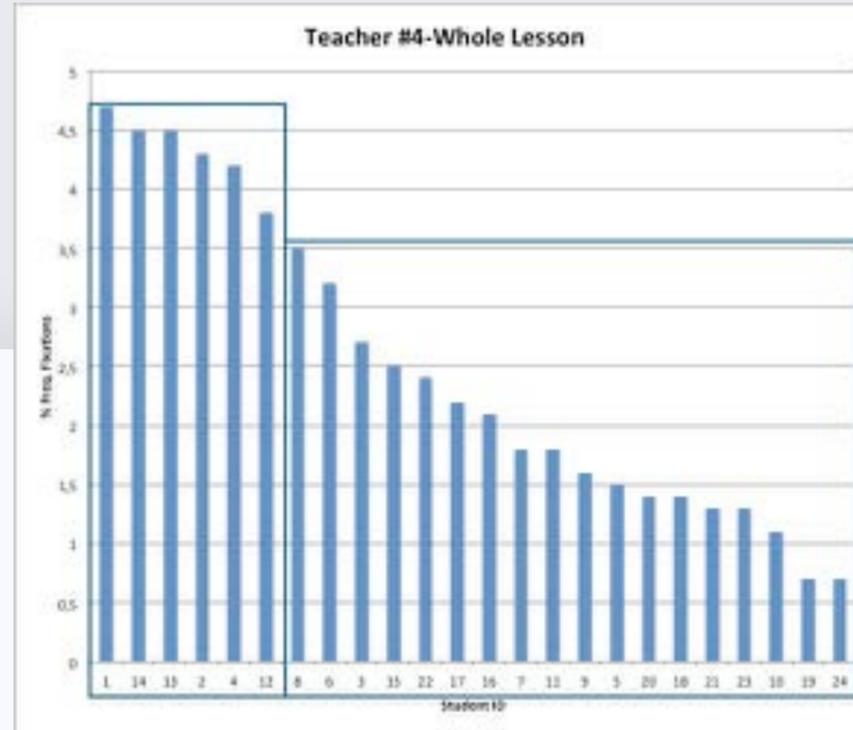
% GAZES TO STUDENTS

N GAZES BY STUDENT TYPE

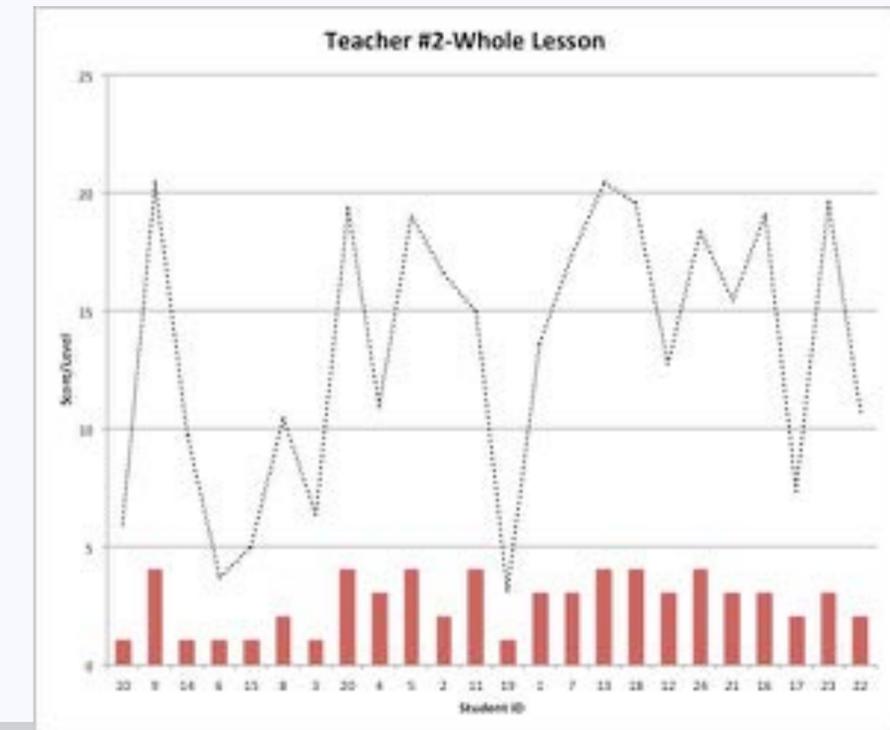
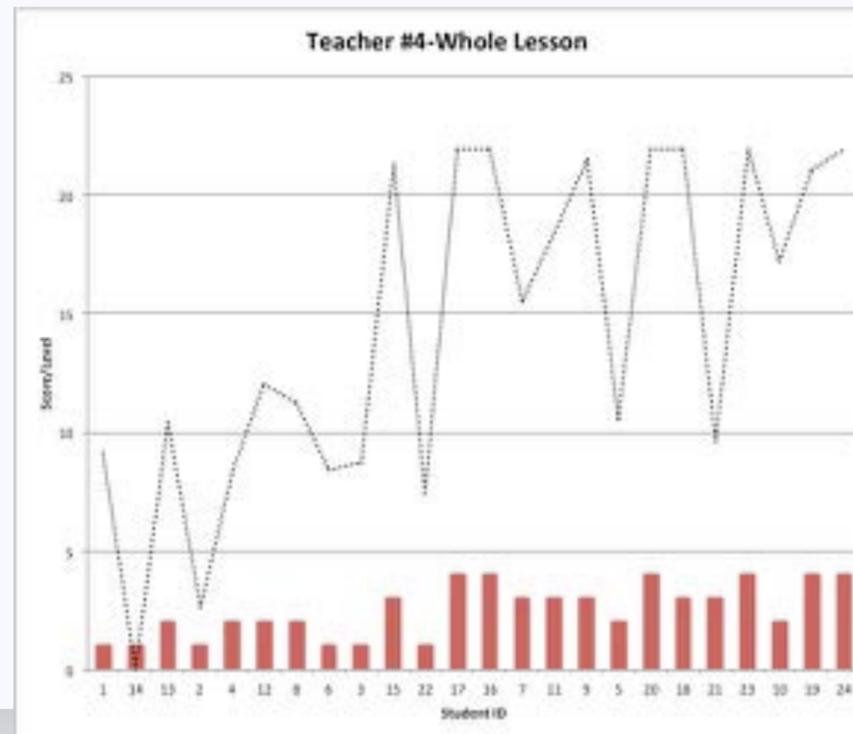
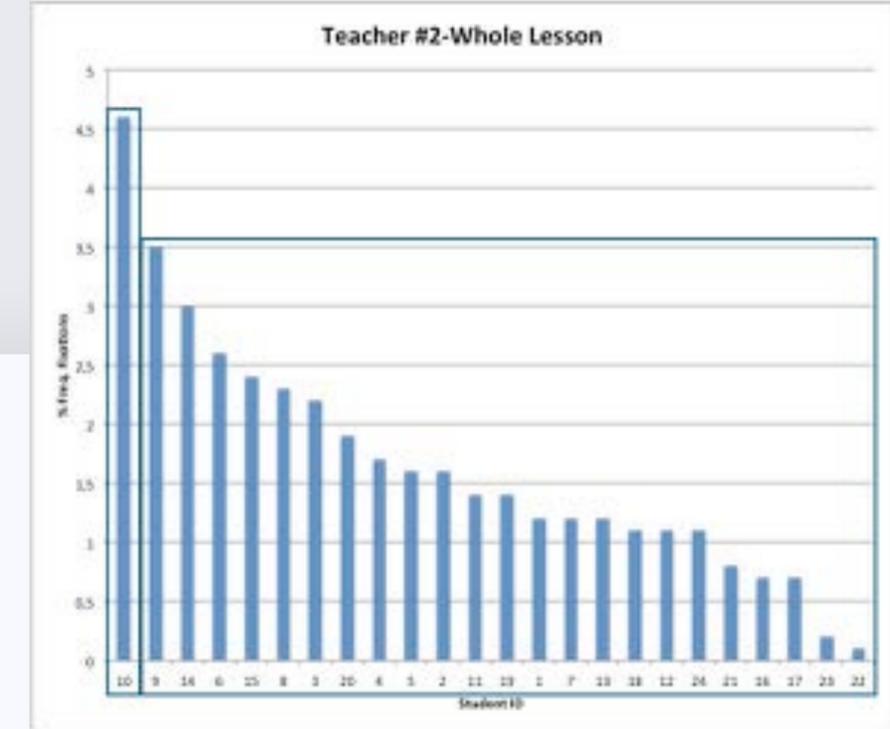
Students
Behavior score

