Sound check

Present-day Practicals webinar series ’25/’26

PRESENT-DAY PRACTICALS

Welcome to webinar 2:

“Extended reality in lab education”

Dr Lars de Vreugd
UMC Utrecht

Dr Karolien Van den Bergh
UCLL, Leuven

We’ve all heard that “practice makes perfect”. But what if you could practice in a completely new way? Imagine being able to master complex lab techniques, explore instruments, and make mistakes safely, all in a virtual space. Could eXtended Reality (XR) be the next step in making lab education more immersive and effective?

We encourage you to **turn on your camera** to help create a more personal and interactive atmosphere.

This webinar will **not be recorded** to help create an open, interactive atmosphere where everyone feels comfortable to share ideas and ask questions. Instead, we’ll share a **recap** afterwards

PRESENT-DAY PRACTICALS

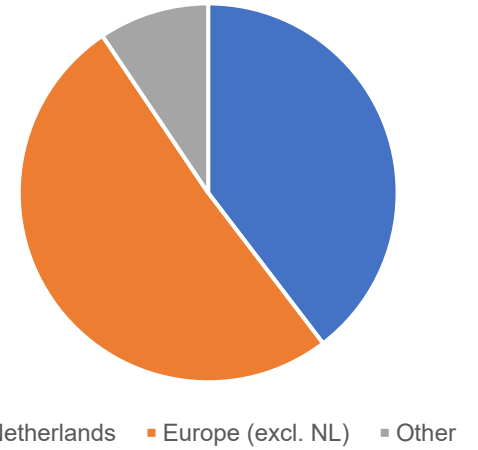
Who are we?

Who are you?

16 different countries:

- Aruba
- Belgium
- Germany
- Greece
- Israel
- Jordan
- Latvia
- Norway
- Slovakia
- Slovenia
- South Africa
- Sweden
- Switzerland
- The Netherlands
- United Kingdom
- United States of America

Regional distribution webinar 2



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We encourage you to **turn on your camera** to help create a more personal and interactive atmosphere.

Use the **chat** to post your questions and share your ideas

After the webinar, we'll share a **recap** containing slides, lessons learned, and additional information and resources

PRESENT-DAY PRACTICALS

Webinar 2:

“Extended reality in lab education”

Dr Lars de Vreugd
UMC Utrecht

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We’ve all heard that “practice makes perfect”. But what if you could practice in a completely new way? Imagine being able to master complex lab techniques, explore instruments, and make mistakes safely, all in a virtual space. Could eXtended Reality (XR) be the next step in making lab education more immersive and effective?

eXtended Reality for learning

Present day practicals meeting

dr. Lars de Vreugd

UMC Utrecht

This session…

1. eXtend Reality Overview
2. XR @ UMCU & UCLL Leuven
3. Discussing XR (breakout rooms)
4. XR research
5. Rounding off

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1. What is XR?

XR (eXtended Reality) is an umbrella term, which includes:

Mixed Reality (MR)

Augmented Reality (AR)

Virtual Reality (VR)

Real world ← - - - - - - - - → **Virtual world**

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1. An XR theoretical model

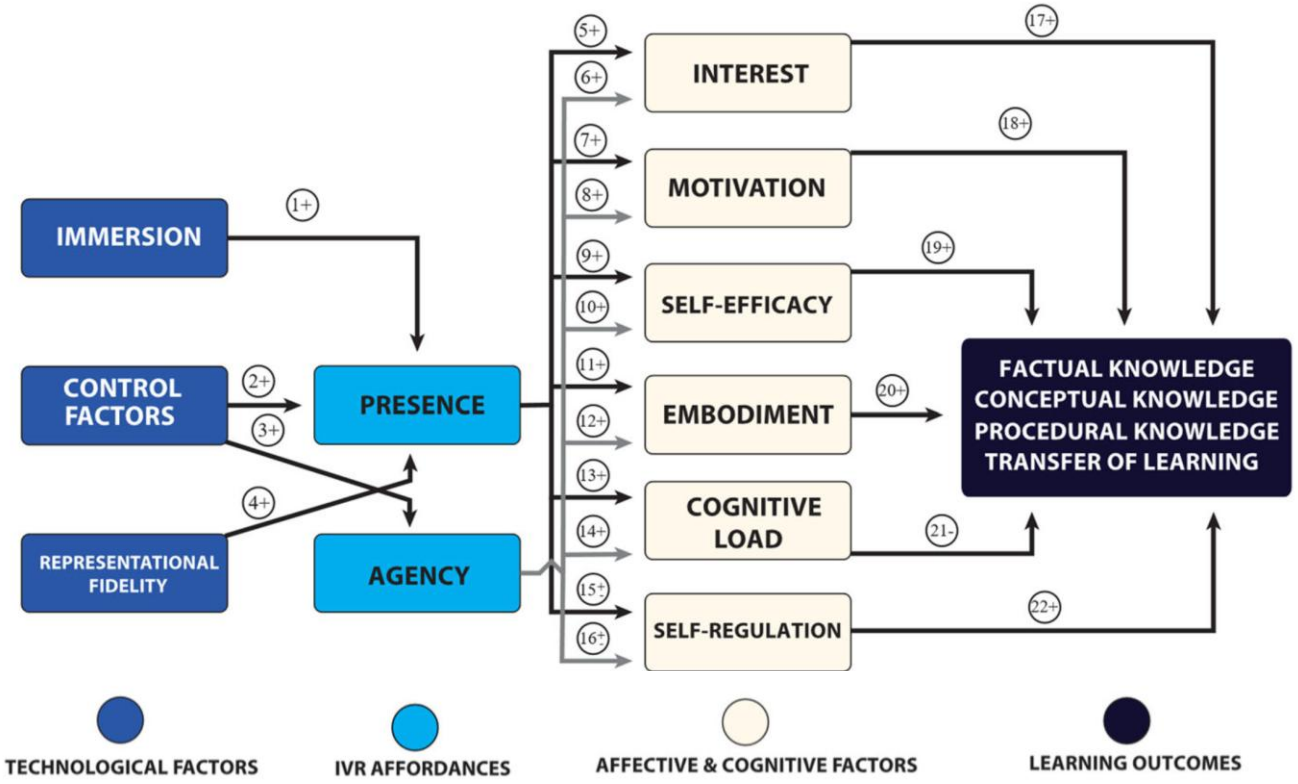
XR has specific characteristics compared to, e.g., e-learning[1]:

Immersion: Vividness of the system
Interactivity: The interaction the system allows
Presence: The feeling of 'being there'

eXtended Reality (XR) … to make learning **simpler**,

more **easily scalable**, more **cost-efficient**, and more **effective**[2]

These characteristics can't be fully described,
but should be experienced!



Cognitive Affective Model of Immersive Learning (CAMIL)

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1. Ryan, M.-L. (2015). 2, Narrative as virtual reality 2: Revisiting immersion and interactivity in literature and electronic media (Vol. 2). JHU Press.

2. Makransky, G., & Petersen, G. B. (2021). The cognitive affective model of immersive learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. Educational Psychology Review, 33(3), 937-958.

