

# Feedback from Teaching and Learning with an Immersive Digital Twin of a Chemistry Lab

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## Context of the pedagogical project

**A one-year long learning project resulting from a collaborative effort between 12 teacher-researchers, 4 technical staff and 3 Instructional engineers at the Cnam, the Mimbus start-up and the Immersive learning Lab**



The real chemistry lab at the Cnam

### Objective:

To develop immersive and interactive virtual training courses to respond to the professional training needs of the Chemical, Pharmaceutical and Food industries

### Why use immersive technology for teaching?

- Heterogeneous level of learners
- Increasingly short time for practical labs
- Interest of Cnam teachers in educational innovations
- Strategic axes of Le Cnam institution



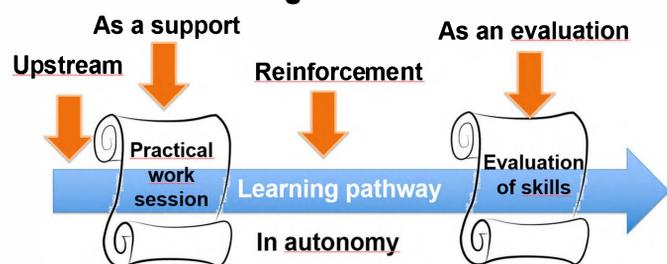
How to design an immersive Twin in VR, how to use it in Classroom



Cnam immersive Twin Chemistry Lab

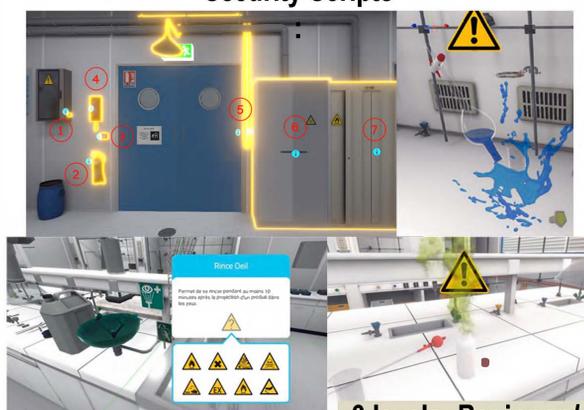
## Learning pathway and immersive modules

### Where to place an immersive module in an existing curriculum?



Initiation to learning professional gestures and mastering of equipments in complete safety and with lower cost.

### Security Scripts



3 levels: Beginner / Advanced / Expert

### laboratory Experiments



## Pedagogical Interactions and Skill Assessments



### Assessed SKILLS

- Protection,
- Observation
- Identification
- Categorization
- Autonomy



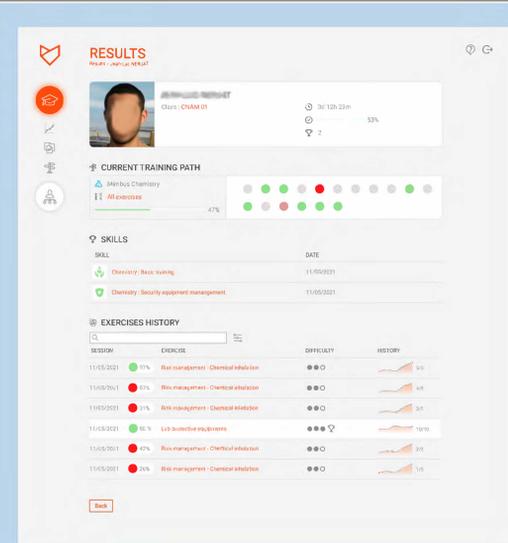
### Mimbus VULCAN: Competencies follow-up

- Track the performance of your students at a glance.
- Customize your training on all the virtual tools using Vulcan.
- Adjusting the pedagogical approach to adapt to new learning methods.
- Giving the trainers the necessary resources to free up time and be more efficient.

When a student is using a VR simulator, VULCAN analyzes key information related to their performance in real-time. It tracks precise manual competencies and provides a complete analysis of completed activities at an individual or class level.

Instructors can modify learning paths and exercises' parameters. VULCAN releases this information to the simulators, so that each student works on an appropriate activity. Exercises can be built using a scaffold approach by layering different skills and building up a student's competencies.

<https://www.mimbus.com/en/produit/vulcan-eng/>



Mimbus VULCAN:  
an opensource  
VR Analytics Platform



Mimbus Chemistry is available in French and English. Contact us.

## Conclusion and perspectives

- Over 2.5 hours of immersive chemistry learning content has been developed
- In 2022, 100 undergraduate students from 5 disciplines undertook the immersive trainings.
- New modules related to process engineering are planned for 2023.
- Studies on user feedback are underway in collaboration with Cnam Ergonomy Lab.

### Other Authors:

Pommet M., Miquelard Garnier G., Lagarde N., Le Stang L.-A., Khaoulani S., Horellou T., Hauquier F., Havet J.-L., Haustant C., Gomez C., Gervais M., Garcia R., Dewez S., Corsyn N., Chapet C., Caqueret V., Wiga W., Amara Z.



CAP'VR: Chimie Agro Pharma Virtual Reality, Le Cnam, 2020, 2022



Trophées franciliens de l'innovation numérique, 2020

The JENII project (JENII - ANR-21-DMES-0006), funded by the ANR (French National Research Agency) as part of the PIA4 call for DemoES projects, started on November 2nd and will run for 3 years.