Students
Academic Score

TEACHER #4: EXPERIENCED



TEACHER #2: NOVICE



DISCUSSION

- This experimental device sheds light on “**old school**” hypotheses on teacher cognition like teacher’s “**withitness**” or “**immediacy**”

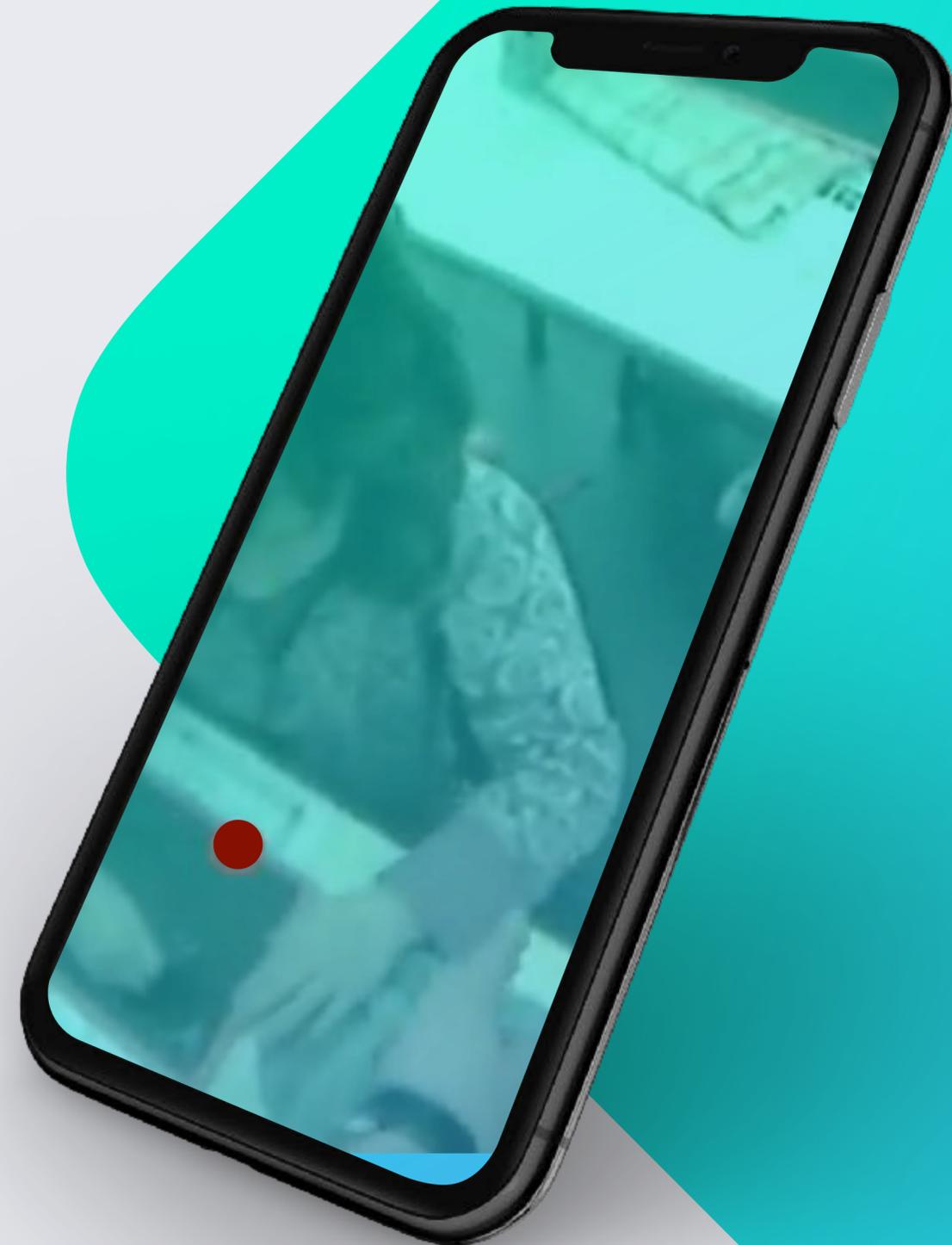


- **Which ethical concerns this kind of studies, if furthered, may entail? How to prevent them?**



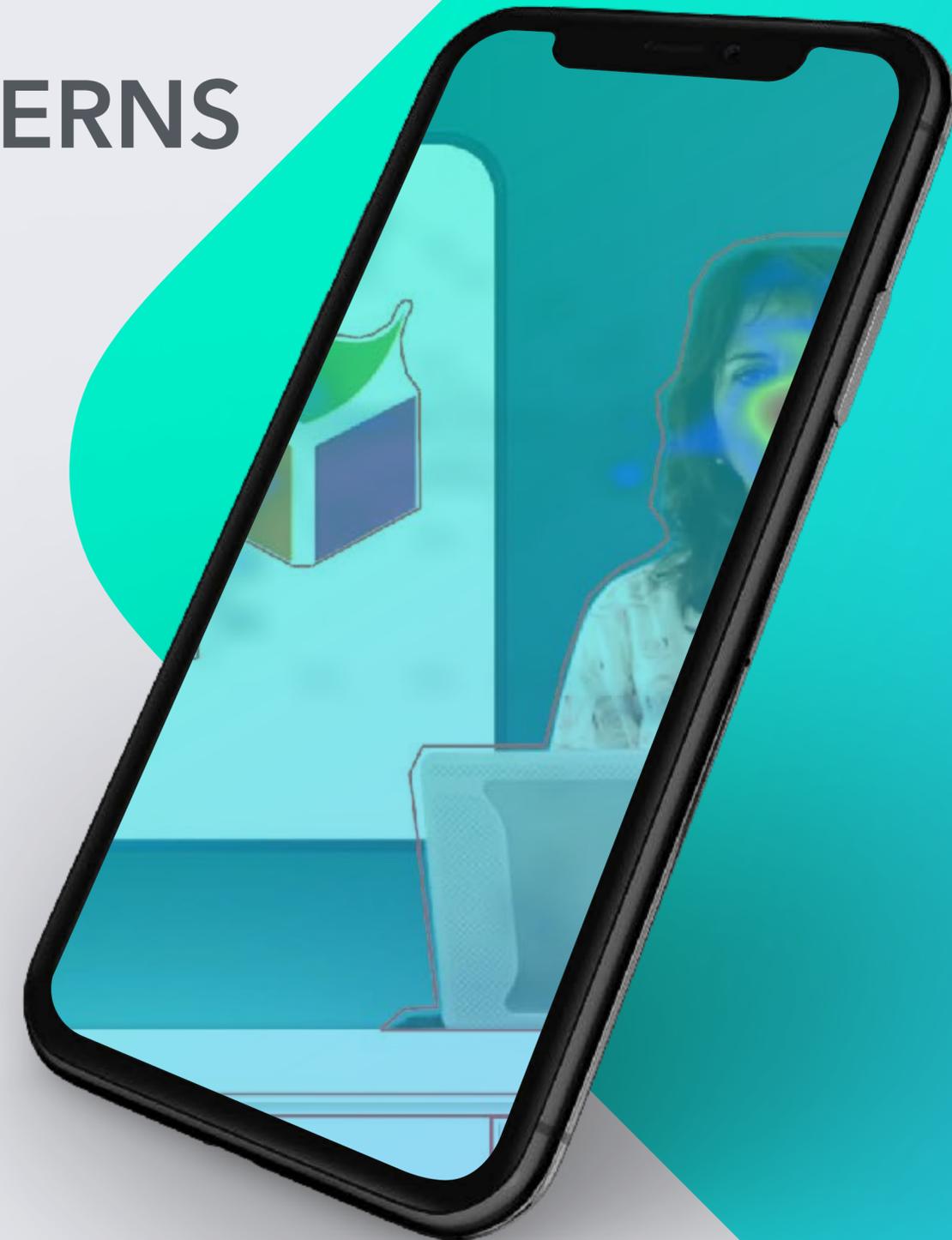
Further reading:

Lang *et al.* (2017)