2. XR @ UMCU

Several VR-Simulations were pilotted in our education:

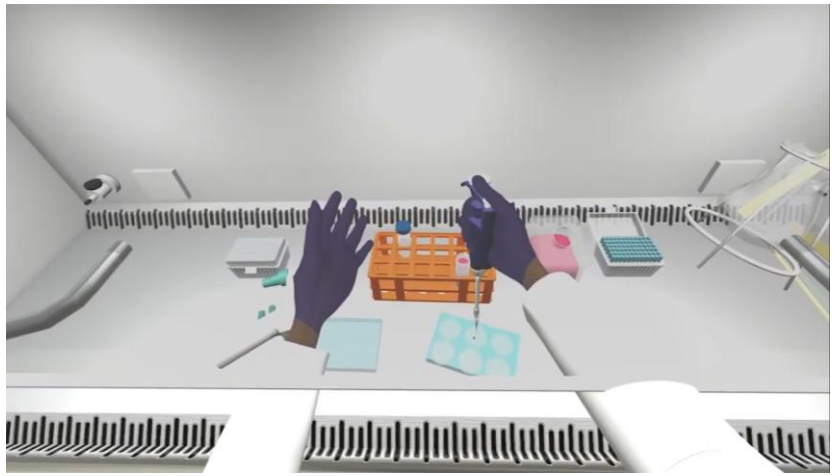
1. **VR-Sterile:** Learning how to work sterile with a Flowcabinet

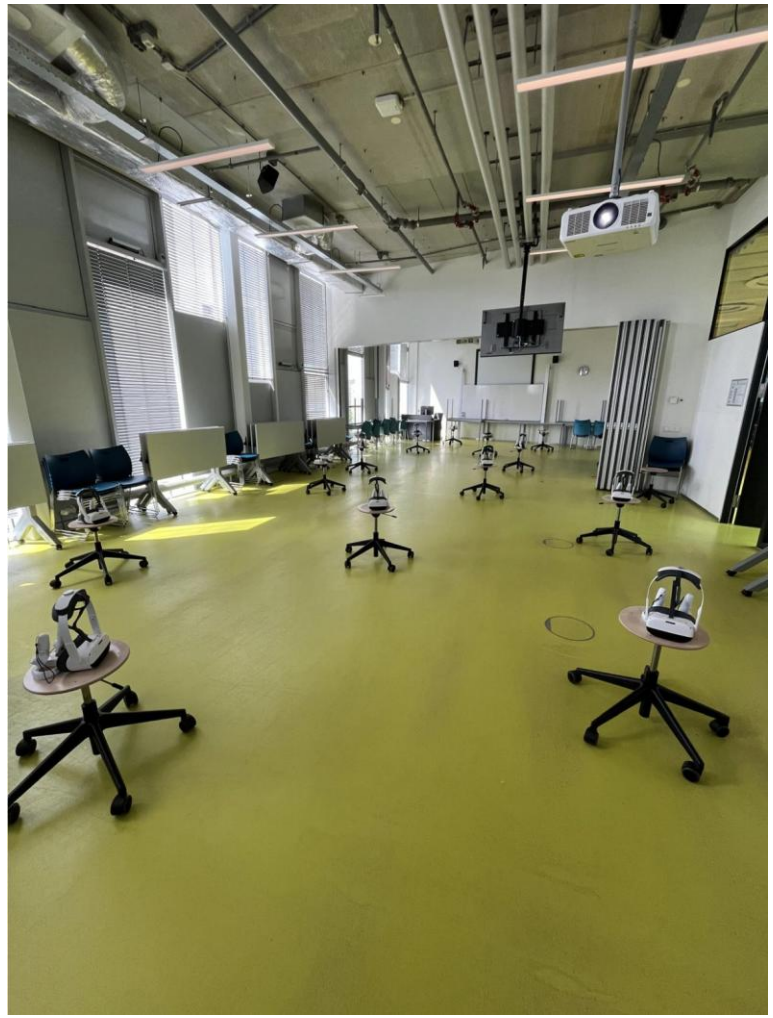
2. **OK-Ready:** learn how to prep an OR

3. **Internship in the Neigbourhood:** Getting to know a patient's perspective and recognizing signals during house calls (360° VR)

2. XR @ UMCU: VR-Sterile

Goal: Learn how to work sterile in a flow cabinet
Tasks: e.g. Preparing flow cabinet and materials, pipetting medium to wells plate
Integrated in two courses: “Tissues” and “Research Methods”
15 students practiced individually





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XR @ UCLL LEUVEN

1. VR-360° LAB TOUR CELL CULTURE LAB

2. VR-DIGILAB, TRAINING LAB SKILLS IN A VR CLINICAL LAB

Extended reality (XR) in lab education

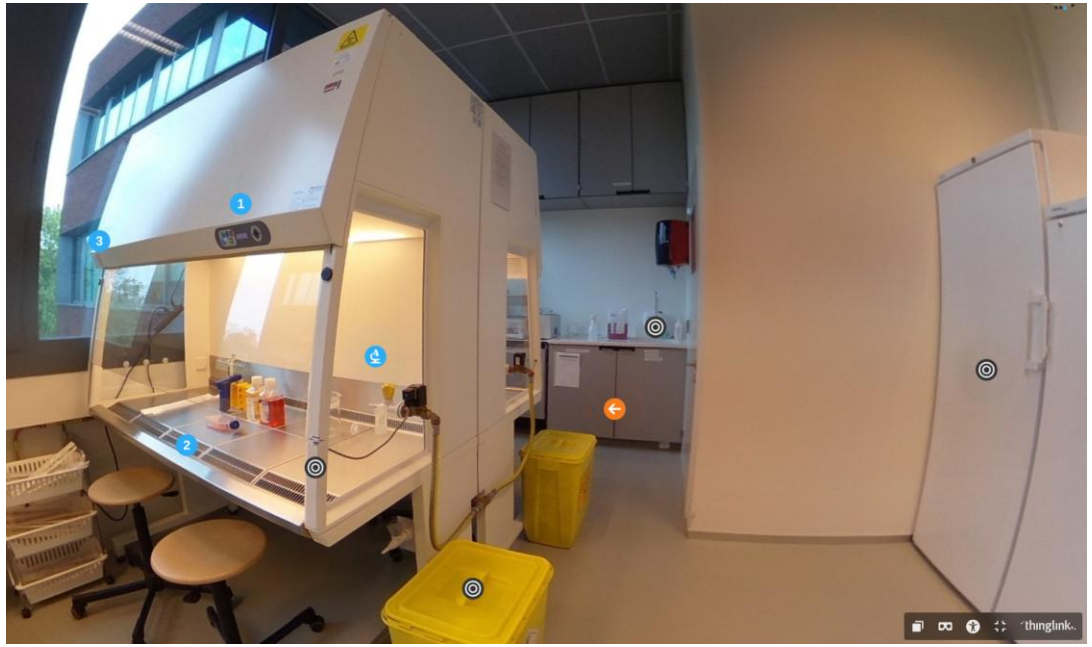
Karolien Van den Bergh, Leuven, Belgium

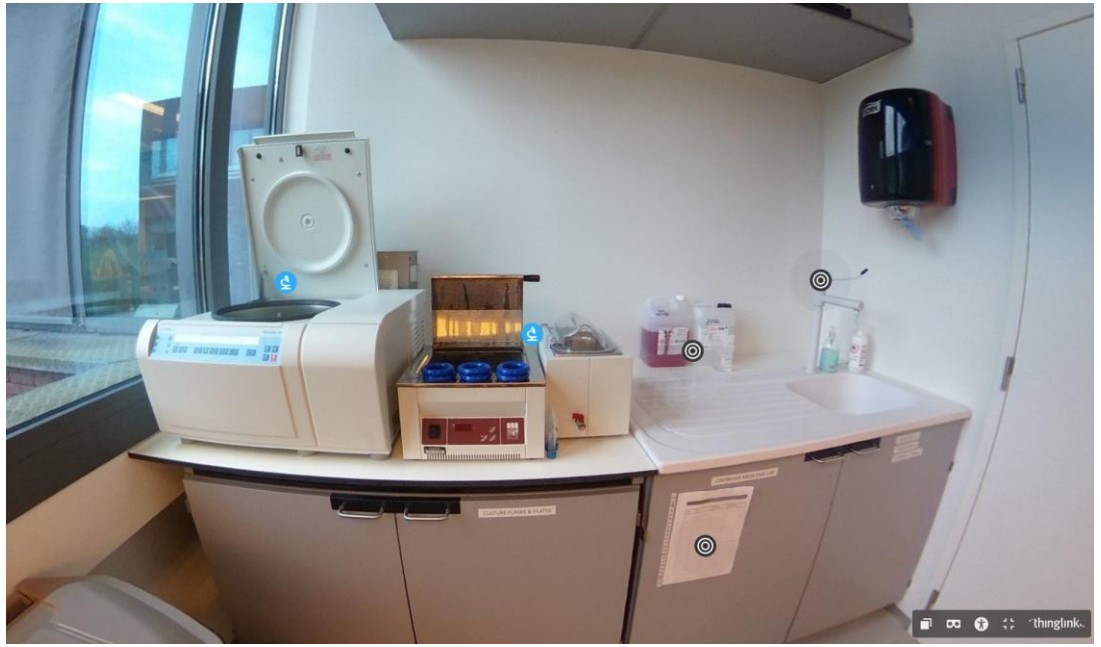
November 20th 2025

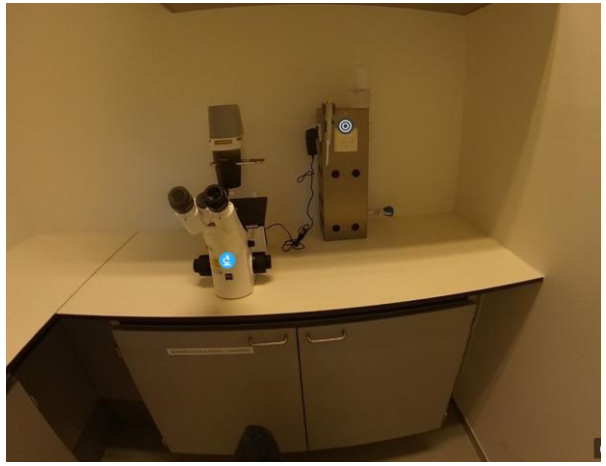
XPLAB

XR in lab education

VR-360° LAB TOUR CELL CULTURE LAB (BSL-2)







