

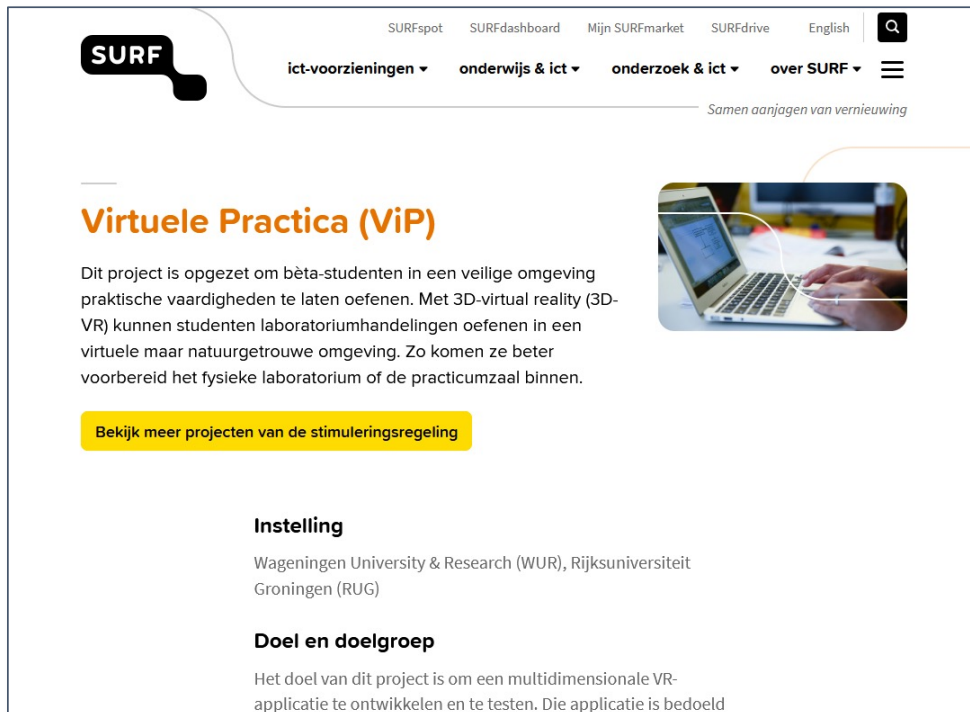
# Faculty-based design of Virtual Laboratory applications for Large-Scale Use

**Prof.dr. Harry Bitter** (WUR)

**Dr. Koos van der Kolk** (LabBuddy)



# Follow-up SURF project: Virtual Practicals



The screenshot shows the SURF website interface. At the top, there is a navigation bar with the SURF logo and links to SURFspot, SURFdashboard, Mijn SURFmarket, SURFdrive, and English. Below this is a menu with categories: ict-voorzieningen, onderwijs & ict, onderzoek & ict, and over SURF. The main content area features the title 'Virtuele Practica (ViP)' in orange. Below the title is a paragraph describing the project: 'Dit project is opgezet om bèta-studenten in een veilige omgeving praktische vaardigheden te laten oefenen. Met 3D-virtual reality (3D-VR) kunnen studenten laboratoriumhandelingen oefenen in een virtuele maar natuurgetrouwe omgeving. Zo komen ze beter voorbereid het fysieke laboratorium of de practicumzaal binnen.' To the right of the text is an image of a laptop with a VR headset connected to it. Below the text is a yellow button that says 'Bekijk meer projecten van de stimuleringsregeling'. Further down, under the heading 'Instelling', it lists 'Wageningen University & Research (WUR), Rijksuniversiteit Groningen (RUG)'. Under the heading 'Doel en doelgroep', it states: 'Het doel van dit project is om een multidimensionale VR-applicatie te ontwikkelen en te testen. Die applicatie is bedoeld'.

