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28 October 2024

Eyetracking-Based Comparative Study of Professional Vision: University Trainers and Pre-Service Teachers in Secondary Education

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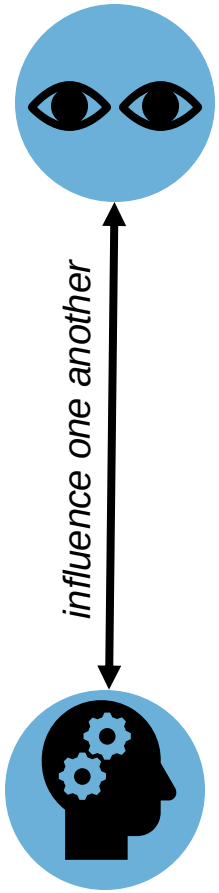
Tell me what you observe and I'll tell you who you are.

Comparative study of professional vision in teaching using eye tracking, university trainers and future secondary school teachers.

Professional vision

As Van Es &Sherin (2008)



- **OBSERVING = TO NOTICE**
- Professional competence (Vifquin & Frenay, 2018)
- Teachers' ability to direct their attention to relevant events in the classroom (Sherin, 2007; Van Es & Sherin, 2008)

-> Selective attention is influenced by a series of parameters (Vifquin & Frenay, 2018; Huang et al. 2018) , including expertise (Keskin et al. 2024).

- **REFLECTING = INTERPRETATION OF OBSERVATIONS**
- Based on Van Es & Sherin (2008) and Vifquain & Frenay (2018):

1) Accurate description of the scene (Van Es & Sherin, 2008)
2) Interpretation, judgement and justification (Van Es & Sherin, 2008)
3) Prediction of consequences (Van Es & Sherin, 2008) and remedies (Vifquin & Frenay, 2018)

Statement

- **BASED ON OUR LITERATURE REVIEW (see Duvivier et al. 2024)**
- PV of expert teachers has been studied
- PV of pre-service teachers **(PT)** has already been studied.
- PV of trainers, including academics **(UST),** is little explored (Duvivier et al. 2024).

Reference authors	University Supervisor Trainer	Pre-service Teacher	Expert Teacher	Novice Teacher
			X	
Yamamoto & Imai-Matsumura (2013)		X	X	
van den Bogert et al. (2014)		X	X	
Wolff et al. (2016)				X
van Leeuwen et al. (2017)		X		
Goldberg et al. (2021)			X	X
Kosel et al. (2021)			X	
Minarikova et al. (2021)		X		
Schnitzler et al. (2020)			X	X
Seidel et al. (2021)		X	X	
Shinoda et al. (2021)			X	X
Stahnke & Blömeke, (2021)		X		
Wyss et al. (2021)	X	X		

Duvivier, V., Derobertmasure, A., & Demeuse, M. (2024). Eye tracking in a teaching context: Comparative study of the professional vision of university supervisor trainers and pre-service teachers in initial training for secondary education in French-speaking Belgium. « Frontiers in Education ». https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2024.1326752/full

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Minarikova et al. (2021)		X		
Schnitzler et al. (2020)			X	X
Seidel et al. (2021)		X	X	
Shinoda et al. (2021)			X	X
Stahnke & Blömeke, (2021)		X		
Wyss et al. (2021)	X	X		

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Statement

- The observation and analysis of teaching scenes constitutes a central activity within the remit of trainers (Cohen et al., 2013; Wyss et al., 2021).

- The practices of trainers are characterised by a number of distinctive features, the specifics of which are frequently misunderstood.

- practices are often perceived as opaque (Awaya et al., 2003) or taken for granted, without being subjected to detailed description and analysis (Zeichner, 2005).

- While trainers are conversant with the processes of observation and analysis of teaching scenes, for those undertaking training as future teachers, this represents their inaugural experience of such activities.

-> *expertise* could give rise to discrepancies with reference to theories on visual expertise (e.g. Gegenfurtner et al., 2023; Lachner et al., 2016).