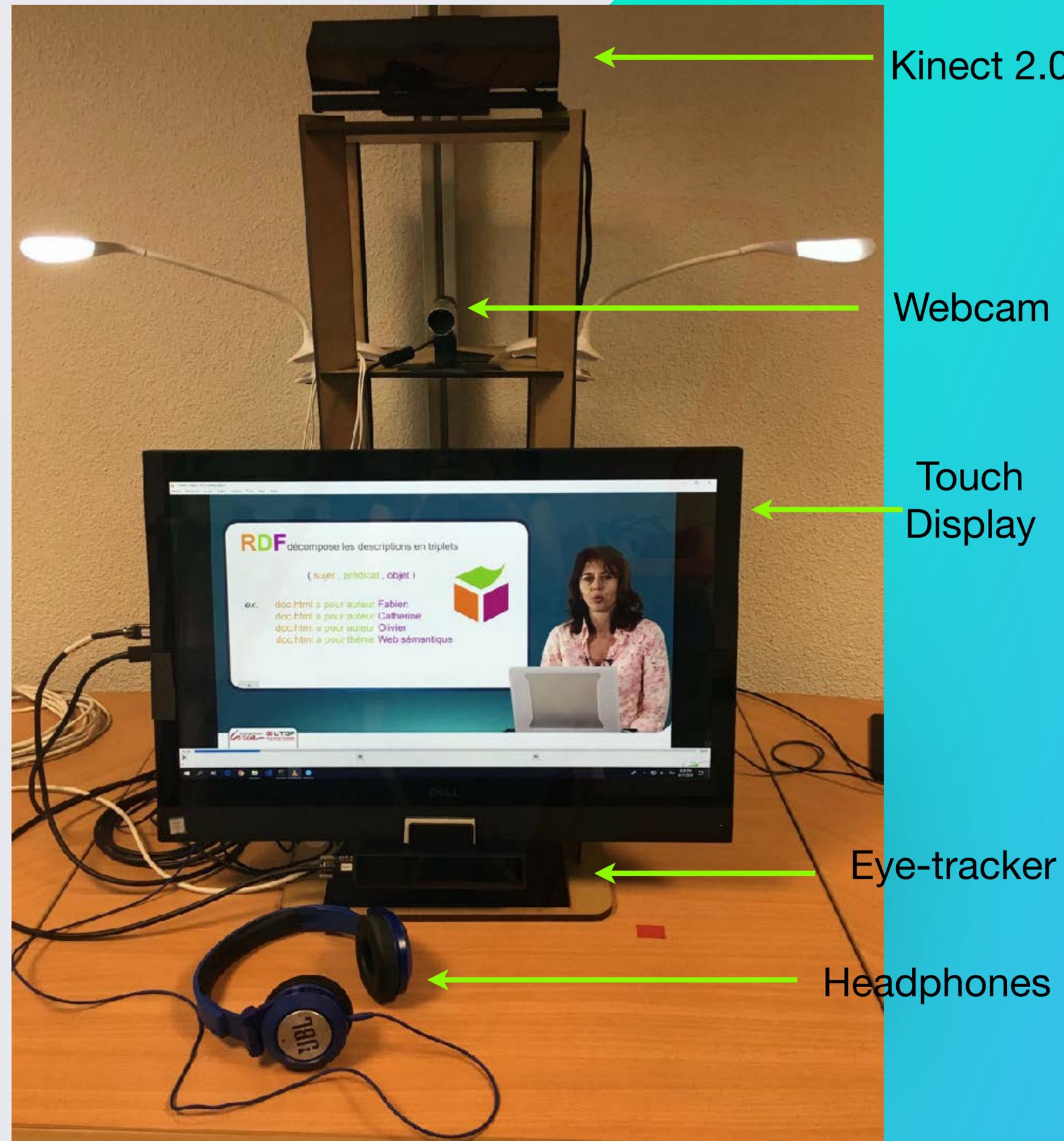
LEARNERS' ATTENTION PATTERNS

- MOOCs (Massive Online Open Courses) are one of the best recent opportunity to **share and build knowledge**
- However, MOOC attrition rates are high
- How students are **attentionally engaged** in MOOC lectures? Does teacher presence help or hinder learning?
- **Partly funded** by the CEEGE ANR Project of the Fr. Research Ministry