## Duration

2019-2021

## Partners



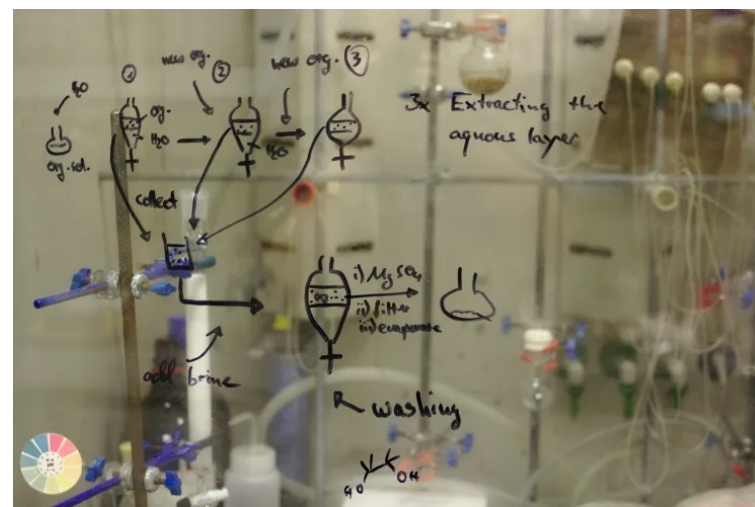
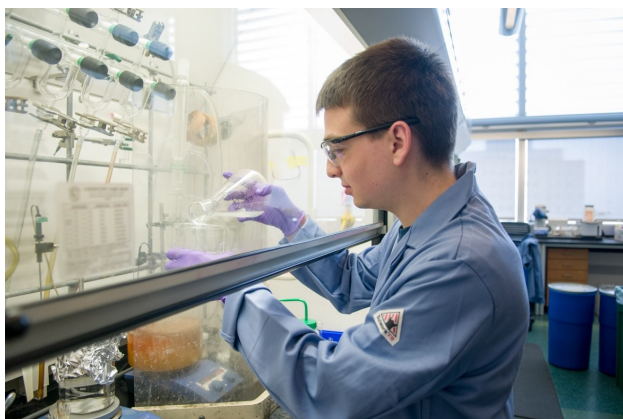
university of  
 groningen



<https://www.surf.nl/virtuele-practica-vip>



# Educational setting



# Teachers get many questions

A photograph of three students in a laboratory setting. A male student on the left, wearing a white lab coat and safety glasses, is holding a test tube with blue gloves. A male student in the center, wearing a black sweater over a white collared shirt, is looking intently at the test tube. A female student on the right, wearing safety glasses, is also looking at the test tube. Several speech bubbles are overlaid on the image, containing questions and statements from the students.

Is this the right flask?

Is this the right way to connect this clamp?

This does not work, why?

Oops!

I am a bit scared

How do I connect the water?

# Our question

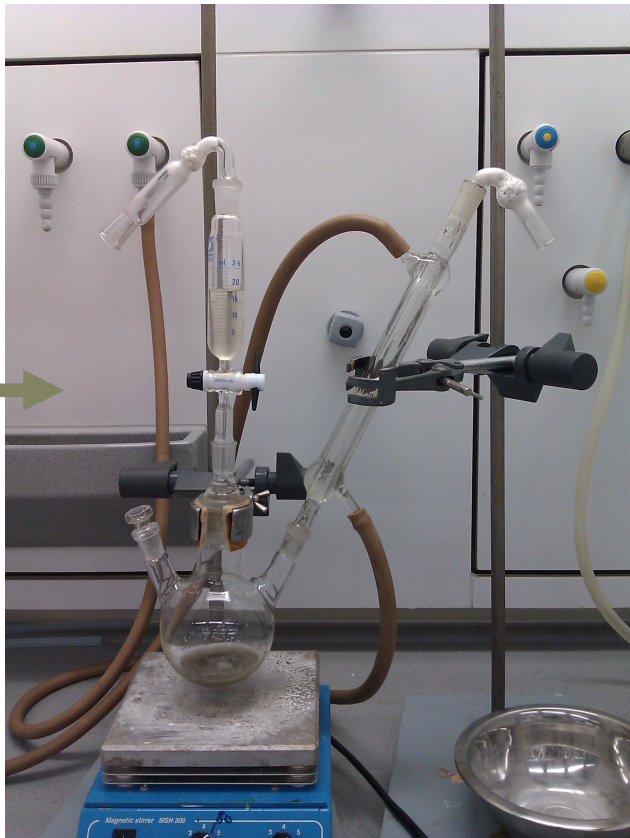
How can **virtual reality** contribute to the efficient teaching of **practical skills** in an **organic chemistry laboratory**?