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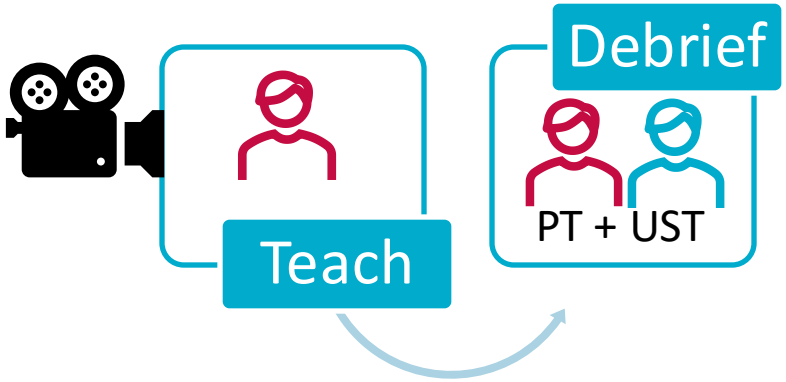


The two participant in question serve the same function.

→ view the video

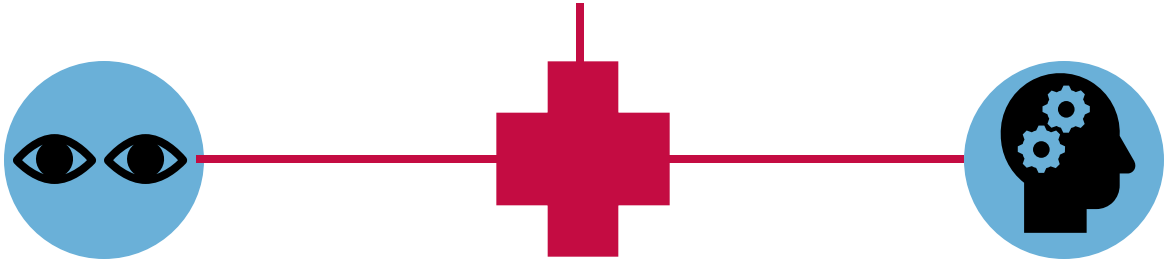
→ provide a commentary on it.

Methodology
Eye tracking and TAP

OBSERVING

REFLECTING

A MIX APPROACH



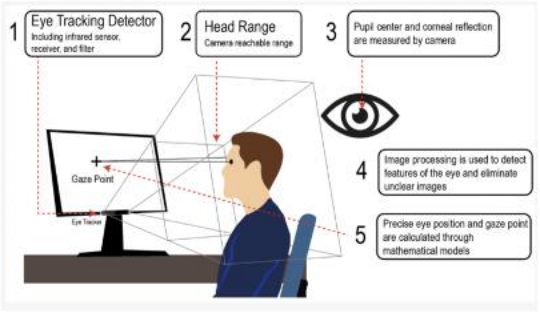
EYETRACKING

-> Identify the centre of attention by following the eye movements (Wang, 2022) of a teacher observing a teaching situation.