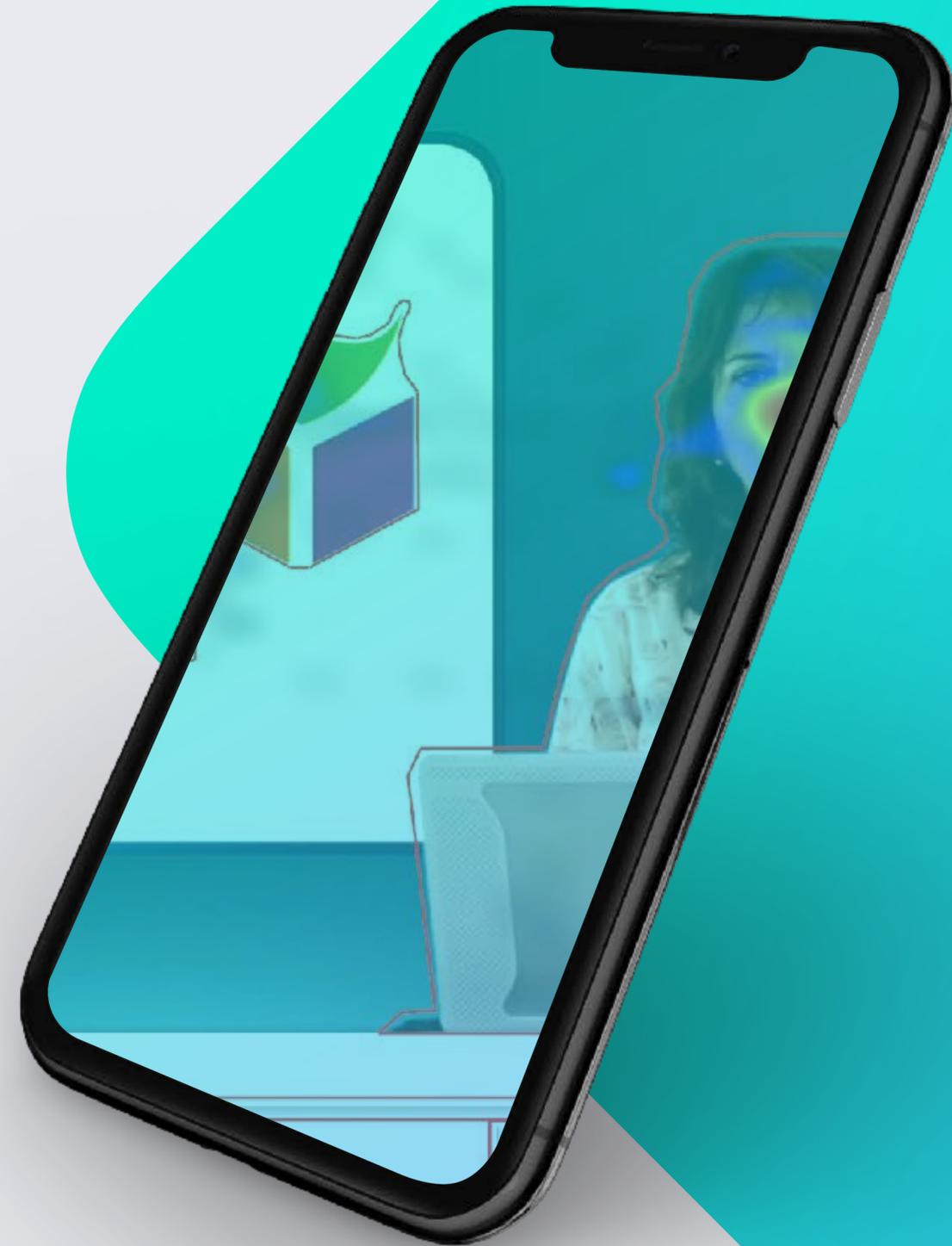
METHOD

- **Context:** 24 participants (students) viewed a video capsule on informatics (semantic web) and their behavior was recorded with this device
- **Comparison:** Capsule with vs. without teacher
- **Measures:** Eye-gaze, facial expression and body posture, opinion-based measure, learning outcomes (MCQ and problem solving)



RESULTS

- 1. Gaze distribution.** Slide content gazed 75% of time in both conditions, but teacher attracted 10% of the gazes
- 2. Learners satisfaction.** The without-teacher capsule was rated higher, with a greater perceived learning
- 3. Learning outcomes.** Learners performed equally in both conditions



DISCUSSION

- MOOC capsules with an overlaid instructor **who doesn't interact with the content** are less efficient than those with content only. The information delivered by the teacher in person is **redundant**