**Big challenge:**  
Lower laboratory anxiety



# ViP in reality

Grignard  
experiment  
in  
fumehood



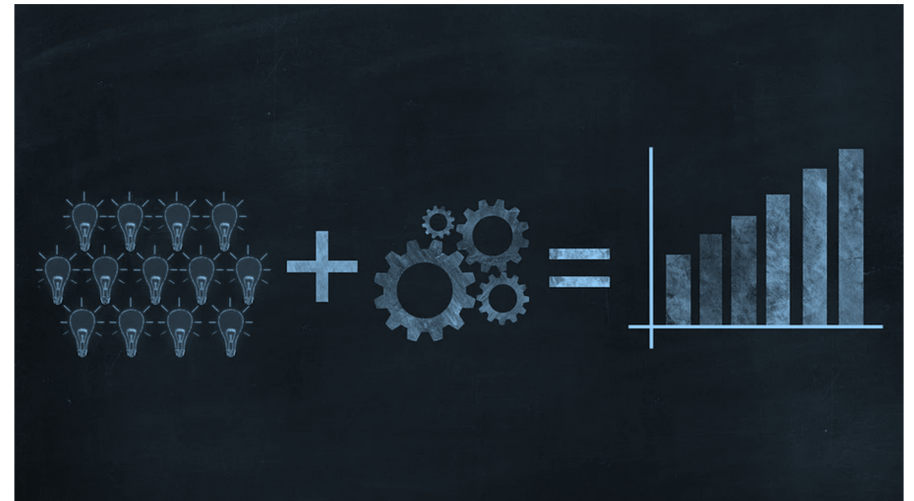
Professor  
creating  
experimental  
setup in VR





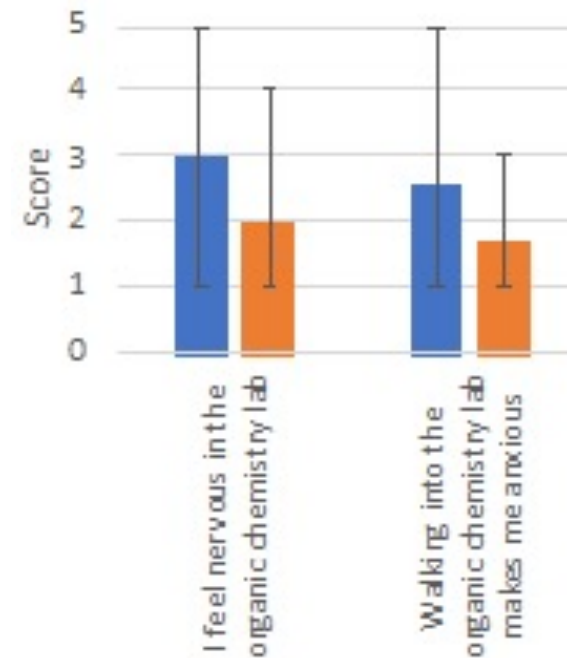
# Original questions/approach

1. Develop the app
2. Measure didactical impact
  - Students
  - Lecturers/Assistants
3. Measure managerial impact
  - Costs
  - Efficiency