VERBAL PROTOCOLS

-> Understand the reasons that guided the observation

-> As **Roussel (2017):** during the observation



Methodology

STEP 1 — CALIBRATION

STEP 2 — VIEWING A
- Silent observation

STEP 3 — DECOMPRESSION TIME
- Reminder of instructions
- micro-test

STEP 4 — CALIBRATION

STEP 5 — VIEWING B
- with commentary

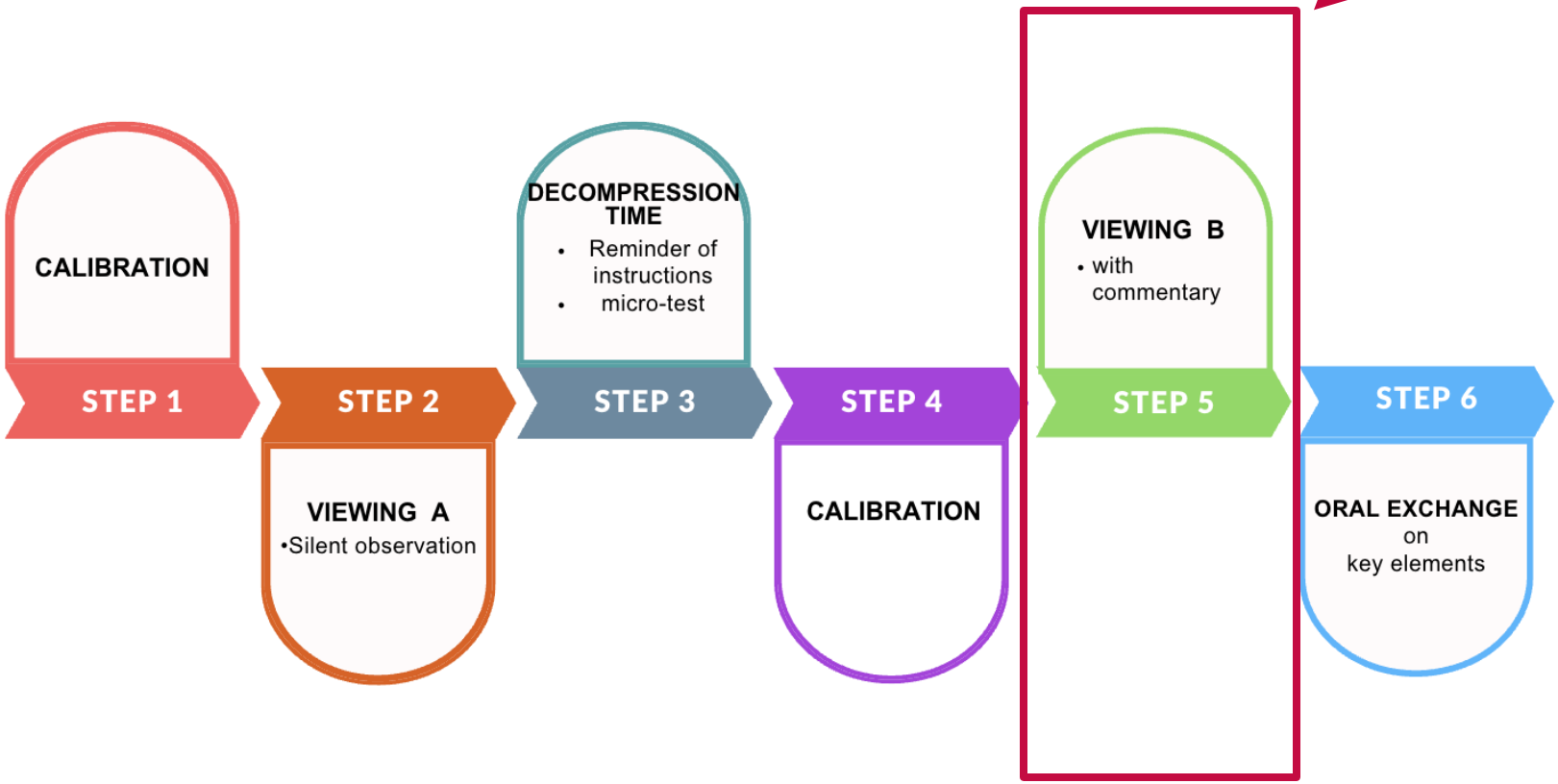
STEP 6 — ORAL EXCHANGE on key elements

Stages of the experiment from Duvivier et al. 2024

Image de Chiu T-P, Yang DJ, Ma M-Y. The Intertwining Effect of Visual Perception of the Reusable Packaging and Type of Logo Simplification on Consumers' Sustainable Awareness. *Sustainability*. 2023; 15(17):13115. https://doi.org/10.3390/su151713115

