



# Using neuroscience to evaluate the influence of media richness on the cognitive and emotional engagement in MOOCs

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HEC MONTRÉAL



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Co-director Tech3Lab

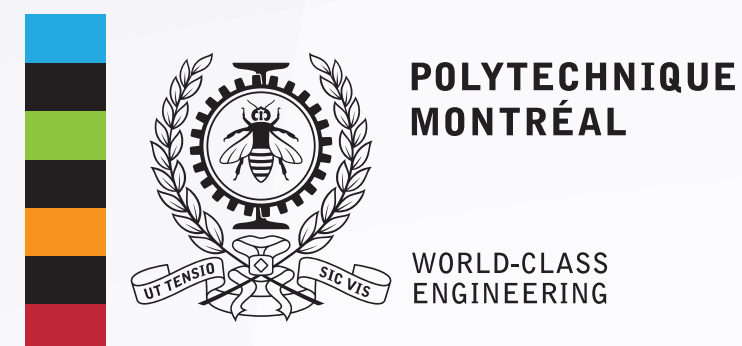
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ResearchGate  
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[https://www.researchgate.net/profile/Pierre-Majorique\\_Leger](https://www.researchgate.net/profile/Pierre-Majorique_Leger)

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## GRADUATE STUDIES



## POST-DOCTORATE

HEC MONTRÉAL



## LABORATORIES & CHAIRS



## GUEST PROFESSOR



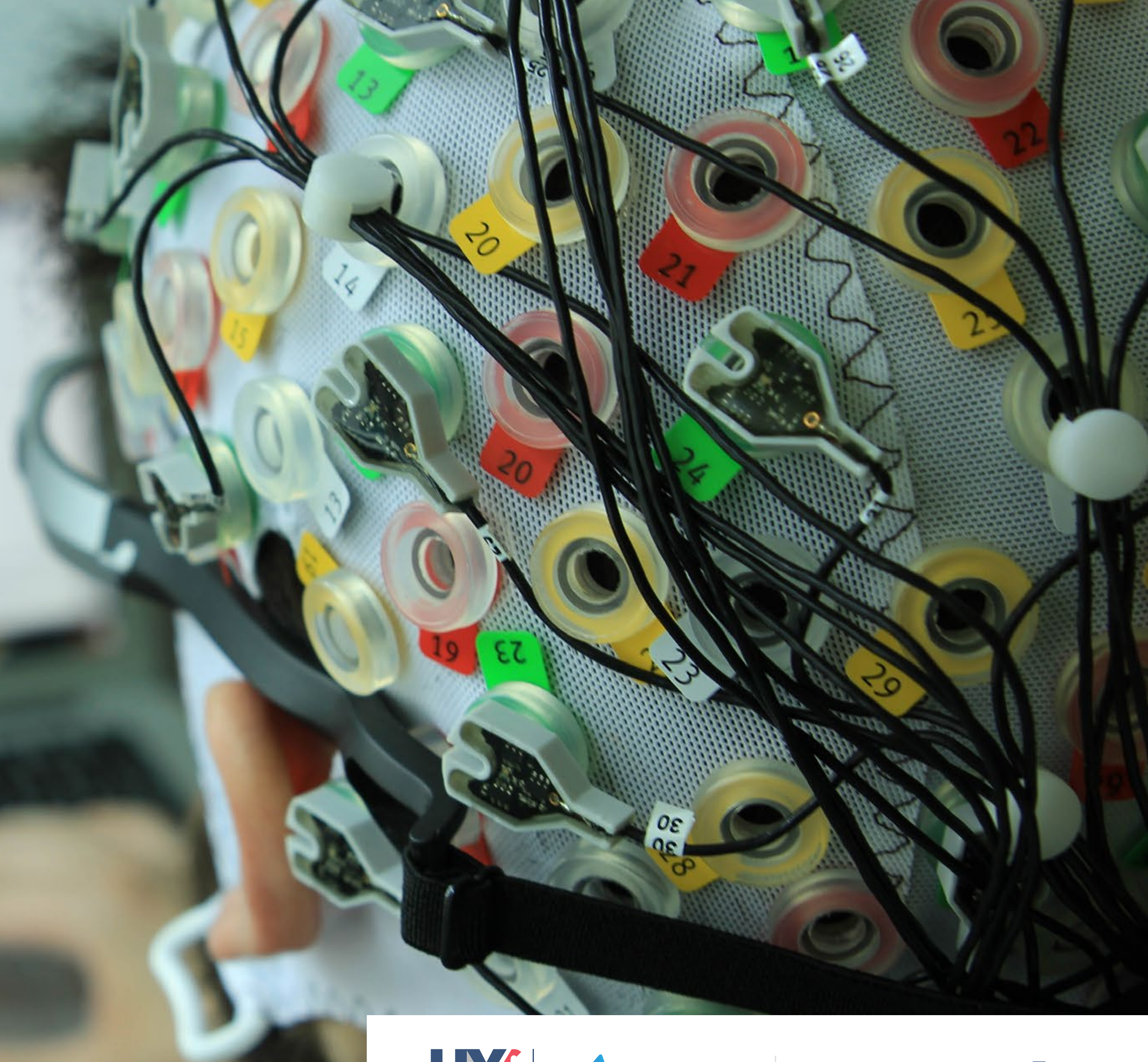
## FINANCIAL SUPPORT



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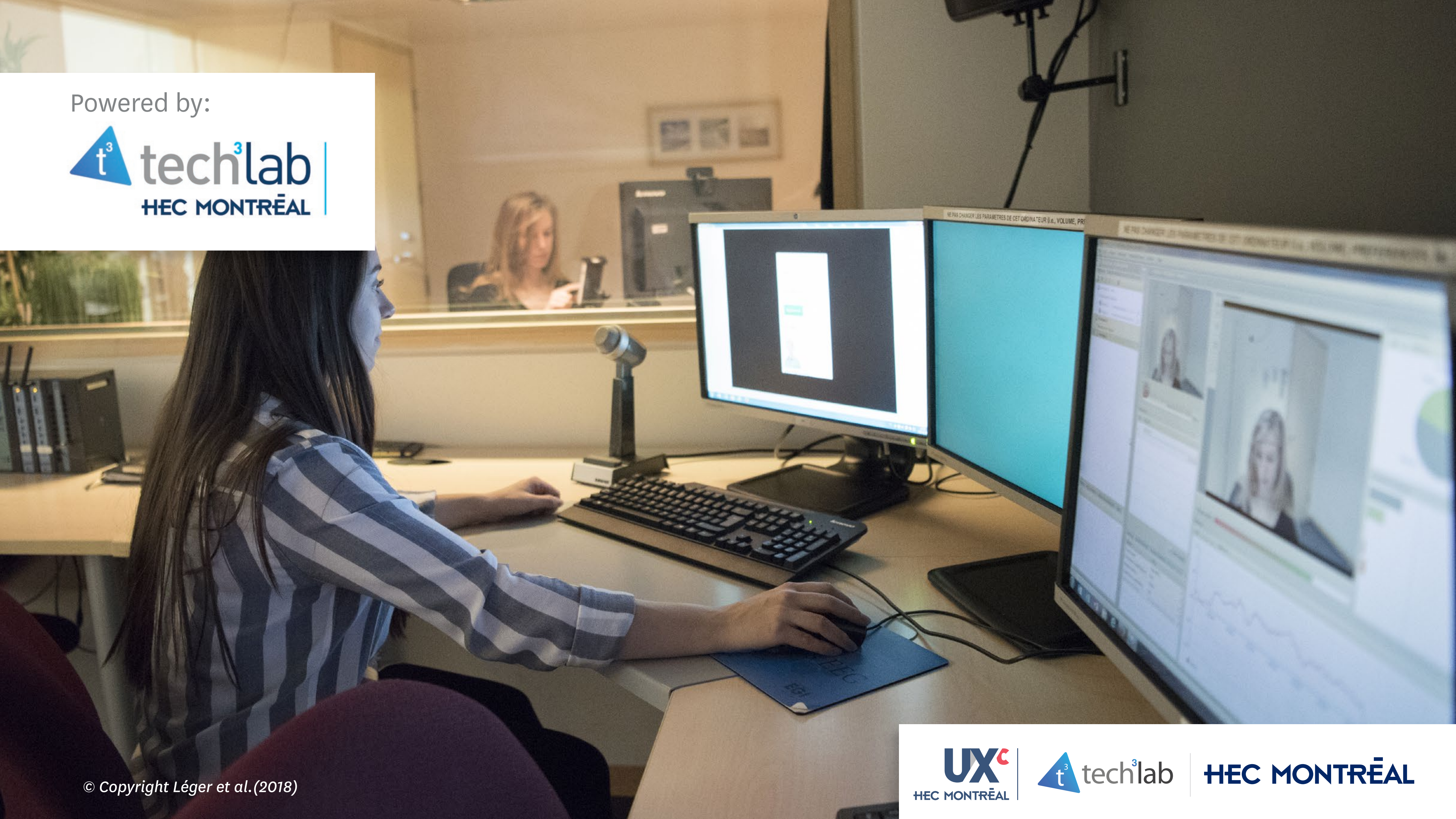


