Enhancing the Metacognition of Nursing Students Using Eye Tracking Glasses

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Context and Goal

❖ In nursing, **simulation** has become an essential tool to develop **clinical reasoning**/judgement and decision-making.
❖ In the School of Health Science in Fribourg, a clinical reasoning technique using a systematic approach to assess and treat the patient's Airway, Breathing, Circulation, Disability, and Exposure (**ABCDE**) has been developed.

Goal : improve the application of this **systematic ABCDE approach** throughout the students' curriculum through a better understanding of their metacognition, thanks to **eye-tracking** in a simulation.

The Pedagogical Process

🟡 Teacher   🟢 Student   🔵 Both

15 nursing students
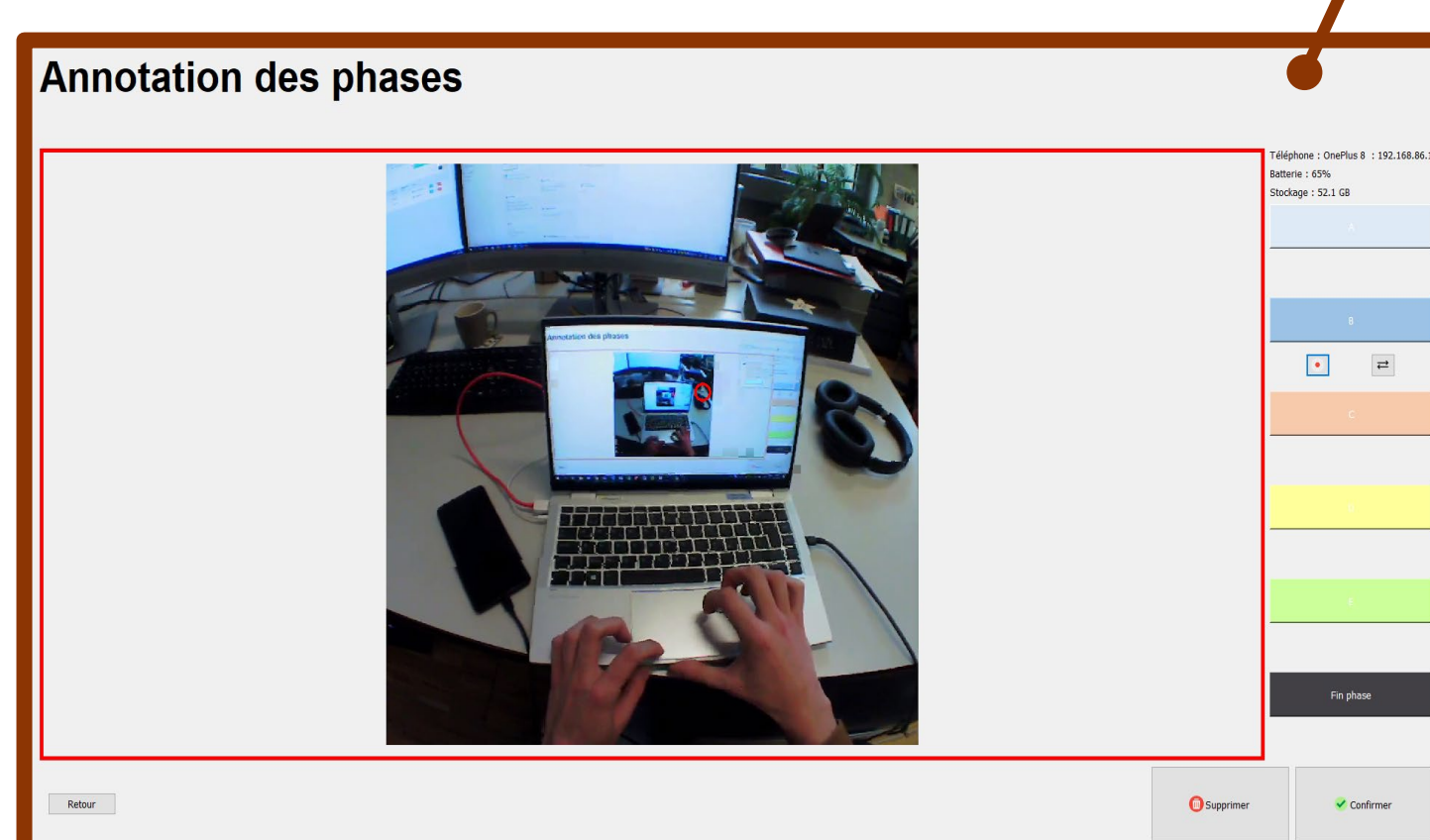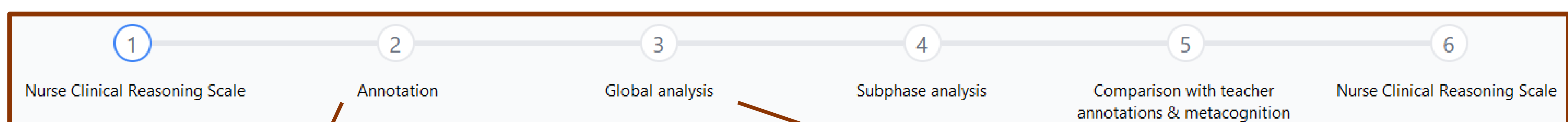
Pupil Invisible Glasses