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XR in lab education

VR-DIGILAB, TRAINING LAB SKILLS IN A VR CLINICAL LAB

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XPLAB

XR in lab education

How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

- **Field survey** on cutting-edge technology lab automates
- Inspired by Roche Diagnostics
- **Modular diagnostic lab automate** was built in **Virtual Reality**:
  - sample supply unit
  - ion selective electrode unit (ISE-unit)
  - chemistry unit (C-unit)
  - immunoassay unit (E-unit)

→ **VR-Digilab** designed using:
  - Blender (3D modeling)
  - Unity
  - xAPI (learning analytics)

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XR in lab education

How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

Scenario building ?

Based on:

- clinical lab visits, conversations with lab technicians and clinical biologists
- trainers from Roche Diagnostics
- instruction manual
- lecturer in clinical chemistry

Curriculum program ?

- 2nd year clinical chemistry course
- 3rd year, prior to internship

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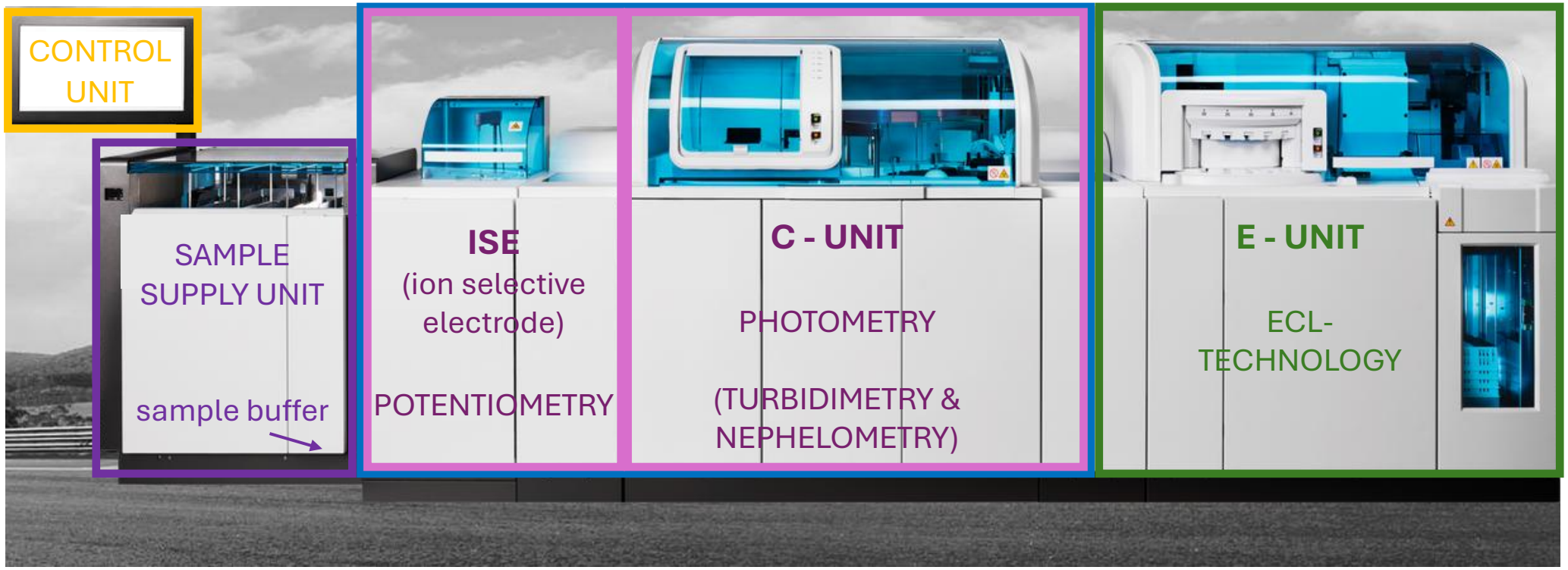
How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

Technical information (= refreshing course) ?

- included in VR-Digilab ?
- additional/prior to VR-Digilab ?



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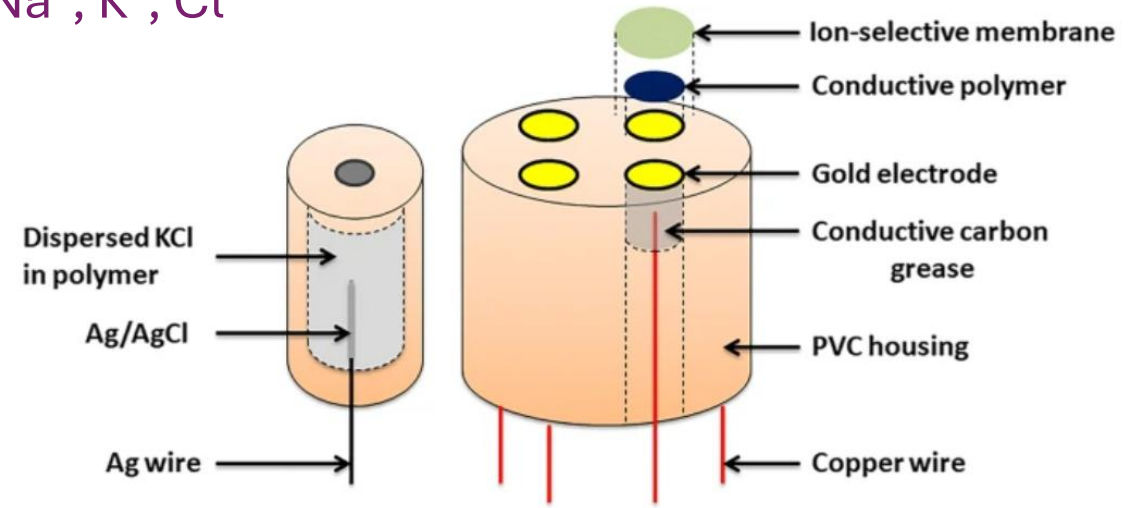
XR in lab education

ISE - POTENTIOMETRY : electrolytes Na^+, K^+, Cl^-



C

ISE
(ion selective electrode)