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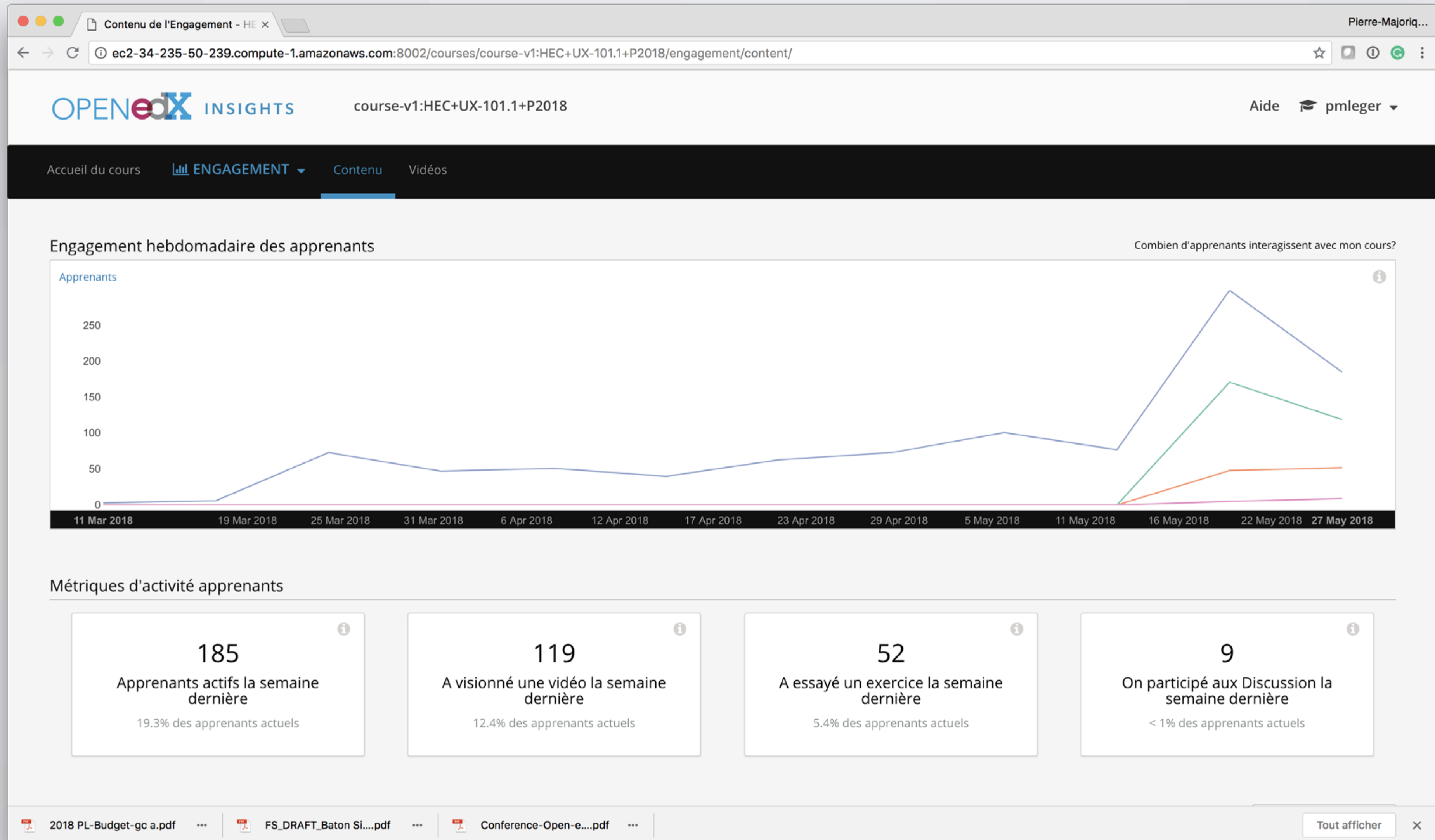




# *Research objectives*

**EVALUATE THE EXTENT TO WHICH MEDIA RICHNESS OF VIDEOS IN MOOCS IS LIKELY TO INFLUENCE THE BEHAVIORAL, EMOTIONAL AND COGNITIVE ENGAGEMENT OF LEARNERS AND THEIR PERFORMANCE.**





