- **Any ideas on the use of this device to work on new research problems?**

Further reading: Guntz *et al.* (2017) using the same device to analyze chess problem solving



DISCOURSE PATTERNS IN PHILOSOPHICAL DISCUSSIONS

- Analyzing the utterances of discussions (e.g., in forums) is a **cumbersome** and **cognitively demanding task** for teachers
- How to automatically measure the quality of contributions of discussants in a philosophical debate?



AUTOMATED SEMANTIC ASSESSMENT

- Use of advanced **Natural Language Processing** techniques
- Automatically accounts for the semantic similarity of words and by extension, sentences, paragraphs, texts, thanks to factorial analyses



METHOD

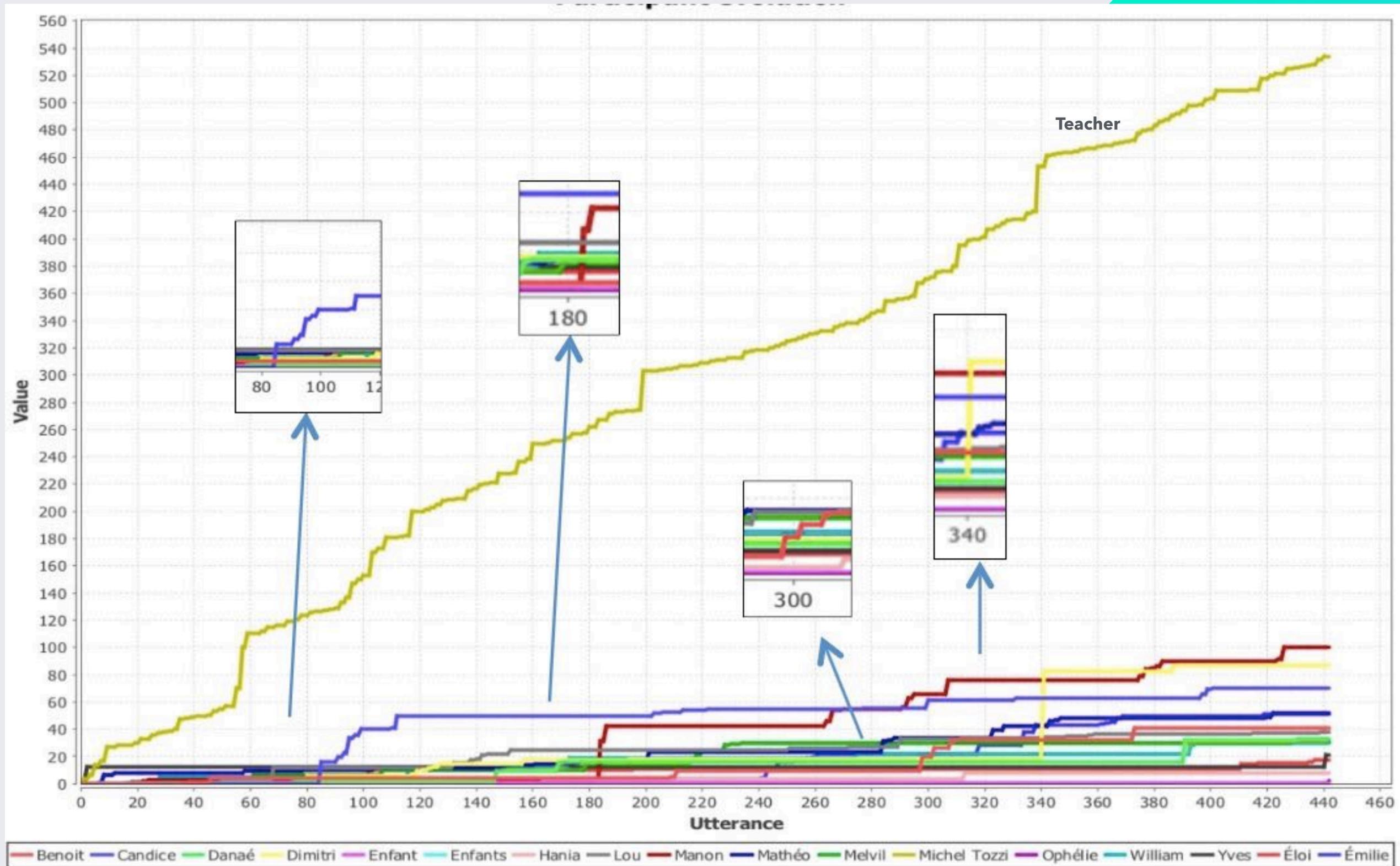
Context: A philosophical discussion across 442 utterances (theme: when do you think something is unfair?), involving 11 Grade-5 pupils led by a philosopher. Some students were playing specific roles (president, secretary)