# Main findings of the didcatial evaluation\*

1. Students and lectures appreciated the VR app
2. Anxiety seems to be significantly lower **after using the app**.



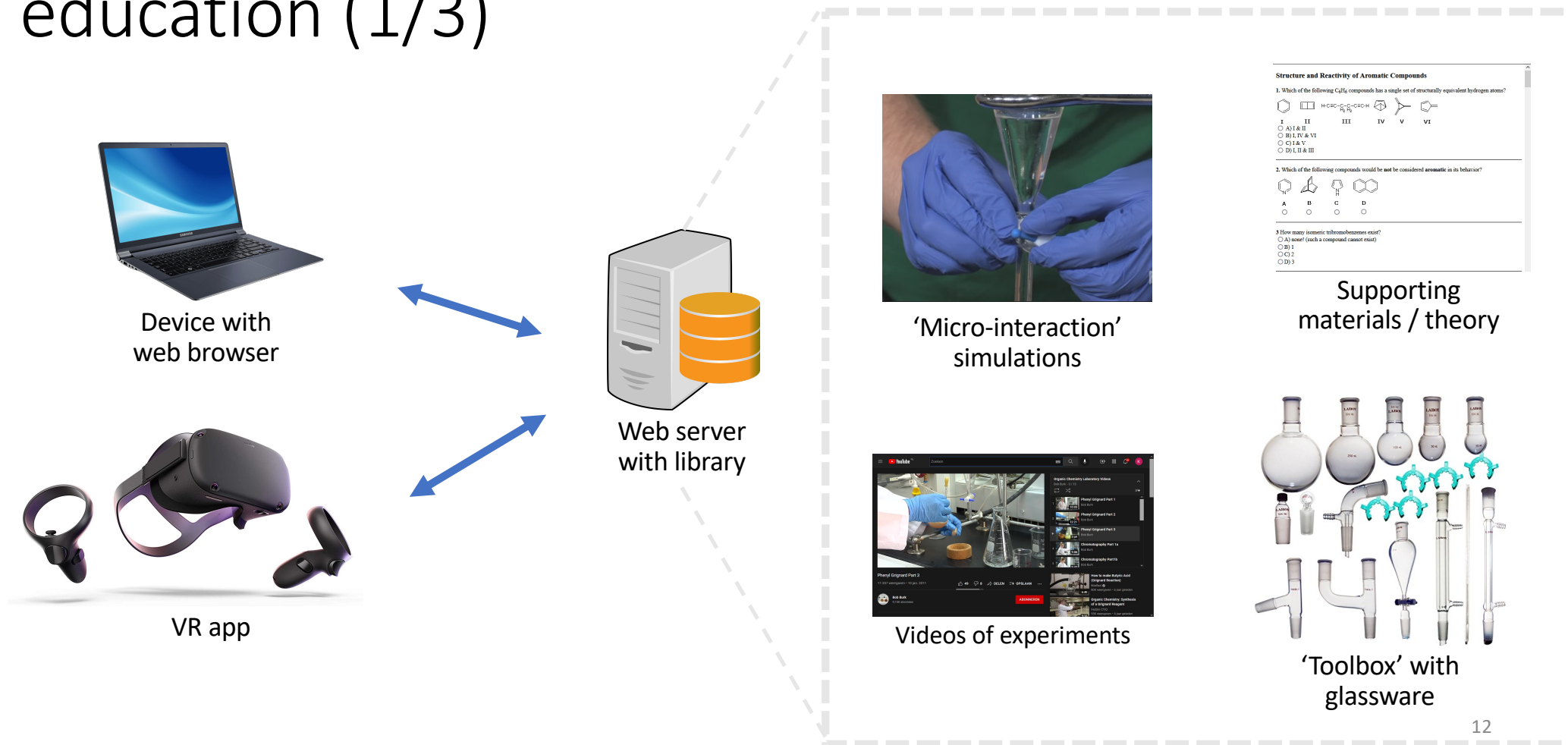
\*) Gungor et al, EURASIA J Math Sci and Tech Ed 2022, 18(3):em2090

# Main findings of the managerial evaluation

- Customization options in app is a must, as each lecturer wants something different.
- High development costs (175k€).
- VR technology is still in rapid development.