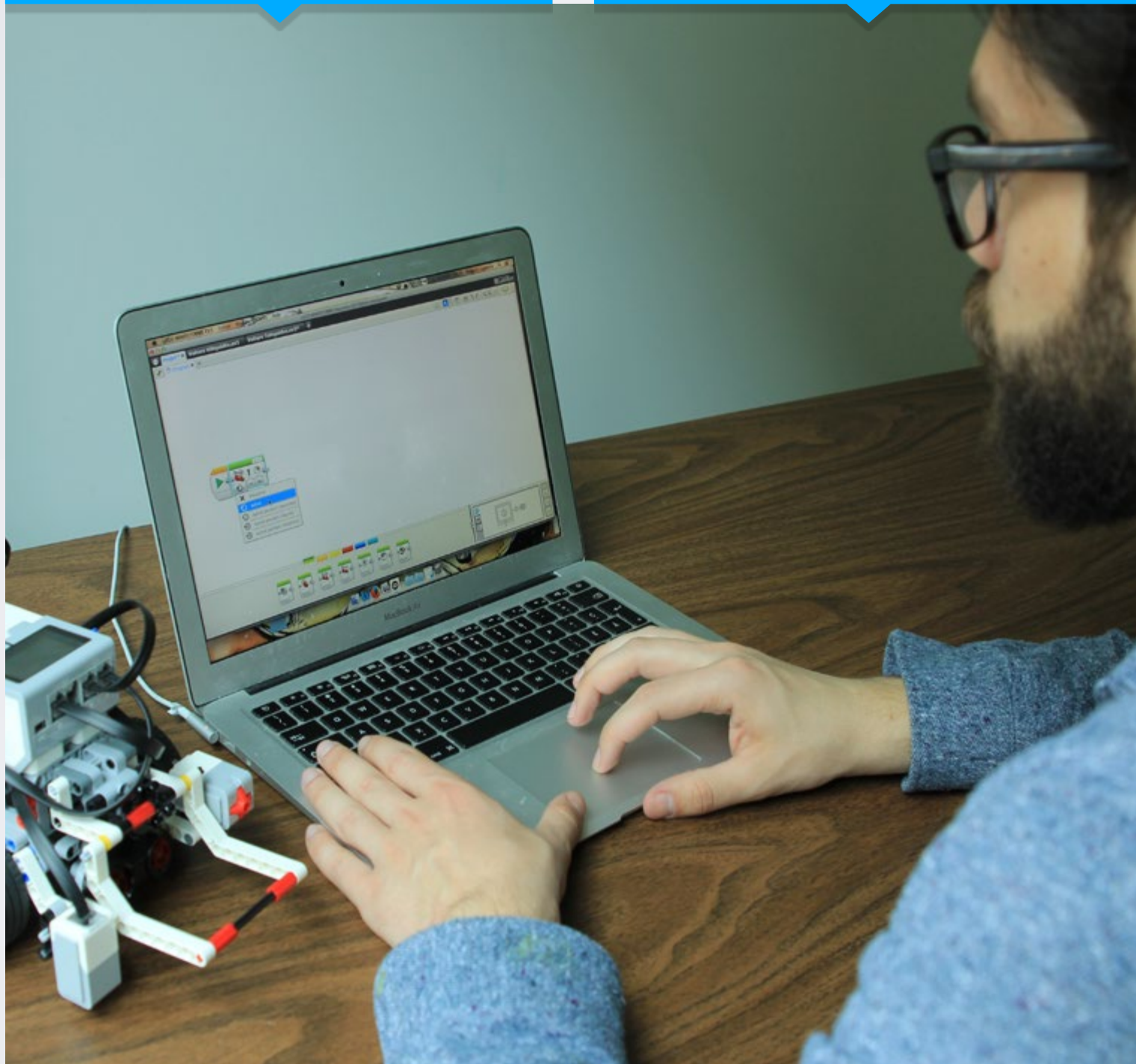






ATTITUDE

KNOWLEDGE

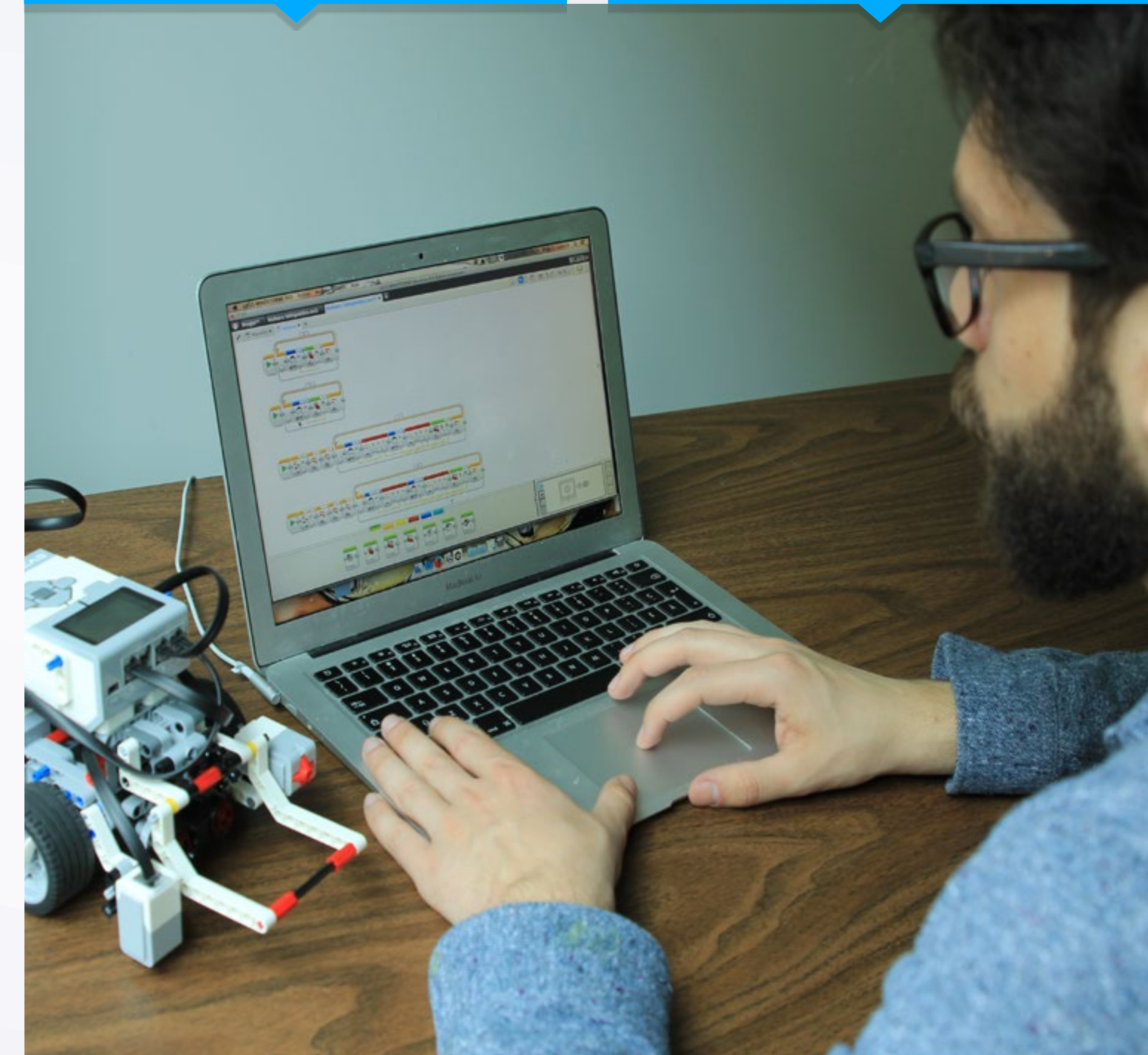


Pre-Test



ATTITUDE

KNOWLEDGE

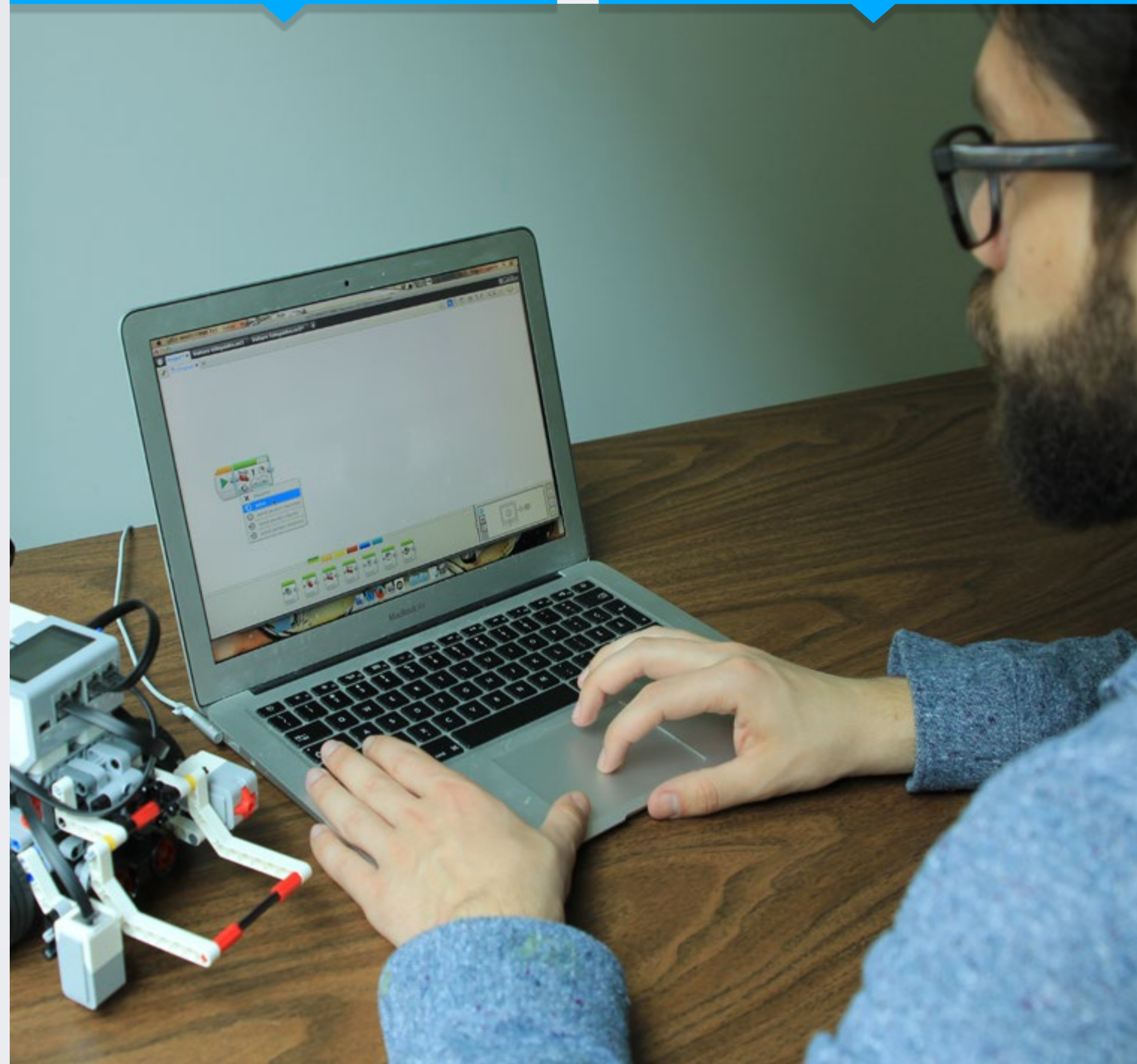


Post-Test



ATTITUDE

KNOWLEDGE



Pre-Test

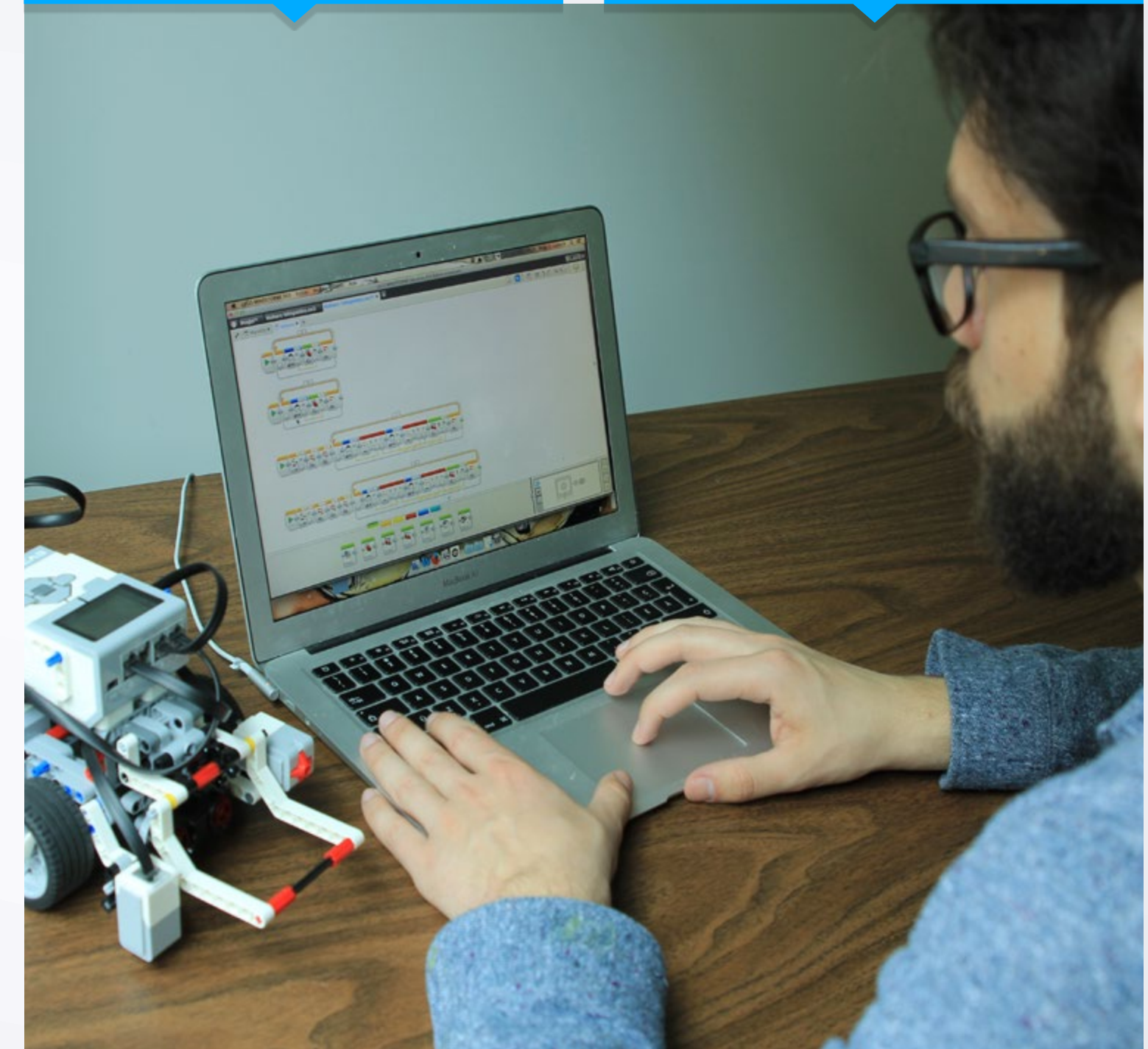


COMPETENCY



ATTITUDE

KNOWLEDGE



Post-Test



# Measuring Engagement



**BEHAVIORAL  
ENGAGEMENT**



**EMOTIONAL  
ENGAGEMENT**



**COGNITIVE  
ENGAGEMENT**



CHARLAND, Patrick, LÉGER, Pierre-Majorique, SÉNÉCAL, Sylvain, et al. Assessing the multiple dimensions of engagement to characterize learning: A neurophysiological perspective. *Journal of visualized experiments: JoVE*, 2015, no 101.