POTENTIOMETRY

2 liquid waste containers (backside)

sample buffer

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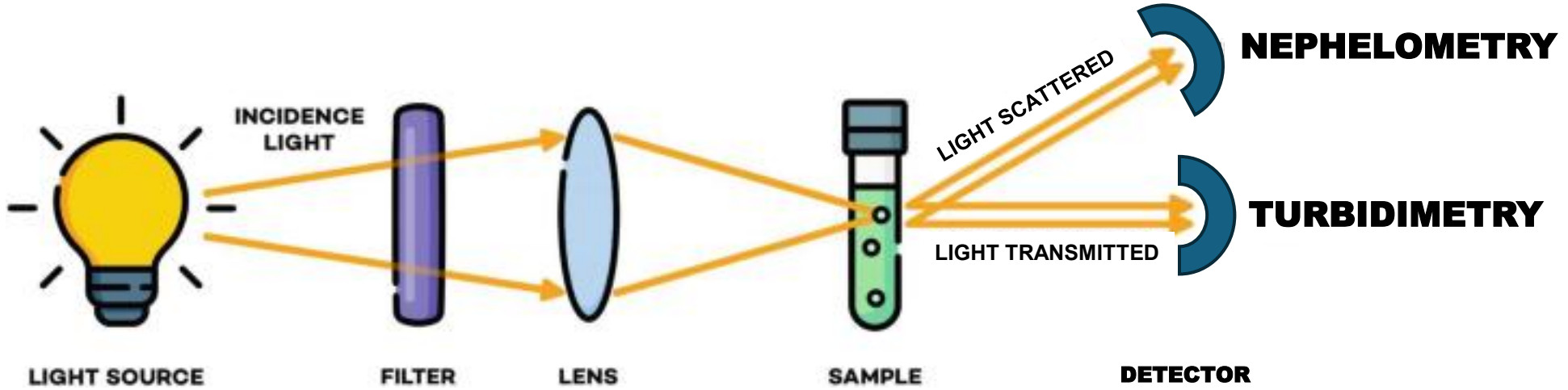
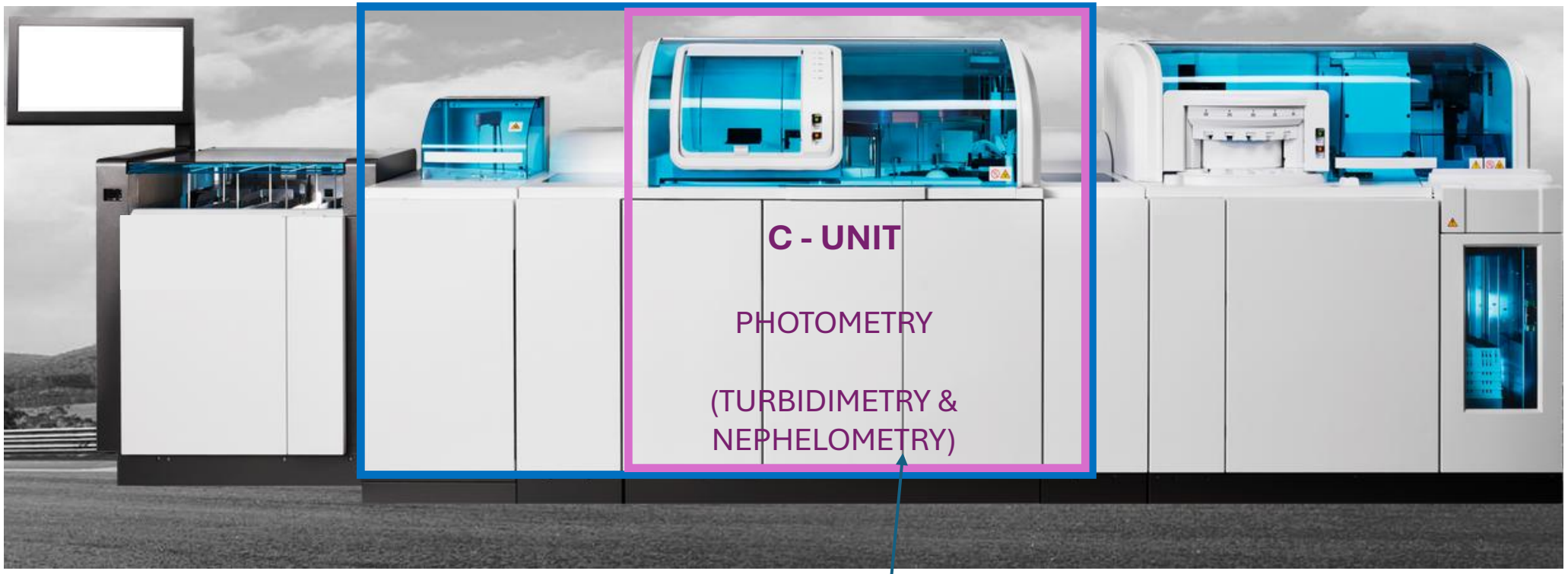
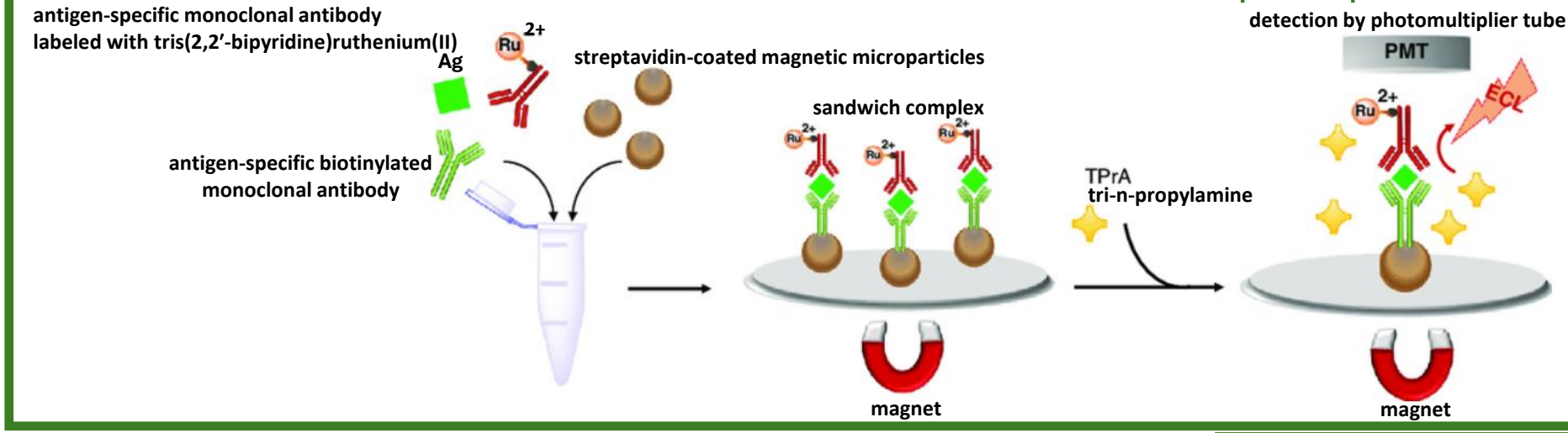
C - PHOTOMETRY : UV-VIS absorbance