Research questions: Can we automatically weigh participants contributions? analyze themes?

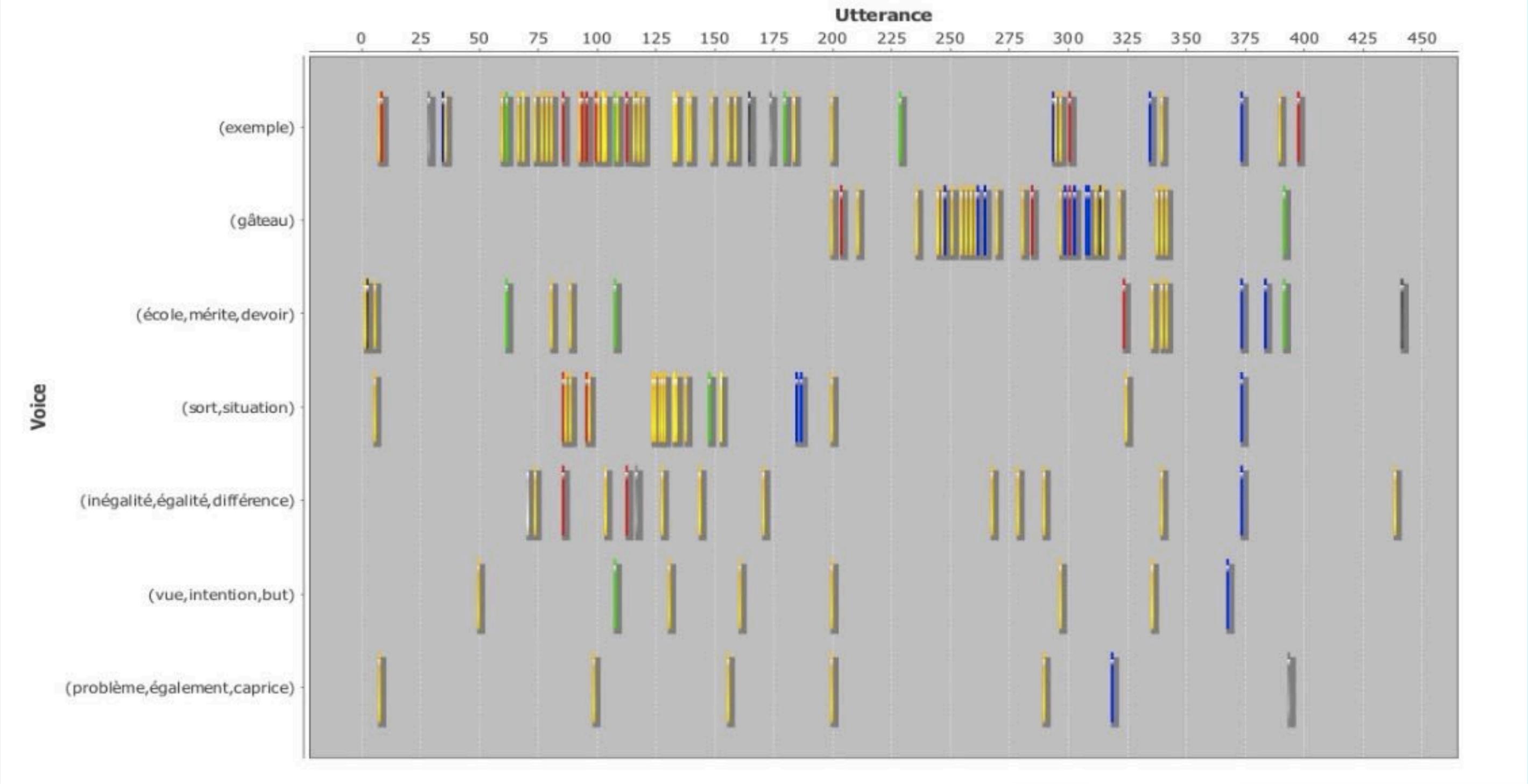
System: readerbench.com



PARTICIPANT CONTRIBUTION TO THE DISCUSSION



DISCUSSION BY THEME



DISCUSSION

- ICT fits perfectly for **scalable assessment**: MOOCs, elearning, eTextbooks...
- Usable for a **large diversity** of textual contents: case analysis, summaries, course material, expert writing

- **??** Would *ReaderBench* be actually of use to you? **??**
To which purpose? Please don't hesitate!

Further Reading:

Play with *ReaderBench*: readerbench.com



AUTOMATED CV ANALYSIS

- Any human resources expert can browse CVs and pick the **most attractive ones** (both formal and content-focused).
- Can we even build a system to automatically check this so that we can screen our CV?

Research funding: EU H2020 RAGE
Project <http://rageproject.eu>



METHOD

Context: A collection of 52 vitas has been assessed by experts (+/-, form/content)

Research question: Can some features – textual enhancements; – positive wording; word complexity; word coherence (keywords related to the whole CV), etc. be automatically screened in the same way experts did?