Methodology

For this presentation



Stages of the experiment from Duvivier et al. 2024

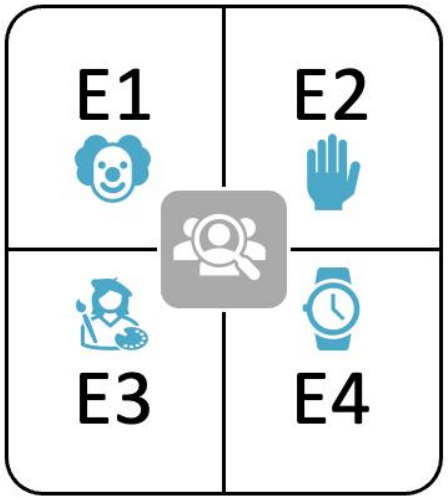
Methodology

The video

- 7 minutes
- A trainee teacher

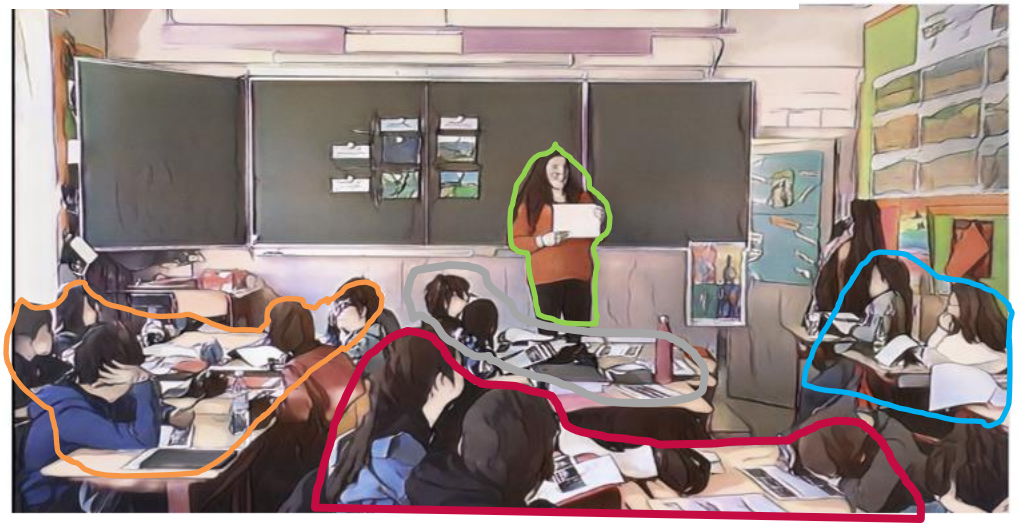
- Start of a lesson
- The trainee teacher makes a planning error
- Pupil in or off-task