Before the simulation :
🟡 **Several weeks before :** Briefing about the new process with eye-tracking glasses
🔵 **On the day of simulation :** Equipping the student with the **eye tracking glasses** + calibration

During the simulation :
🟢 **Students** : perform care and clinical reasoning through the **ABCDE's systematic** approach
🟡 **Teachers** : In the video control room, annotating the beginning/end of each ABCDE phase
Data collected = **Voice** and **video** from the student's point of view + **gaze** data

After the simulation :
🔵 Debriefing session with the student
🟢 The student analyses his/her simulation on a second custom interface, with guided metacognition questioning following the timeline below.

1	2	3	4	5	6
Nurse Clinical Reasoning Scale	Annotation	Global analysis	Subphase analysis	Comparison with teacher annotations & metacognition	Nurse Clinical Reasoning Scale

Annotation des phases

3 relevant metrics of situation awareness describing the students' gaze distribution over different areas of interest (AOIs) and periods of the simulation :

❖ Fixation rate
❖ Fixation time in AOIs
❖ Percentage of time spent in AOIs

AOIs were detected with a YOLOv5 model

Voici la répartition de vos points de fixations visuels sur l'ensemble de la simulation:

Zone d'intérêt	Fréquence de fixation sur la zone d'intérêt [fixations/sec]	Temps passé sur la zone d'intérêt [secondes]	Pourcentage de temps passé sur la zone d'intérêt [%]
bras	0.0	0	0.0 %
buste	0.0	0	0.0 %
chariot	0.0	0	0.0 %
jambe	0.0	0	0.0 %
tete	0.0	0	0.0 %

Results

Self-made questionnaire (5-points Likert scales, subjective data)

+

UX/UI
Glasses : easy to use (4.73) and non-invasive (4.33)
Interface (4.47) and instructions/video tutorial (4.8) clear and easy to use

Learning
Better identification of elements for their patient's nursing (4.33) and cognitive reasoning (4.33), enhanced learning thanks to eye-tracking (4.2)
Positive change for their next intervention (4.46)

−
The annotation of the ABCDE approach phases (4)
The accuracy of the eye-tracking metrics (3.66)

Short French version of the User Experience Questionnaire

Pragmatic quality : **1.72/3**
Hedonic quality : **2.32/3**
Overall : **2.02/3**

User experience of the process considered as *excellent* regarding the benchmark set by the authors' questionnaire.

These preliminary results are encouraging for the further development of this innovative pedagogical process in Switzerland.

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