# *Video production style: The influence of media richness*

**GRAPHIC DESIGN REPRESENTS AT LEAST  
25% OF TOTAL COSTS OF A MOOC**

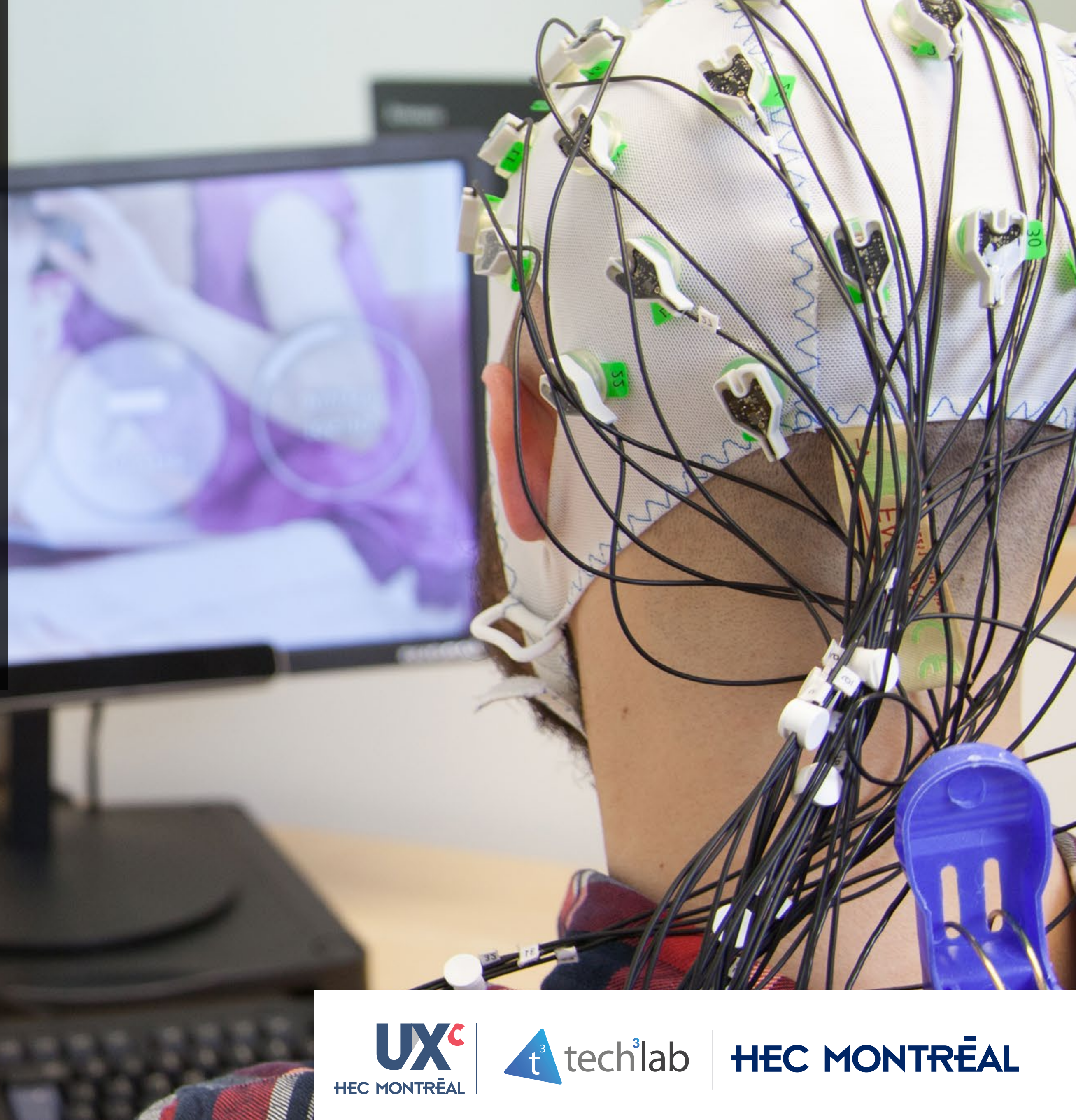
Source : Raccoongang, 2017



# Methodology

## LABORATORY EXPERIMENT

- Experimental design: Between-subject study
- Two conditions: High and low media richness
- Duration: 14 minutes
- Exact same content and same instructor
- 10 female (38%) and 16 male (62 %)
- Pre-test and post-test



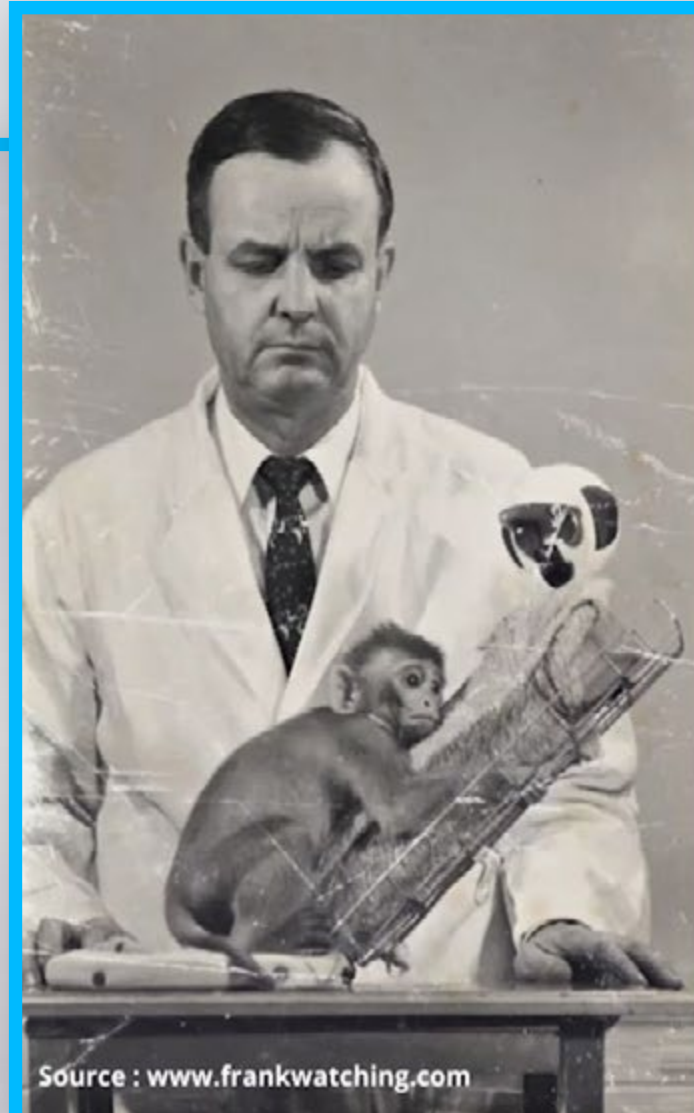


# Experimental stimuli

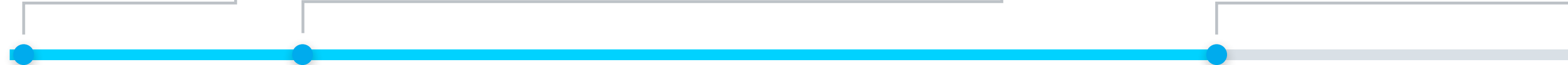
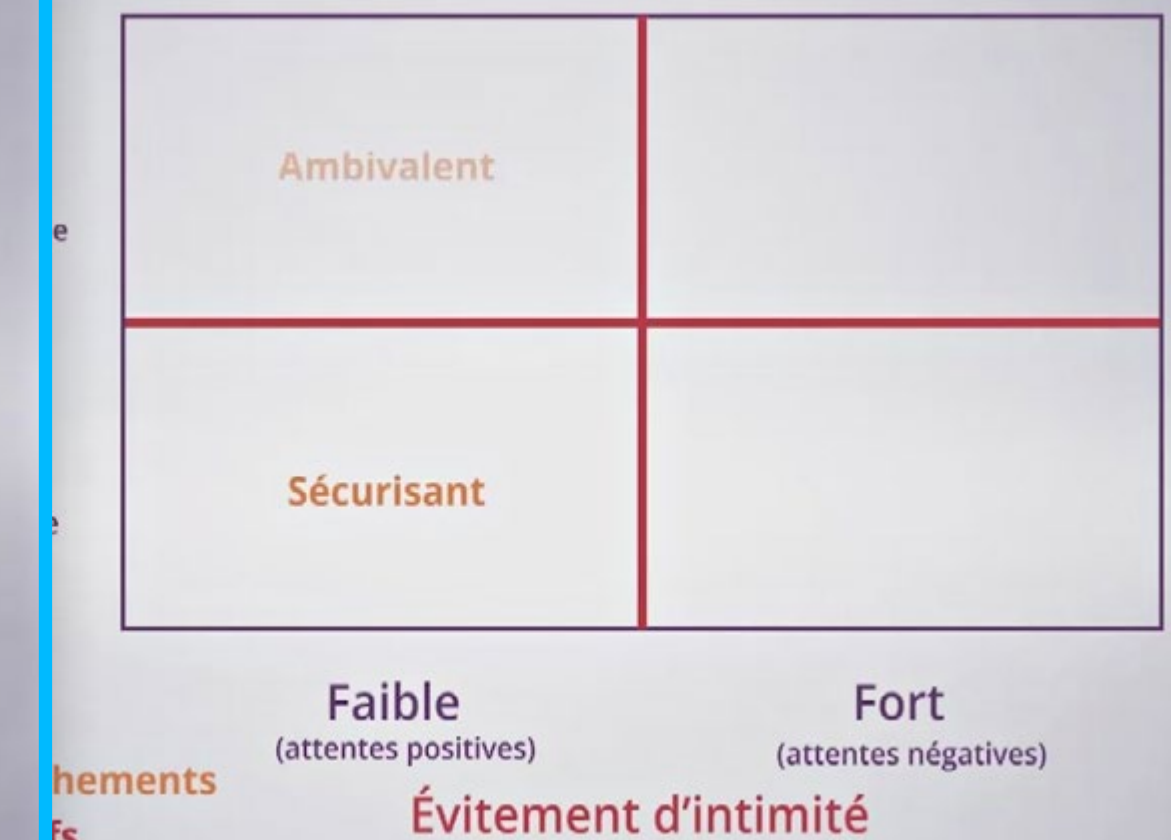
HIGH RICHNESS