XR in lab education

E - ELECTROCHEMILUMINESCENCE TECHNOLOGY : sandwich principle



E - UNIT

ECL-TECHNOLOGY

Cardiac markers
Tumor markers
Hormones
Vitamins
Serology
TDM

sample buffer

pipet tips & waste

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XR in lab education

How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

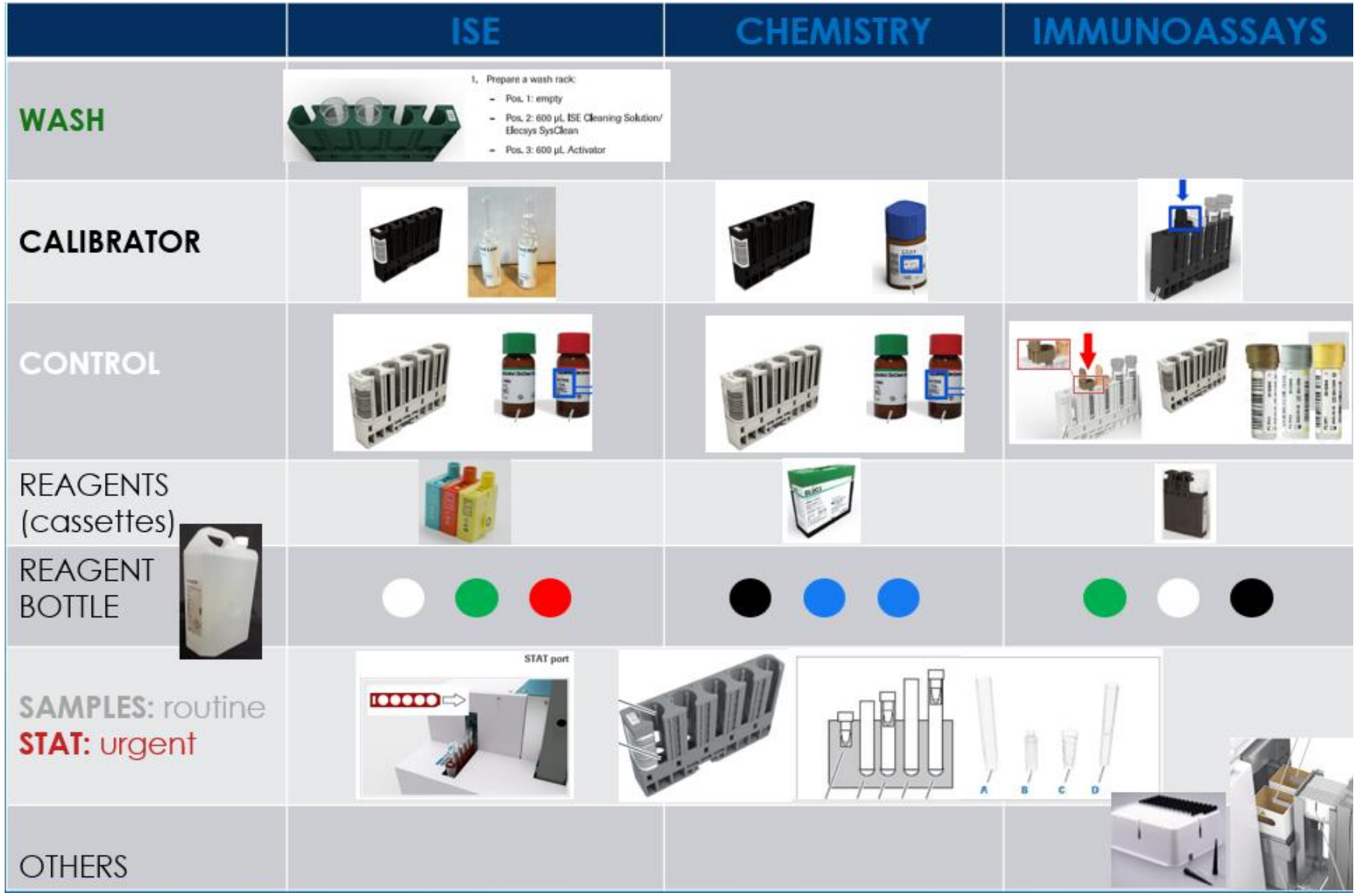
PRE-ROUTINE SETUP

Combination of theoretical knowledge & practical operations

ROUTINE

POST-ROUTINE

TROUBLESHOOTING



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Breakout rooms

Karolien and Lars have presented some examples, now you can think about XR for your education.

Some questions to discuss:

1. How can XR be implemented in your (lab) education?
2. Which learning processes can or cannot be supported using XR?
3. What challenges do you see for integrating XR in your institution?
4. What else is required to realise XR implementation in lab education?

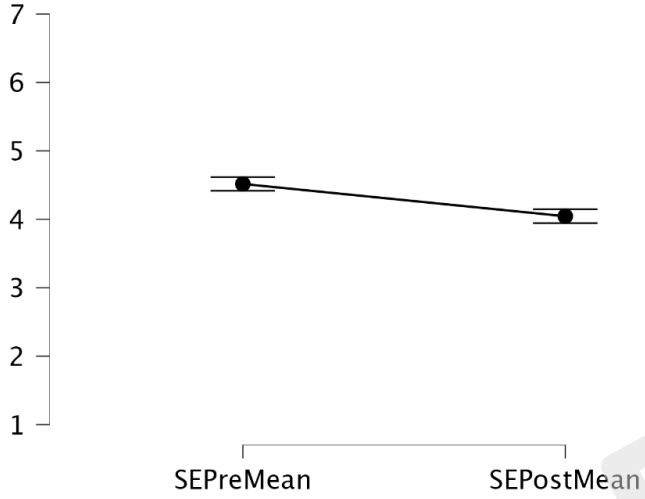
Feel free to discuss other pressing topics as well!

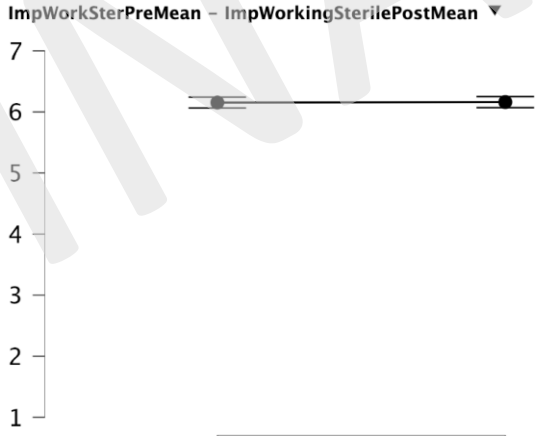
Reflections

What would you like to share?
What inspired you?
Any new questions?

3. Some preliminary results

VR-Sterile study (n=148) first filled out a pre-test survey, then used VR-Sterile, and finally filled out a post-test survey.
Variables of interest: Self-efficacy, Usability, Usefulness, Importance of working Sterile, Prior instructions, Prior experience, etc.





ΔSelf-Efficacy
M = -0.46, t=6.36 (146) p < .001, d = 0.52
(medium effect)

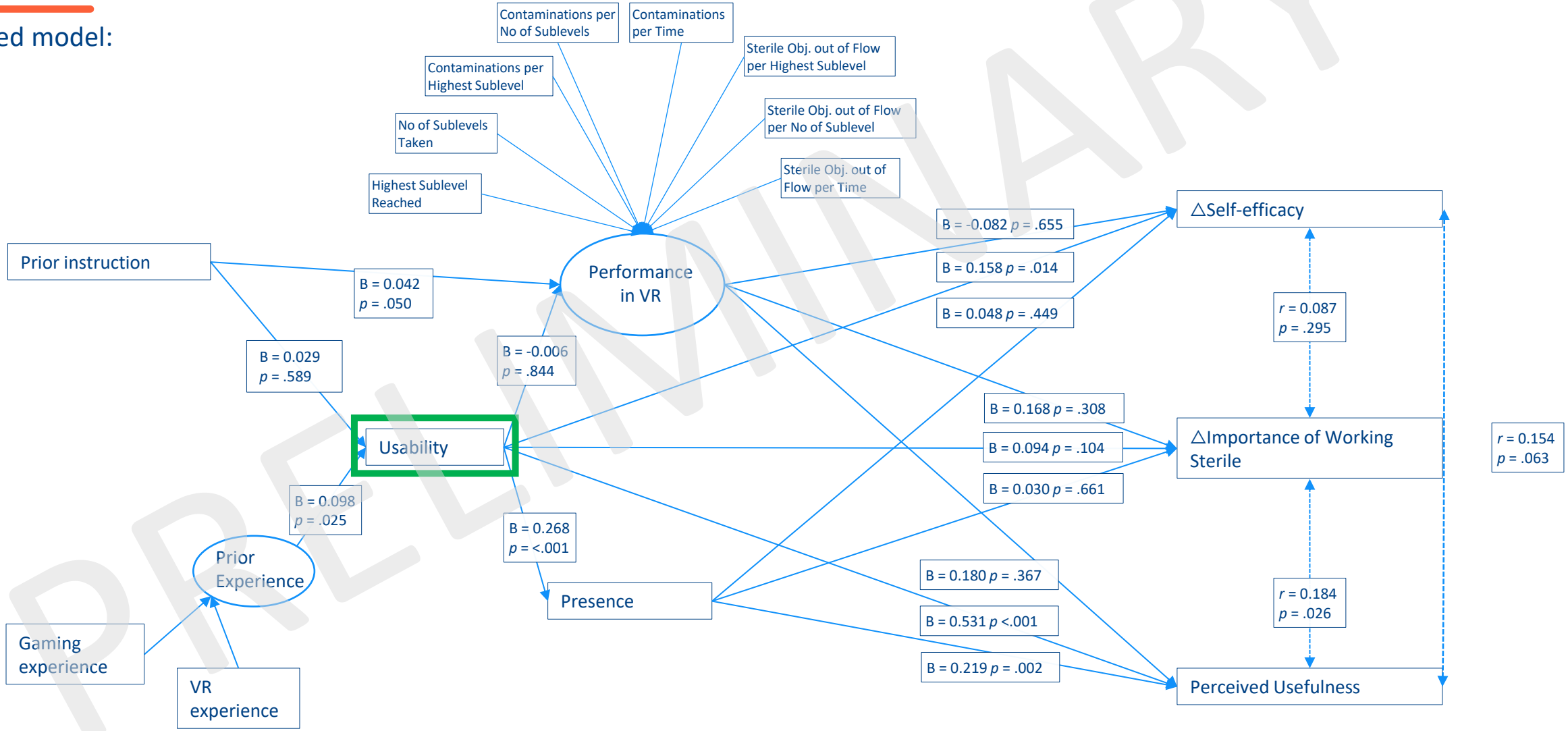
So, use of VR-Sterile helps calibrate students' Self-efficacy?
Do students overestimate themselves slightly?