Methodology



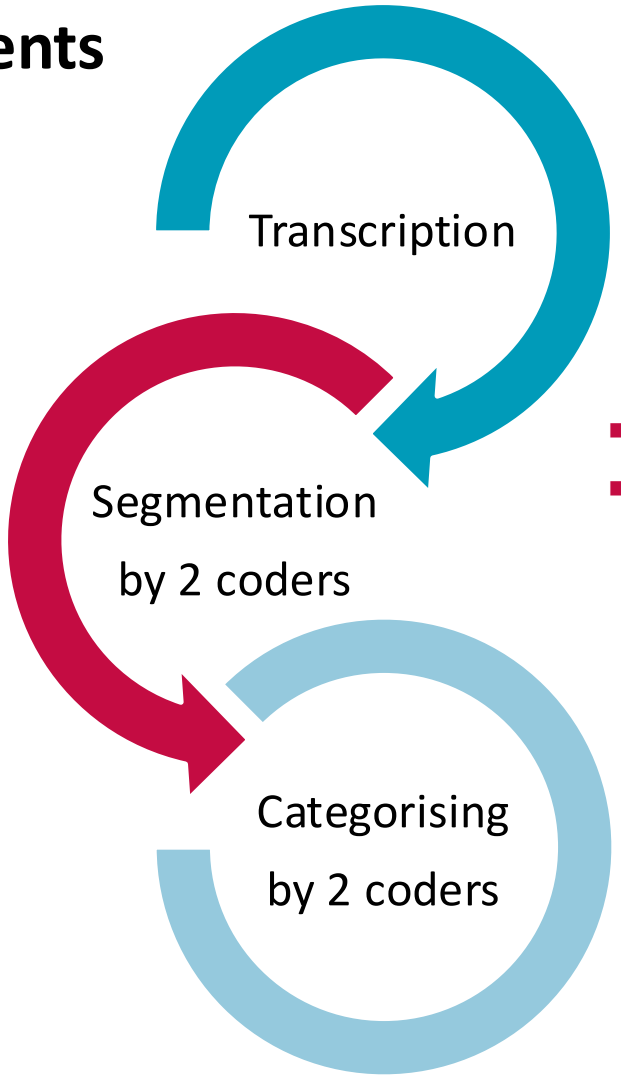
Eyetracking ‘s Data

- Aera of interest on
  - 4 pupill
  - Group
  - Trainee teacher



Methodology

Verbal ‘s comments

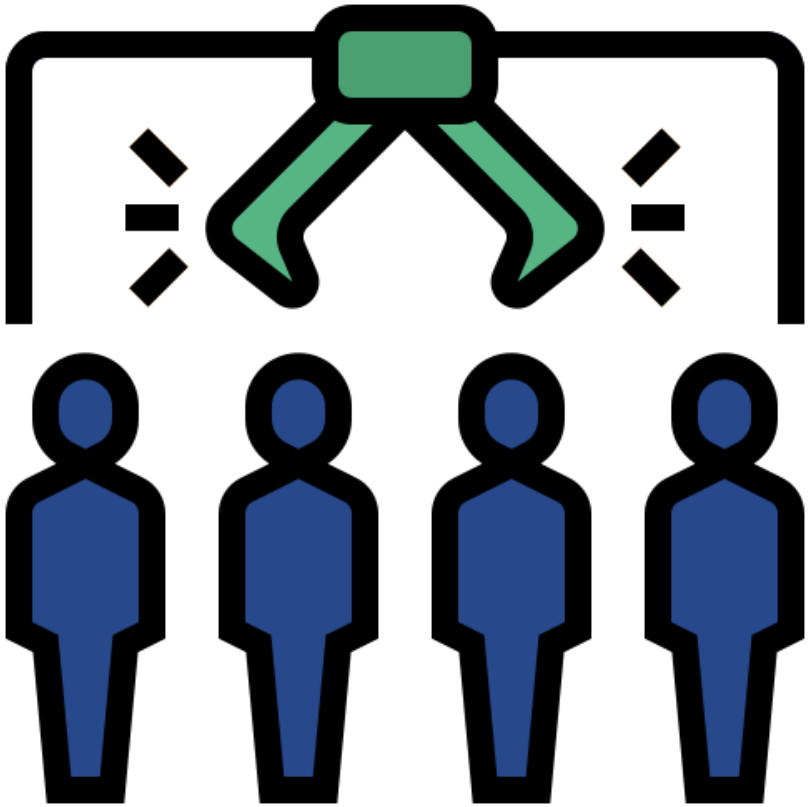


PT= 1437 segments
UST = 379 segments

- cfr Paillé & Muchellini (2007)
- validaded if 80% between the coders (Miles & Huberman, 2003)

- N-vivo-12
- 2 coders

Sample



- **19 PT enrolled in the micro-teaching training system of AESS program - academic year 2022-2023 (group 1)**
  - 16 valid eyetracking data for PT
  - 19 valid verbal data for PT
- **6 UST involved in the debriefing process (secondary education) by the INAS (group 2)**
  - Average experience ranged 16 years
  - 2 PH/D and 4 PH in Education Sciences
  - Valid data (eyetracking and verbal): OK

Some questions and hypotheses

OBSERVING

RQ 1: Individual being observed?

H: Attention is more restricted in PT ; UST to observe a larger number of individual (eg. Yamamoto & Imai-Matsumura, 2013; Cortina et al., 2015).

-> fixed and moving AOI are used to identify group of pupils and trainee teacher.

-> Indicators: 1st view, fixation, (Re-)view

QR 2: visual strategies employed by UST and PT ?

H: UST eye scanning capabilities are more dynamic than PT (van den Bogert et al. 2014).

-> fixed and moving AOI are used to identify target pupils.

-> Indicators: 1st view, fixation, (Re-)view

Some questions and hypotheses

REFLECTING

(adapted from Vifquain & Frenay, 2018)

RQ.3: Objects spontaneously formulated?

H: PT focus on device for learning and pupils (Vifquain & Frenay, 2018) and UST focus on trainee teacher

-> Classification based on « teaching-learning model » (Derobertmasure & Dehon, 2015) : objective; teacher; pupils; learning topic; device for learning + context

RQ.4. Type of reasoning process formulated?