## L'attachement

avec  
**Caroline Aubé**  
Professeure agrégée, Département de management  
HEC Montréal



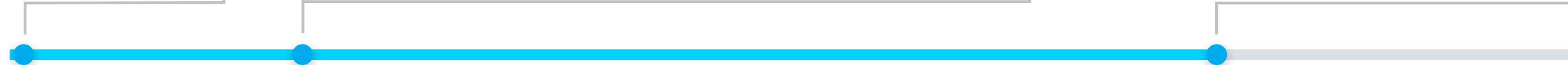
**Harry Harlow (1905-1981)**  
psychologue américain





# Experimental stimuli

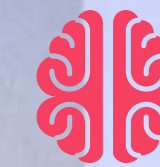
LOW RICHNESS



1x







# Instruments

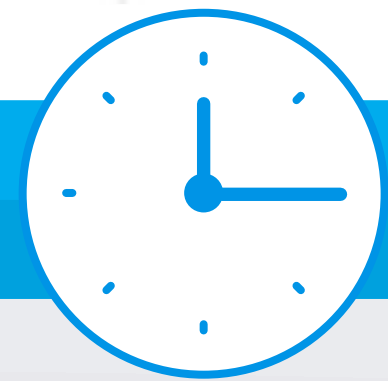
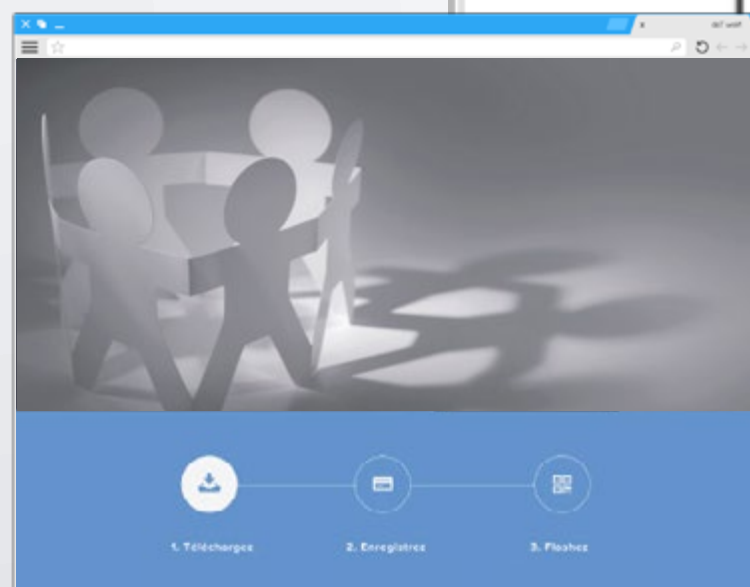
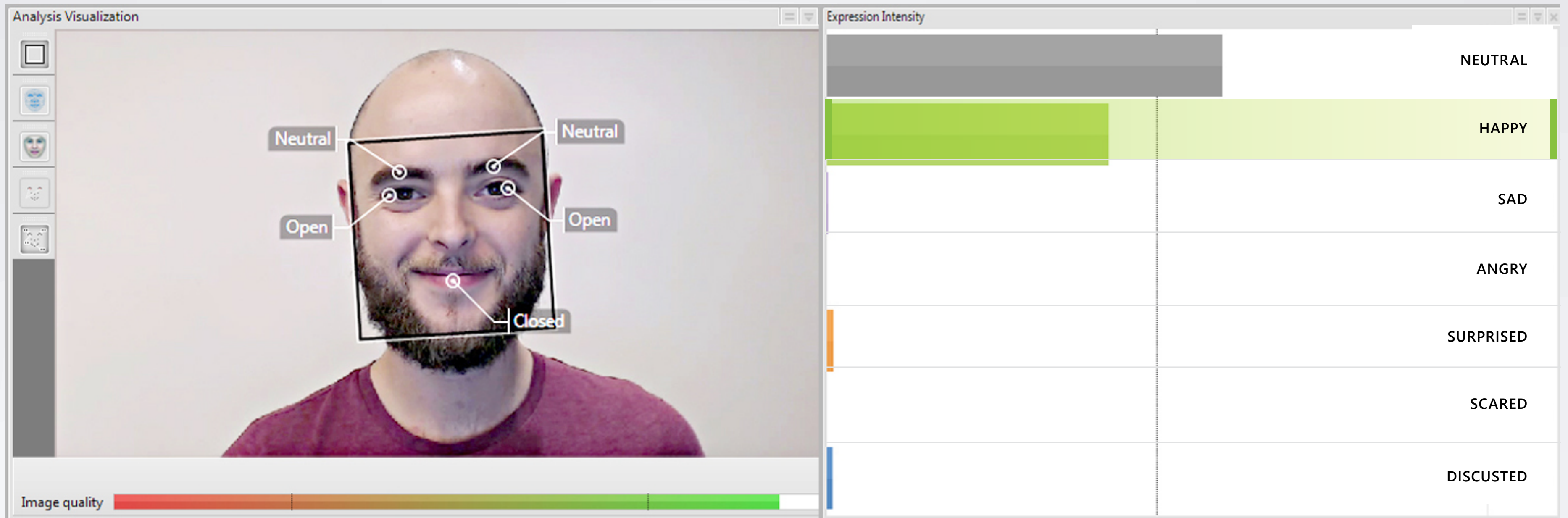
EMOTIONAL ENGAGEMENT (VALENCE)  
Automatic Facial Analysis (Facereader)

COGNITIVE ENGAGEMENT  
Electroencephalography (EEG)