Δ Importance of working Sterile:
M= 0.01 t = -0.087(146), p = 0.93, d = -0.007 (no effect)

So, use of VR-Sterile does not affect students' sense of importance of working sterile?
(Which is perhaps not necessary?)

3. Some preliminary results

Hypothesized model:



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4. Ongoing XR research

1) VR-Sterile use: long term

   Self-efficacy? Importance? Usability? Usefulness? Presence? Prior experience?

2) OK-ready for learning with University of Twente:

   Structure and surface (dis)similarity? Cognitive load (extraneous, intrinsic, germane)?

1) Aggressive patients (hopefully):

   360 degree VR vs. Immersive VR: what elicits emotions more?

NRO
NATIONAAL REGIEORGAAN ONDERWIJSONDERZOEK

Unravelling Virtual Reality's Potential for Learning: Applying and Extending the Cognitive Affective Model of Immersive Learning – Heleen Pennings

Virtual Reality (VR) dompelt gebruikers onder in virtuele omgevingen om zo realistische leerervaringen aan te bieden. Dit project onderzoekt hoe het gevoel om écht deel te nemen in de VR-omgeving bijdraagt aan leren. Daarnaast onderzoekt Pennings in hoeverre het uitmaakt dat VR-simulaties niet exact aansluit op de praktijk. In het derde deel van haar onderzoek kijkt ze hoe het steeds opnieuw inzetten van VR bijdraagt aan leren.

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Heleen Pennings,
Lars de Vreugd,
Fiona Slond,
Danza Onvlee,
Anne-Petra Rozendal,
Mieke Gerritsen,
Marlies Ludikhuize

University of Twente
Mohammedreza Farrokhnia,
Caiwei Zhu
Frank Halfwerk,
Marleen Groenier,
Ilona Friso-van den Bos

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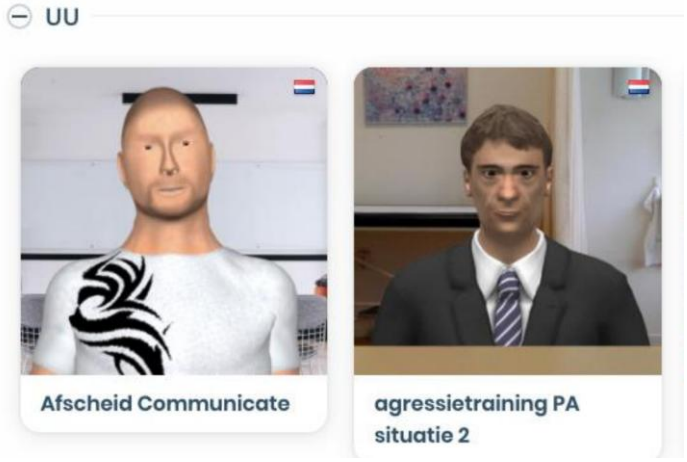


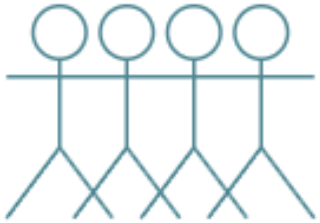
Retrieved from:
https://teaching-and-learning-collection.sites.uu.nl/nl/tool/dialoguetrainer/

Retrieved from:
https://www.zorgwelzijn.nl/geweldplegers-slaan-niet-zelden-ook-thuis-hun-vrouw-of-kind/

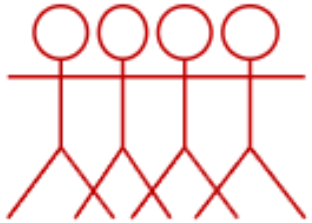
XR in lab education

VR-Digilab, training lab skills in a VR clinical lab

How to train students best?



Group 1: no intro
(n = 4)



Group 2: intro
(n = 4)

Instructions on VR headset and controllers

1. Play-In (black- & white-board with information)
2. Demo video
3. Refreshing course (pre-routine, daily routine, post-routine actions)

Instructions on VR headset and controllers

1. Refreshing course (pre-routine, daily routine, post-routine actions)
2. Play-In (black- & white-board with information)
3. Demo video

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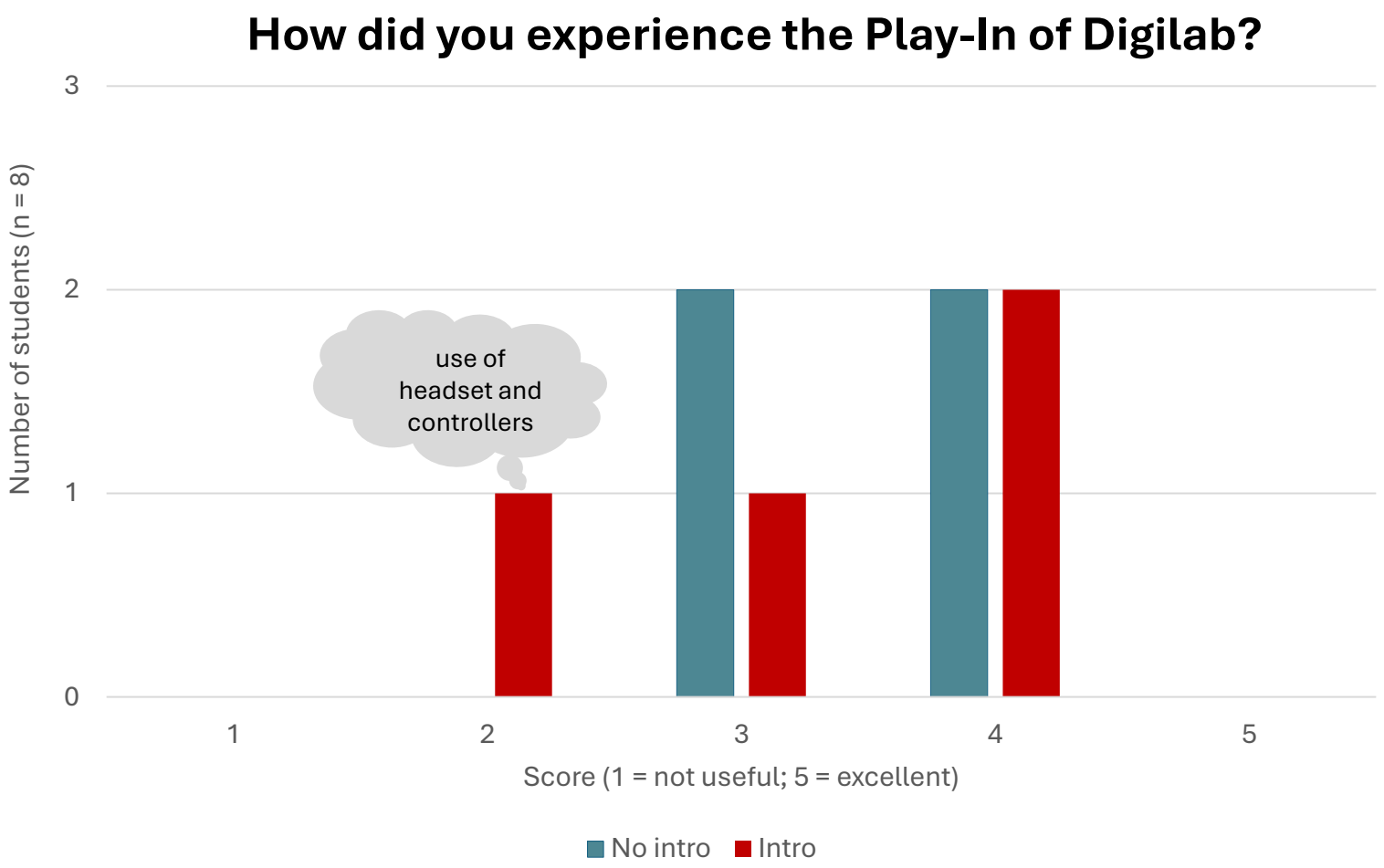
XR in lab education

How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?