H: Description and interpretation by the PT (Vifquain & Frenay, 2018) and evaluation by the UST (Cohen et al. 2013)

-> Classification based on Sherin & van Es (2008), Seidel & Stürmer (2014) and Vifquain (2015): description; question; evaluation; interpretation; prediction

- Cross-referencing (as Vifquain & Frenay, 2018)
- Inter- and intra-coder (Landis & Cock, 1977)

Results: observing

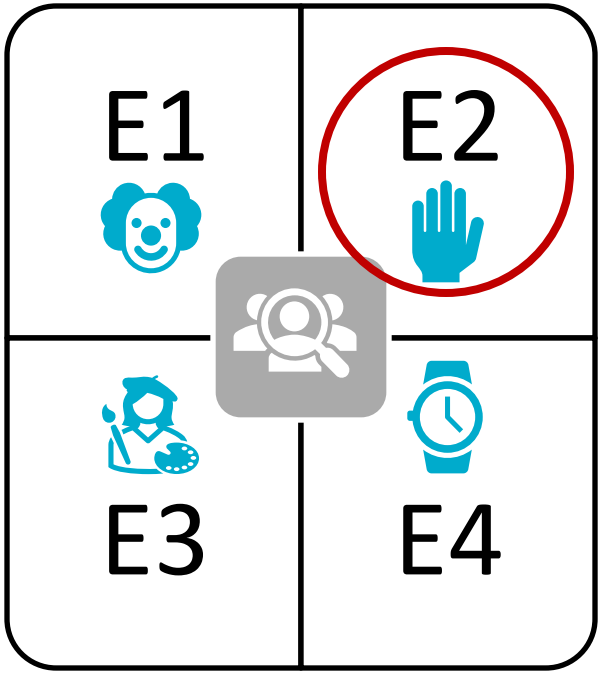
QR1. Individual being observed?

- The fixation scores between the participants in the study, namely the students and the trainee, are **comparable.**

-> E.g. : Focus on teacher

- PT = 33, 9% (fixation)
- UST= 39% (fixation)

- **Significant difference** of target pupil
  - PT= focus on pupil E2
  - UST= focus on pupil E1 and E3



Results: observing

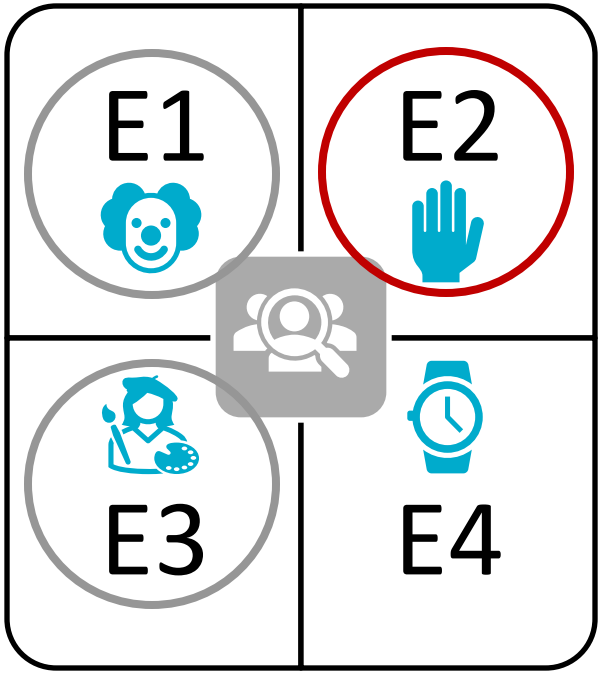
QR1. Individual being observed?

- No significant differences in the mean and dispersion between PT and UST, regardless of the individuals (pupil vs. trainee teacher).

-> E.g. : Focus on teacher

- PT = 33, 9%
- UST= 39%

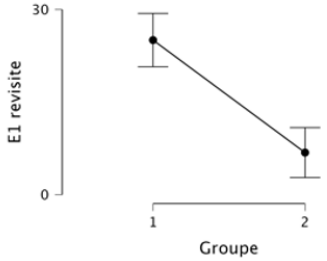
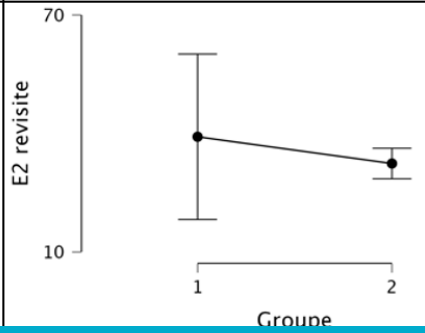
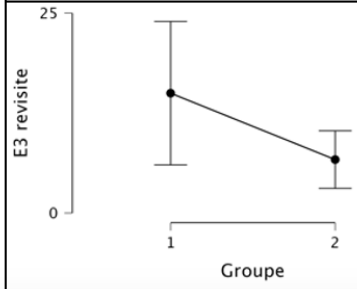
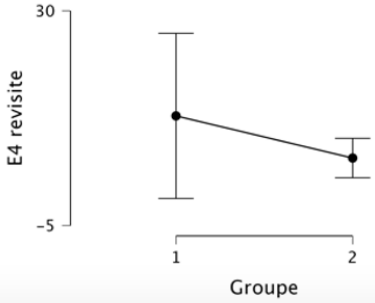
- **Significant difference** of target pupill
  - PT= focus on pupil E2
  - UST= focus on pupil E1 and E3