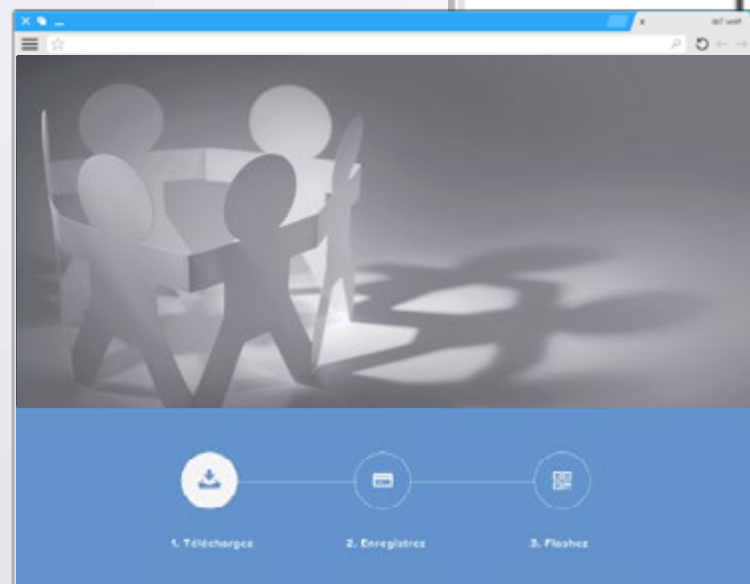
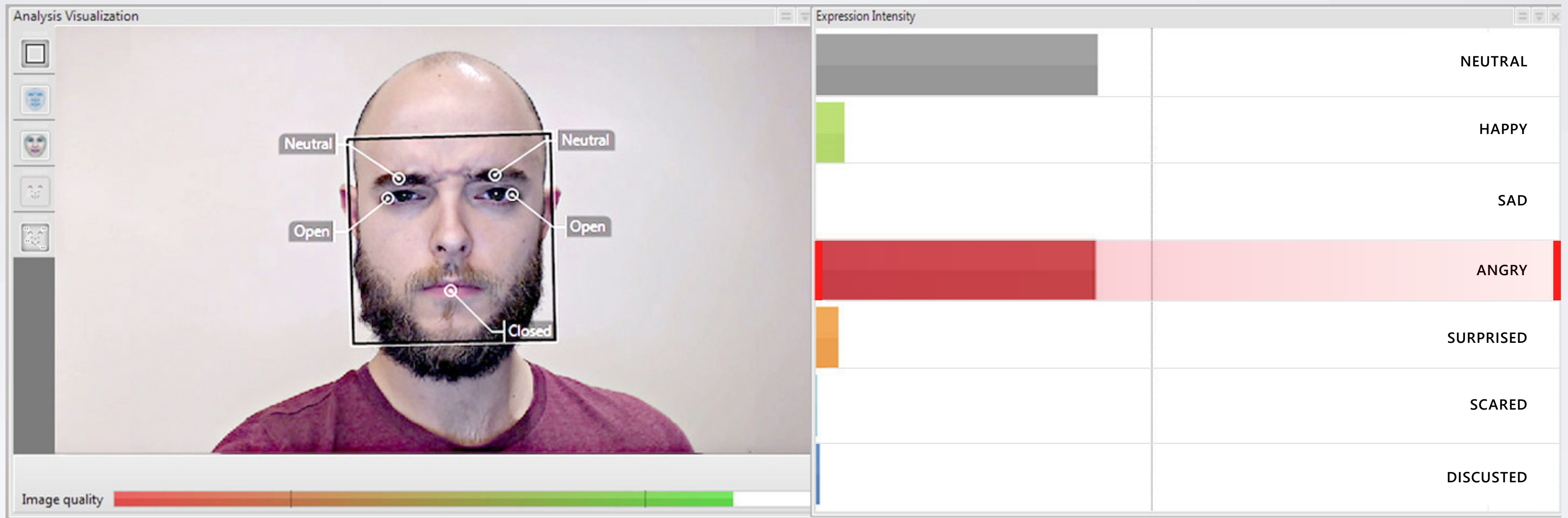


EMOTIONAL ENGAGEMENT (AROUSAL)  
Electrodermal activity (EDA)