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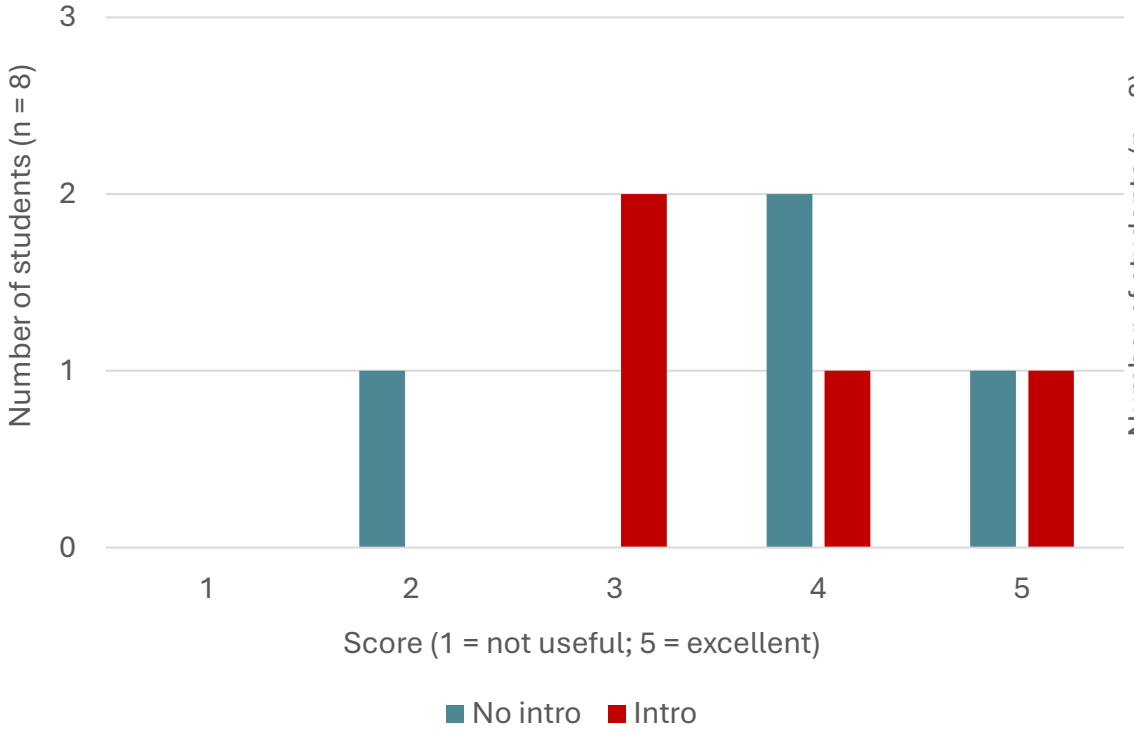
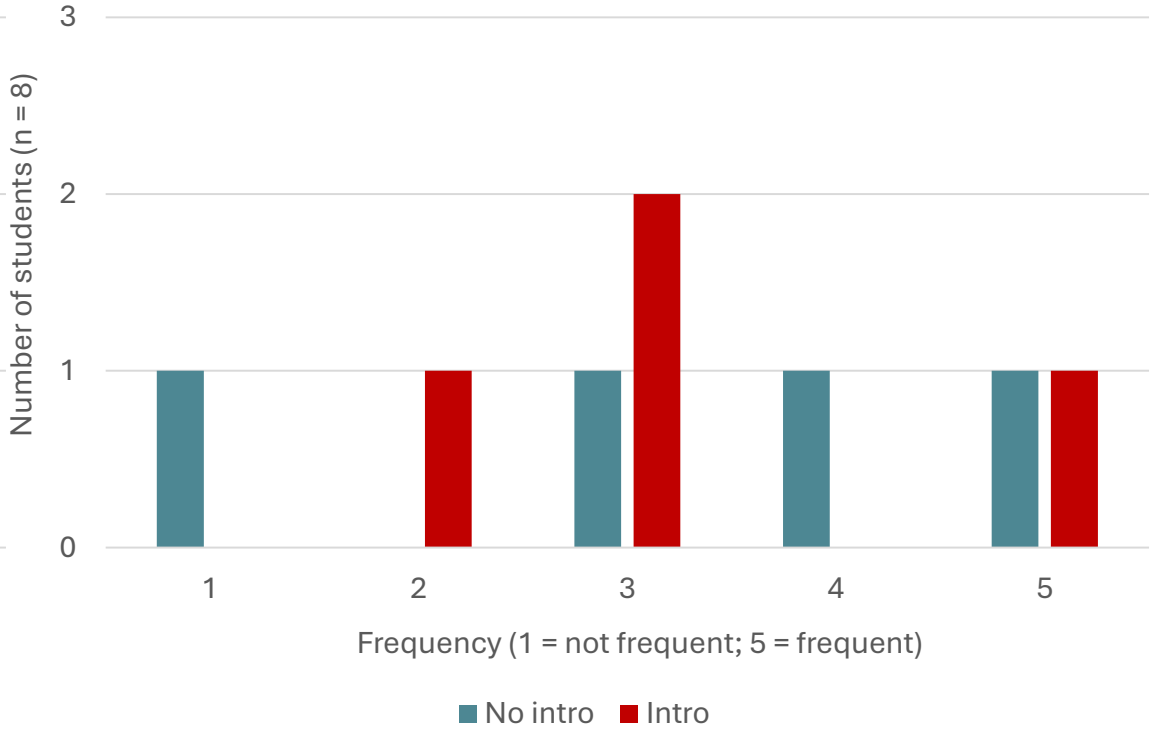
How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

Is the presence of the informative black- & whiteboards within Digilab useful?



How frequent did you use the informative boards?



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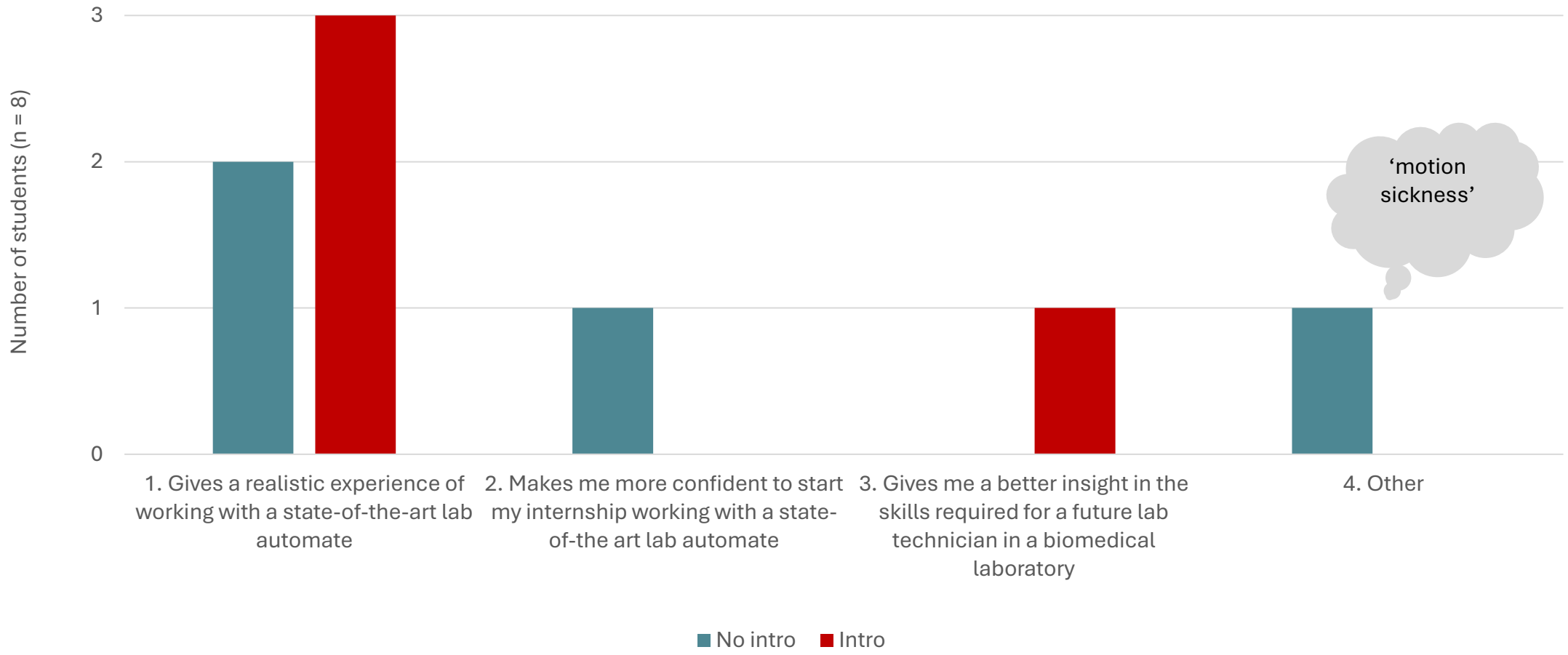
How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