Results: observing

QR 2: visual strategies employed by UST and PT ?

- Fixation
- First view
- **Revisit**

Revisits in E1	Revisits in E2
T= 5.965	T= 1.2
p = <.001	p = 0.244
Df=20	Df=20
	
Revisits in E3	**Revisits in E4**
T= 2.395	T=1.735
p =0.027	p =0.098
Df=20	Df=20
	

Cohen's kappa values (mean):
PT = 0.807; UST = 0.806

Results: reflecting

RQ.3: Objects spontaneously formulated?

PT	Objective	Trainee Teacher	Pupil	Learning topic	Device for learning	Context	Other	Total
Description	0,7	1	21,3	0,68	26,5	4,7	0	54,88
Question	0	2,5	0,99	0	3,1	0,3	0	6,89
Evaluation	0	0	2	0	6,7	0,99	0	9,69
Interpretation	0	0	9,9	0	9,86	4,3	0	24,06
Prediction	0	0	0	1	3,1	0,4	0	4,5
Other	0	0	0	0	0	0	0	0
Total	0,7	3,5	34,19	1,68	49,26	10,69	0	100

UST	Objective	Trainee Teacher	Pupil	Learning topic	Device for learning	Context	Other	Total
Description	3,11	21,5	25,1	0,3	4,28	6,23	0	60,52
Question	0	1,36	0,76	0,5	1,56	1,17	0	5,35
Evaluation	1,56	9,92	3,11	0,5	6,23	6,81	0	28,13
Interpretation	0,19	0,76	1,17	0	2,72	0,58	0	5,42
Prediction	0	0	0	0	0	0,58	0	0,58
Other	0	0	0	0	0	0	0	0
Total	4,86	33,54	30,14	1,3	14,79	15,37	0	100

Percentages by group of participants. One table = 100%.

Results: reflecting

RQ.4. Type of reasoning process formulated?

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Interpretation	0	0	9,9	0	9,86	4,3	0	24,06
Prediction	0	0	0	1	3,1	0,4	0	4,5
Other	0	0	0	0	0	0	0	0
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Percentages by group of participants. One table = 100%.

Conclusions

QR	Hypothesis	Answer
RQ. 1: individual	PT: less individual in the video UST: more individual in the video	No
	PT: focused on the participatory pupils UST: Focus on off-task pupils	Yes

PT vs UST

- Difficulties in concentrating on less relevant elements (= Keskin et al. 2024) vs UST
- Difficulties in identifying critical incidents in the classroom (= van den Bogert et al., 2014; Wolff et al., 2016; Yamamoto & Imai-Matsumura, 2013) vs UST
- Centred on the participative pupil (= Shinoda et al. 2021) vs UST

Conclusions

QR	Hypothesis	Answer
RQ.2. Visual strategy	Difference between PT and UST in fixations, first views and revisits	Only revisits (significant)

- UST : immediate strategies (= Wolff et al., 2016; Stürmer et al., 2017; Kosel et al., 2023; Yamamoto & Imai-Matsumura, 2013)
  -> revisit -> glance

- No more even appearance (fixation) between PT and UST (≠ Keskin et al. 2024)

Conclusions

QR	Hypothesis	Answer
QR.3. Verbalised objects	PT= Pupil and system UST: Teacher	Yes (motivation of the pupils, involvement of the pupils in the required tasks) Yes+ pupil

- UST made **17 times more** comments about trainee teacher on screen than PT

!! Fixation on trainee teacher !!