(a)



(b)

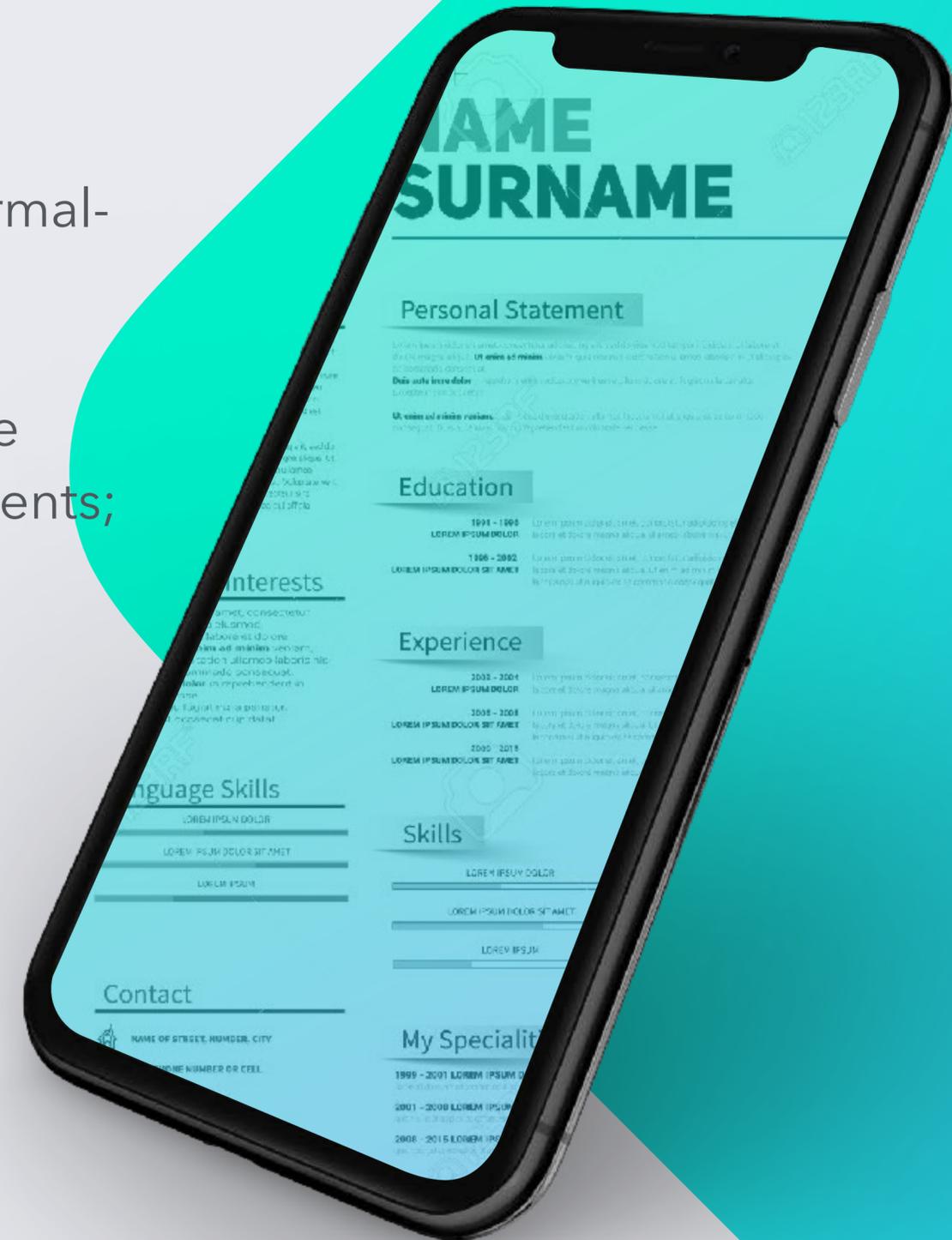
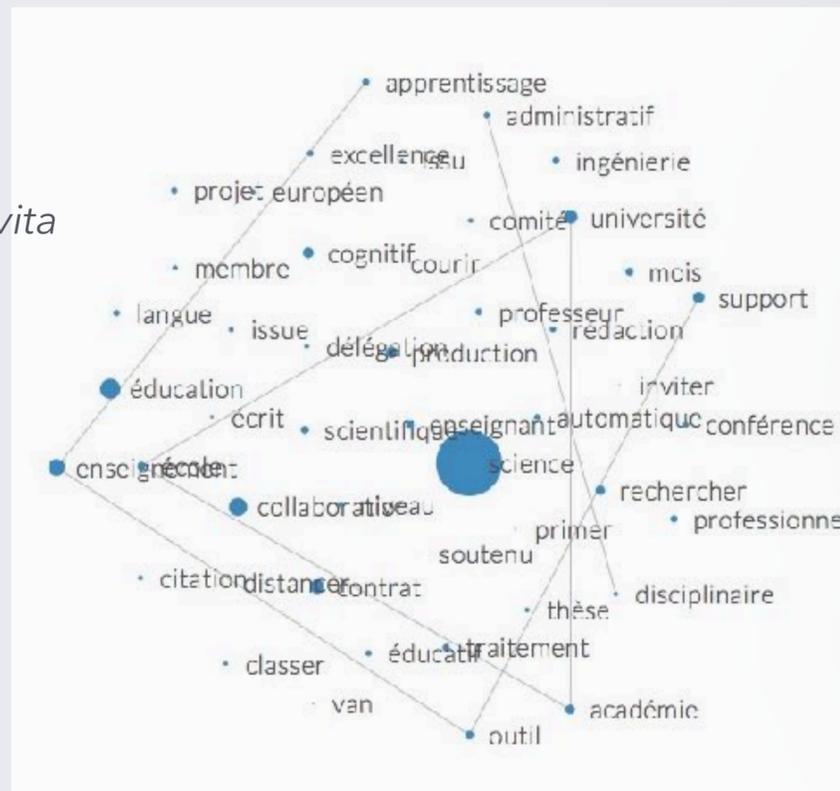
Side-by-side comparison of CVs being classified as (a) positive versus (b) negative. Some details were blurred for anonymisation.