What is your opinion after the Play-In of Digilab?



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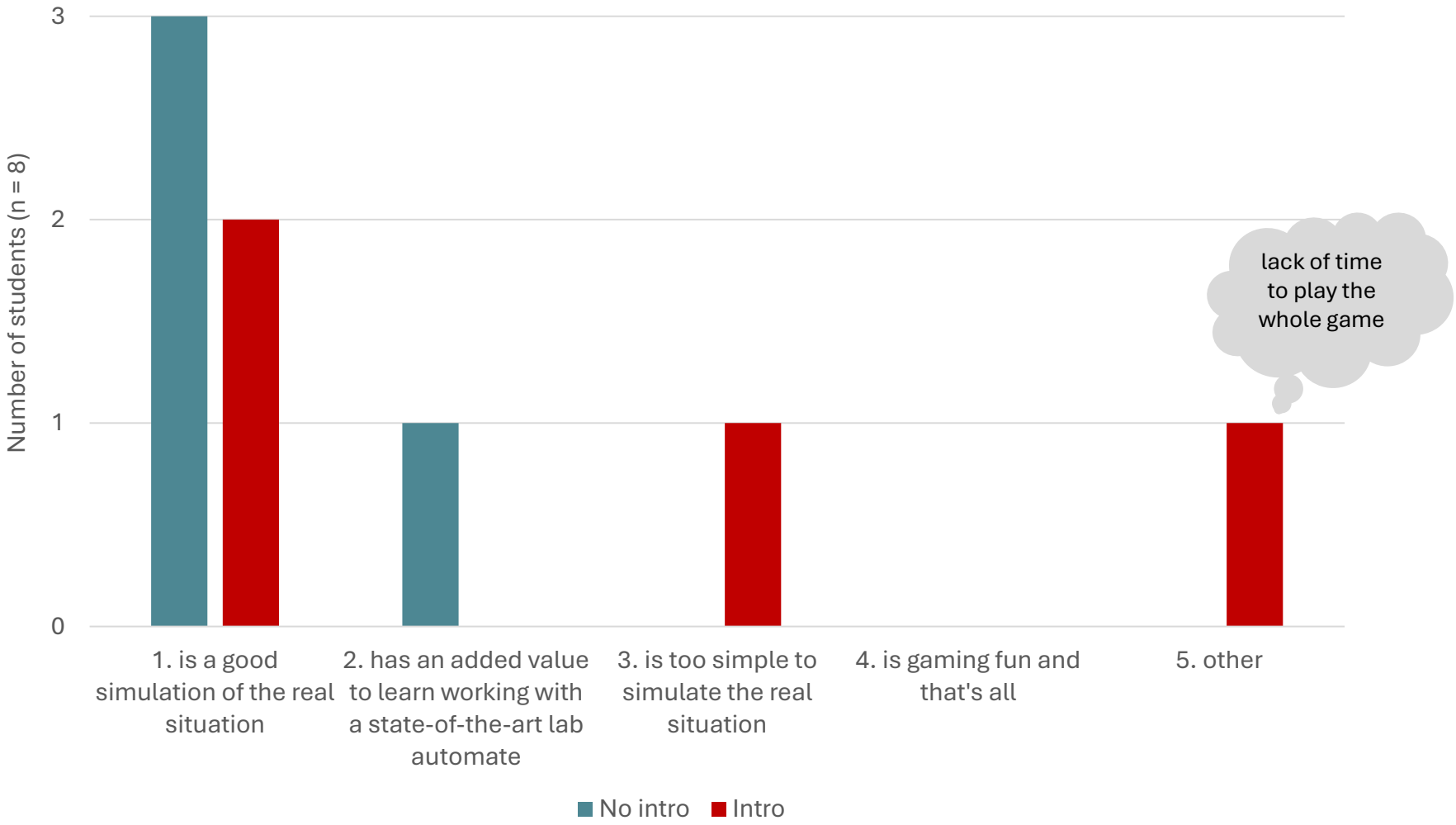
XR in lab education

How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

The immersive experience with virtual reality Digilab is



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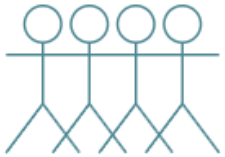
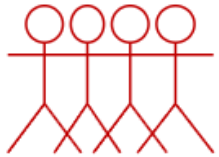
XR in lab education

How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

Conclusion on best VR learning experience ?



Group 1: no intro
(n = 4)



Group 2: intro
(n = 4)

Group 1: no intro	Group 2: intro
Play-In with Digilab without explanation is **difficult**	**Less need** of instructive boards within game after refreshing course
Tutorial/training on how to use headset and controllers (→ 'usability') More **instructions** (= refreshing course) on how to operate the lab automate will facilitate the Play-In	**Tutorial/training** on how to use headset and controllers (→ 'usability')
Casting for other students or demo video is helpful	**Casting** for other students or demo video is helpful
Motion sickness as Play-In takes longer	Difficulties using **headset and controllers** stalls the Play-In (student could not finalise Digilab)

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XR in lab education

How to prepare students in Medical Laboratory Technology for an internship in a clinical laboratory equipped with high tech lab automates?

Conclusion on best VR learning experience ?

VR-Digilab:

- is **interactive** and **interactable** game-based learning
- integrates **practical skills** and **theoretical knowledge** (instructive boards), no fear of making mistakes (‘self-regulation’, ‘self-efficacy’)
- requires some experience with **VR headset** and **controllers**
  (→ instructions, tutorial, coach, … ‘cognitive load’)
- contains straightforward scenario’s but requires some **guidance** (refreshing course, coach, …), preferably **prior to** the Play-In and not only by the instructive boards within the game (delays the game → more motion sickness, … ‘usability’)
- gives a **realistic idea** how the lab automate works and how you have to **operate** the machine (‘interest’, ‘motivation’, ‘perceived usefulness’)
- is recommended to other students **prior to their internship** (≠ Play-Ins)

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5. Rounding off

Any questions?
Thoughts, ideas, inspiration for using VR in education?
Or, critique, doubts, challenges?

Thanks to

Lut Gielen
Dave Seré
Laura Campbell
Vincent Katsoulis
Reinoud Berkein

Heleen Pennings
Janine Geerling
Marlies Ludikhuize
Anne-Petra Rozendal
Danza Onvlee

Thank you for your participation!

PRESENT-DAY PRACTICALS

Link to evaluation

Upcoming webinars

Present-day Practicals webinar series ‘25/’26

1.	How do students truly learn in the lab?	Thu 06/11/’25
2.	Extended reality in lab education	Thu 20/11/’25
3.	Refocusing labs: from cookbook to open inquiry	Tue 02/12/’25
4.	Fostering sustainability in lab education	Tue 13/01/’26
5.	Artificial intelligence in lab education	Thu 29/01/’26
6.	TBA	Tue 17/02/’26

LabBuddy webinar: Enhancing lab education — Thu 19/03/’26

info@presentdaypracticals.nl

THANK YOU

for attending this webinar

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