  - PT = 33, 9%
  - UST= 39%

- Discrepancy between what PT see on the screen and what they were thinking about at the same time?
- USTs can describe what the trainee is doing while looking at something other than herself on the screen ? For example, they could consider how she distributes the word by observing the pupils?

Conclusions

QR	Hypothesis	Answer
QR.4. Process	PT: description and interpretation UST: evaluation and interpretation	yes No-> description and evaluation

- PT
- Evaluation with few nuances: OK / KO
- Interpreting based on very few theoretical elements: « pupil seem motivated » (= Derobertmasure, 2012)
- UST
- evaluate and propose alternative
- Main functions of UST: observe and evaluate through feedback (= Cohen et al. 2013)

-> VP's PT and their UST: different results and some similarities

-> VP's trainer is close to the 'expert VP' described in the litterature

Limits and perspectives

- AOI: size, duration of evenement
- View B data : some differences with view A when PT and UST discover the video
  - E2 percentage of fixations is 4 times higher in view B than A by both PT and UST
  - E1: ignored by PT and UST in view A, then fixated in view B
- Specificity of certain UST
  - UST_1: 17 times more interpretative statements than other UST.
  - UST_6: Eye movement more dynamic than the others, with more eye exits.

- During the placement period, the PST observe the trainee teacher i classroom.

-> replicate this study for the training supervisors.

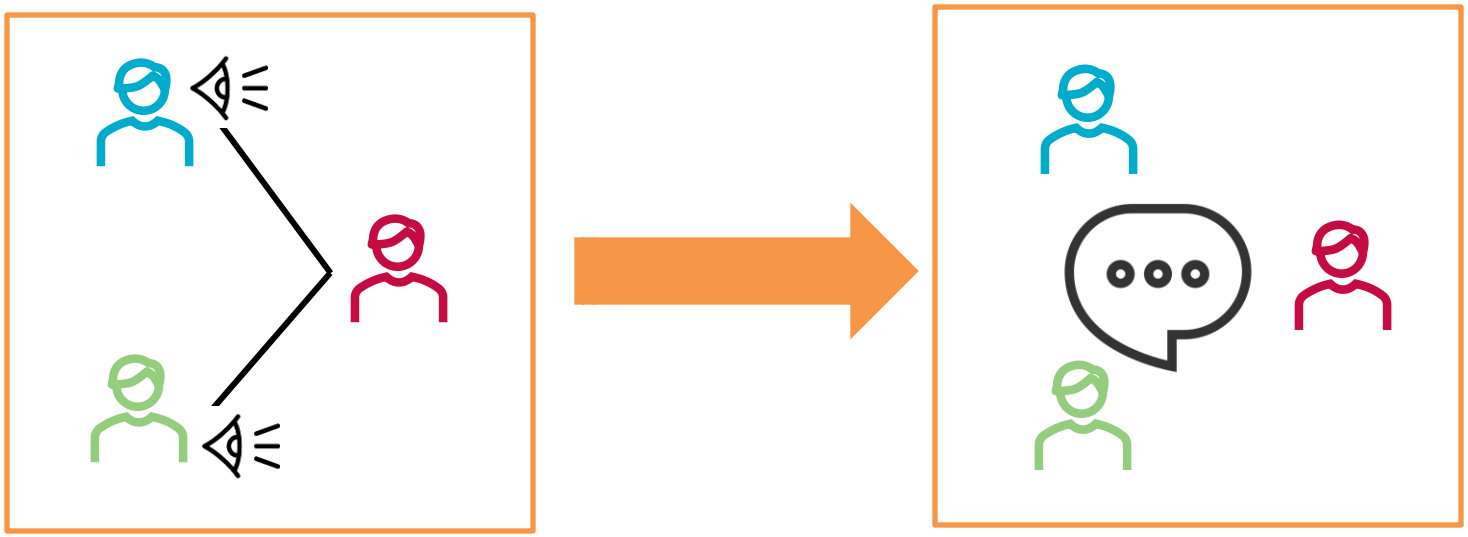
-> They should also wear ET glasses (UST and training supervisor)

Limits and perspectives

- During the placement period, the PST observe the trainee teacher in the classroom.

-> replicate this study for the training supervisors.

-> UST and training supervisor should also wear eyetracking glasses



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Thank you !

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