RESULTS

The most predictive indices of CV quality

- Quality is better predicted by content than by formal-centered features
- Formal:** Simple and readable font types
- Content:** Number of adverbs; number of positive words; length of sentences expressing achievements; cohesion flow

Concept map of my own 1-page vita



DISCUSSION

- Textual analysis is a powerful yet simple way to **screen** a wide range of educational material: handbooks, students' written production
- Assessing the emotional charge of any text is **tricky**: context counts, and a proposition with positive + negative words isn't neutral ("not wonderfully interesting" is negative)(Pulman, 2014)

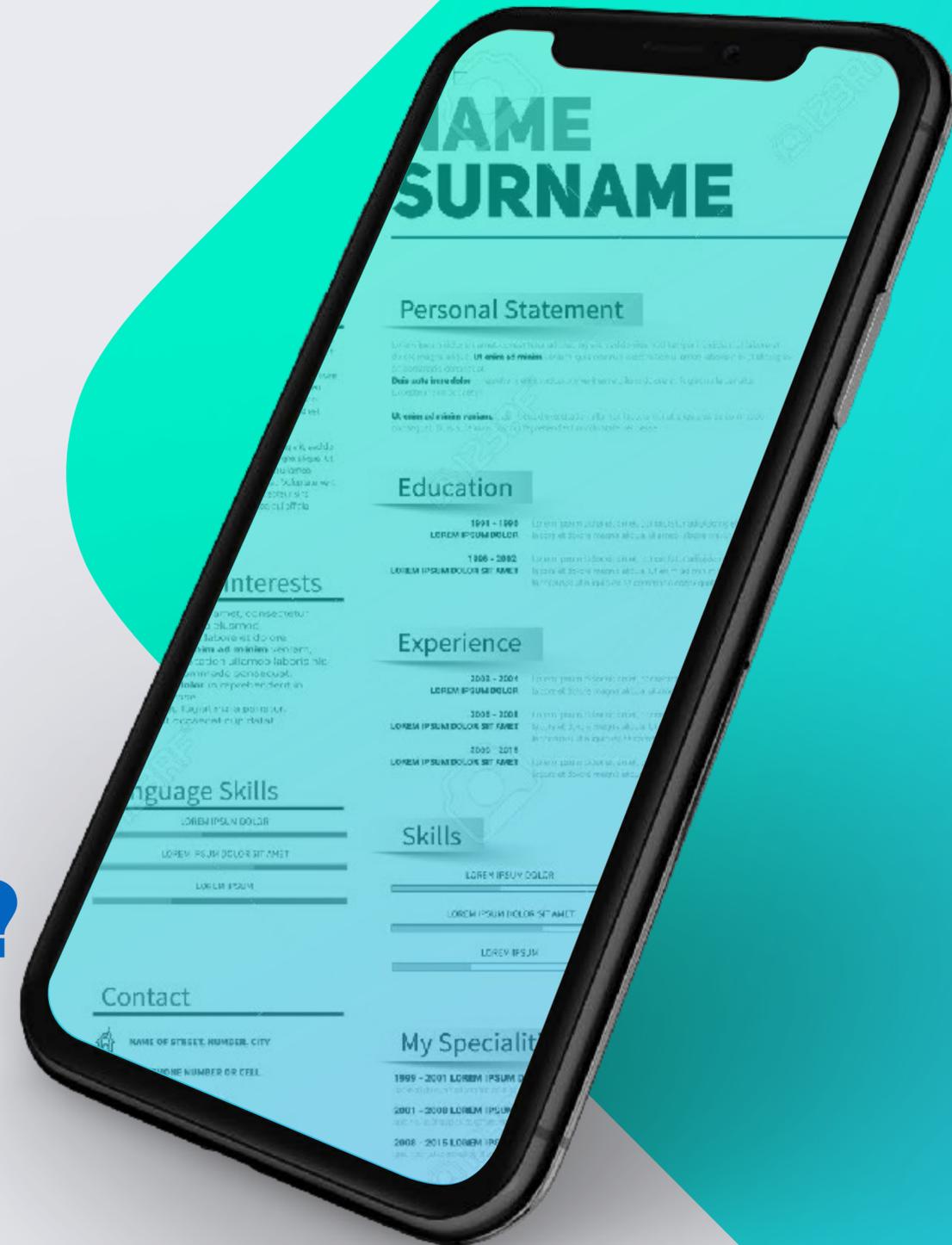


- Which educational uses would you envision from "textual emotion analysis"?



Further reading:

ReaderBench CV Video demo: <https://www.youtube.com/watch?v=Nsd40AmQUKE>



USING ICT IN EDUCATION

- Digital devices can both be **tools** (to act upon a situation) and **instruments** (to get information from a situation)
- Importance of **interdisciplinary** research to uncover use patterns
- Recent focus on **emotions** and **educational data mining...**
- ... for **large scale** situations (MOOCs, universities)

Further reading: Innovating Pedagogy Reports
<http://www.open.ac.uk/blogs/innovating/>



BUT... IT'S A *DELICATE* ISSUE

- ICT use raises likely **ethical and political concerns** researchers and teachers have to address
- Computers as **surveillance** devices?

Further reading:

Drachsler & Greller (2016)

Morozov (2013)

Watters' blog at <http://audreywatters.com>



THANKS FOR YOUR ATTENTION!
ANY QUESTIONS?



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<http://pdessus.fr>



References: <https://frama.link/cokleeco>

THANKS TO: James Crowley, Mihai Dascalu, Erica de Vries, Thomas Guntz, Gabi Gutu, Laura Lassance de Oliveira Morais, Jean-Pascal Simon, Stefan Trausan-Matu, and others...