# Our take on a VR ecosystem for organic chemistry education (1/3)



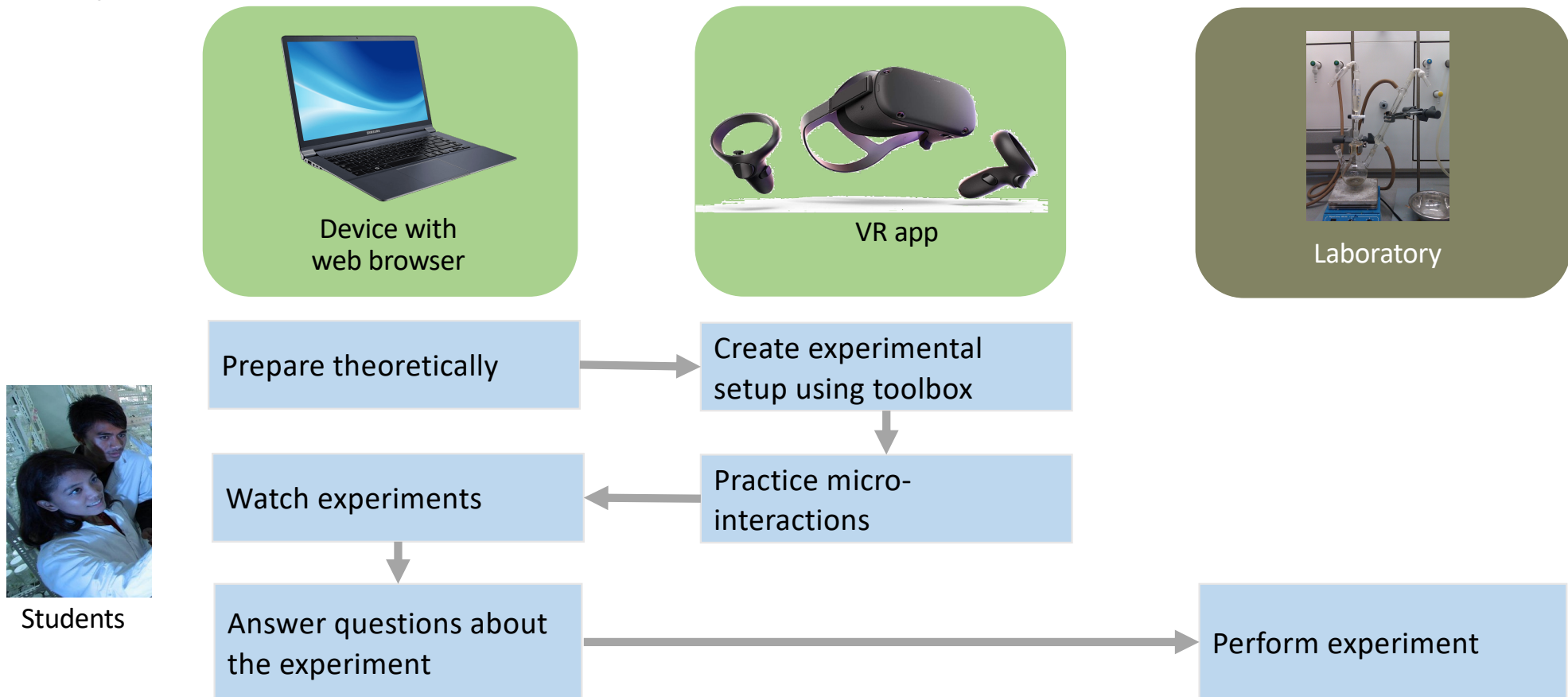
# Our take on a VR ecosystem for organic chemistry education (2/3)



Teachers



# How students could prepare for their laboratory experiment

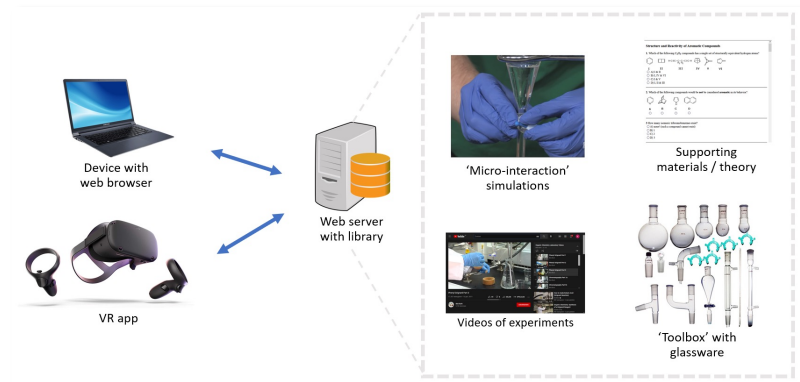


# Closing thoughts



1) We have a **working** prototype

technically      educationally



2) We have a vision for the future

# Closing thoughts



Prototype



Vision

- Stay up-to-date
- Management efficiency vs learning goals
- Licences/privacy (Facebook)
- Communication between IT, chemists & managers
- Costs high
- .....
- **How to make this sustainable?**

# Virtual reality in Practica

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