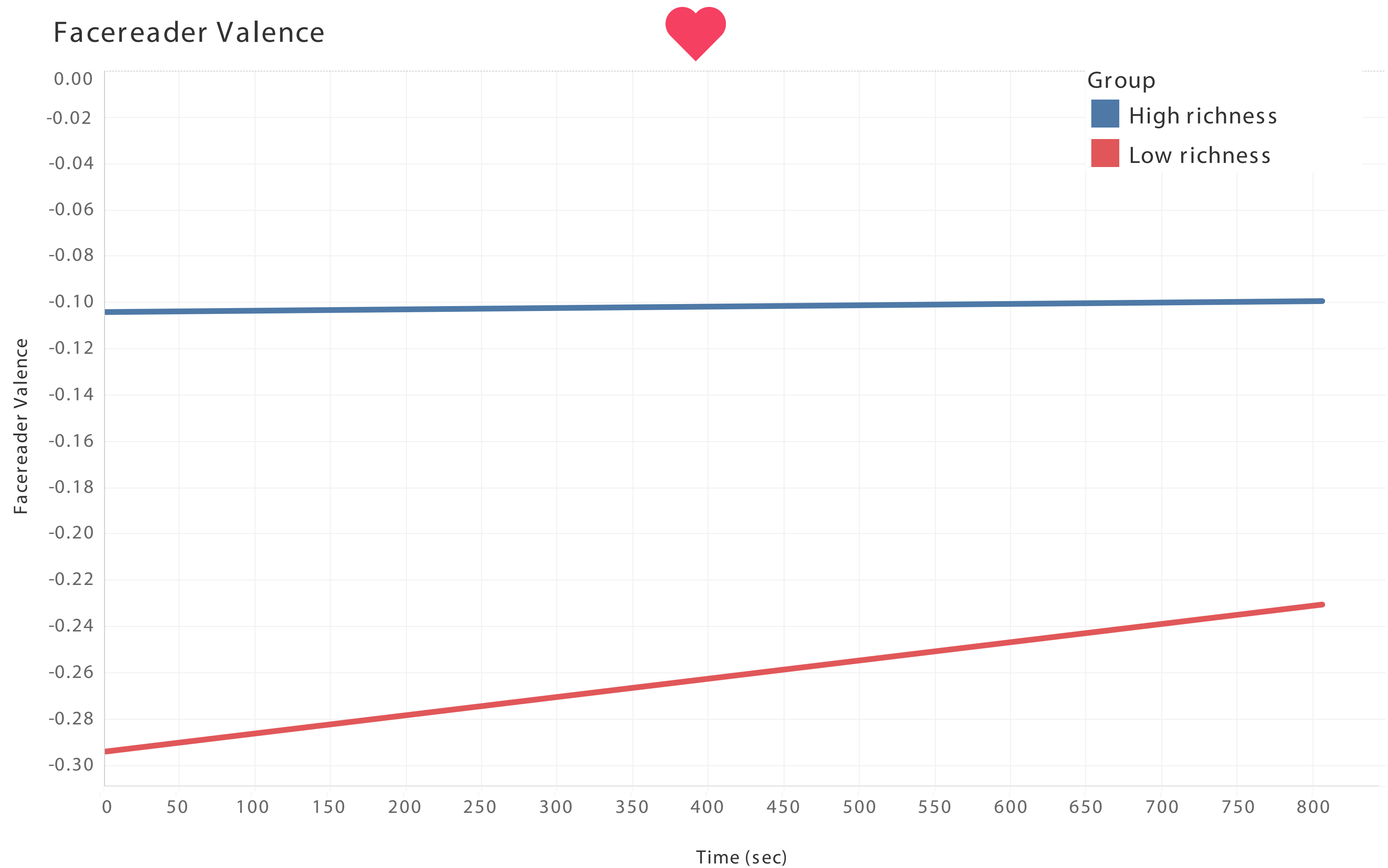






# Results

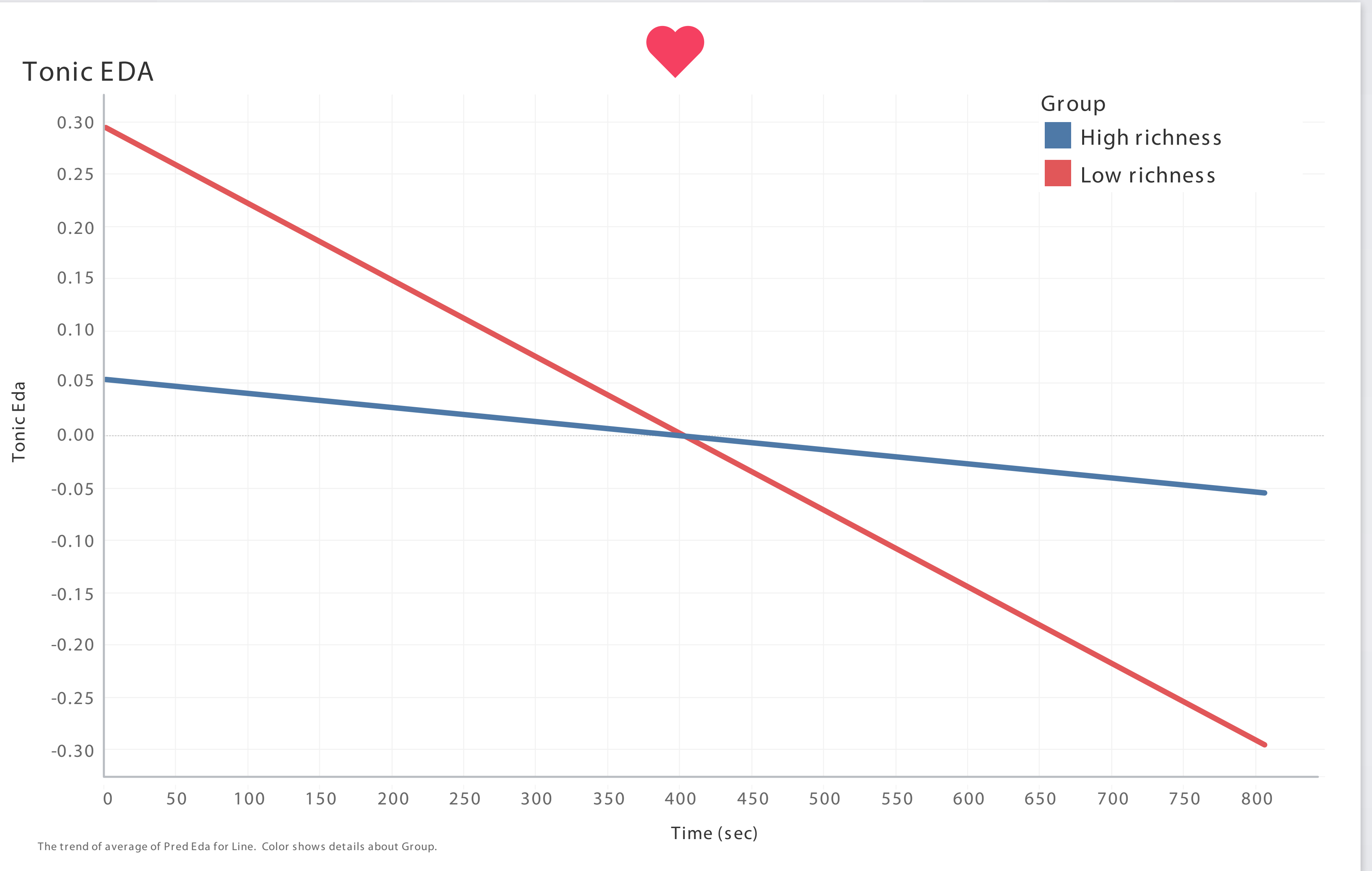
## EMOTIONAL ENGAGEMENT: VALENCE (FACEREADER)





# Results

## EMOTIONAL ENGAGEMENT: AROUSAL (EDA)

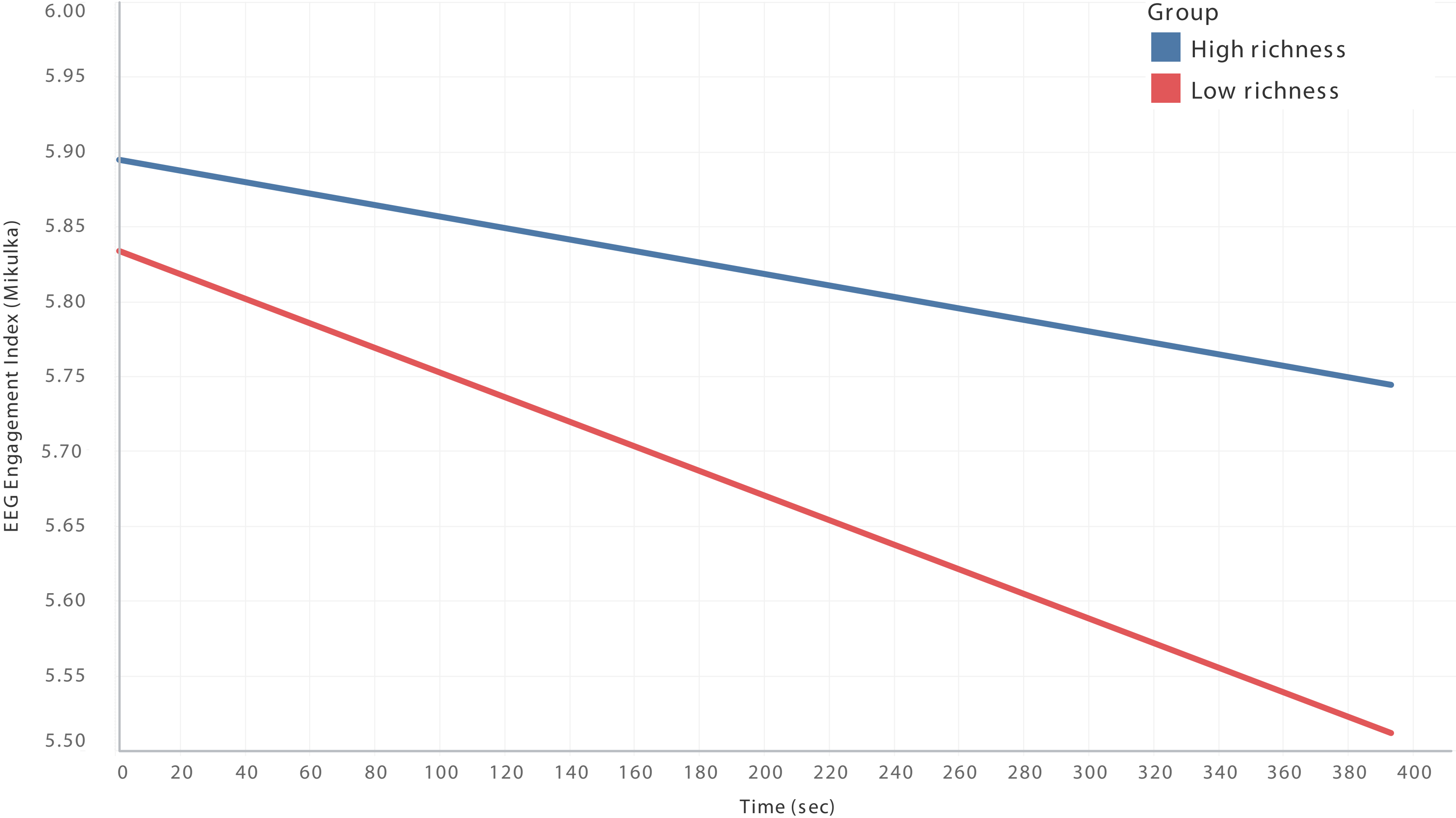




# Results

## COGNITIVE ENGAGEMENT

### EEG Engagement Index (Mikulka)



The trend of average of Pred Eeg for Line. Color shows details about Group.



# *The effect of engagement on learning outcome*

- Significant positive relationship between valence and arousal of the subject and overall performance.
- Quadratic relationship between cognitive engagement and performance : the higher the engagement, the higher the performance, but at some point, the vigilance has a negative effect on performance.





# Conclusion:

- MOOC design recommendations
- Limitations
- Future research





t<sup>3</sup> tech<sup>3</sup>lab

*Thank you!*

