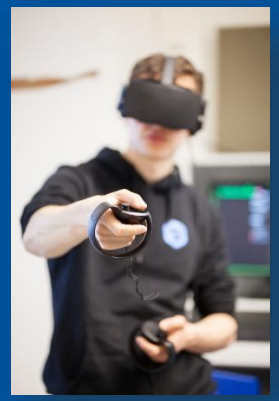

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Mobility System Cooperation in Higher Education

Ein Projekt der RWTH

Innovative VR-technology in teaching of mining engineering students

Presenter:
Nils Schlatter, M. Sc.

Persons involved in the project and its contents:
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Institute of Mineral Resources Engineering, RWTH Aachen University (Germany)

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Innovative VR-technology in teaching of mining engineering students

Content

- Our Institute, Our Vision
- Why VR in teaching?
- What is the VR-Mine?
- Scenario-based learning
- Difficulties in teaching with VR
- Evaluation of the VR-Mine experience
- What is planned for the future?

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Our institute, Our vision

Vision 2024: Digital Mine

- 360° mine
- Mine life cycle
- VR goggles, training simulators, educational videos
- Scenario-based learning



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Why VR in teaching?

- Outdated teaching methods
- Lack of 3D visualisation
- Lack of practical experience

Virtual Reality (VR) used to:

- Simulate closeness to reality
- Increase motivation for learning
- Enhance understanding through visualization
- Promote experimental learning
- Enhance process-orientated learning
  - e.g. equipment and safety training

"The transfer of knowledge and principles of professional practice in mining is enriched by using innovative, digital communication media."

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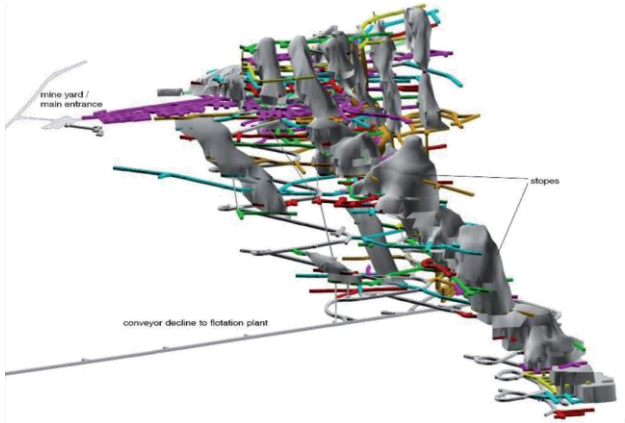
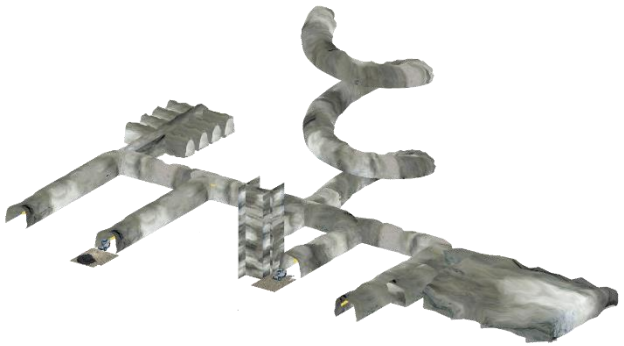
Innovative VR-technology in teaching of mining

What is the VR-Mine?

- **Virtual Mine Project**
  - Sponsored by EIT RawMaterials (2018 – 2020)
- **MyScore**
  - Sponsored by DAAD & BMBF (2019 – 2022)
- **Virtual underground mine**
  - Based on a real mine (Mittersill Mine, Austria)
  - Realised with Unity
  - Various scenarios (e.g. Mine Safety)
- **Aims**
  - Application of theoretically acquired knowledge
  - Preparation for later work
  - Learning in a safe environment



Underground model of real mine site (Raith and Schmidt, 2010)



VR-Mine underground model 2022

Real mine site
(Raith and Schmidt, 2010)

VR-Mine

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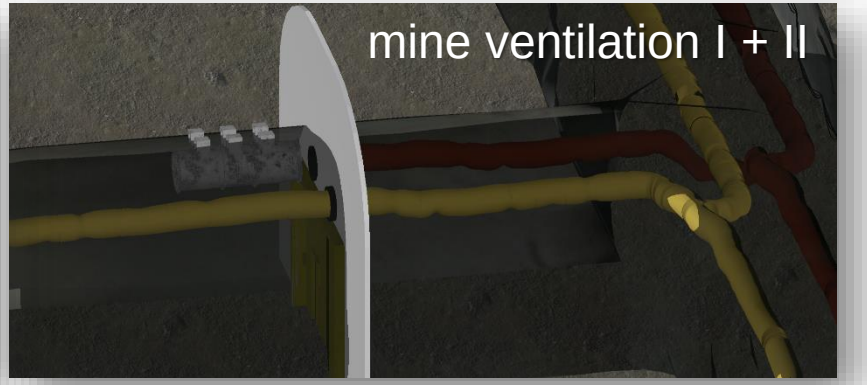
Scenario-based learning



?

drilling & blasting

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Difficulties in teaching with VR

(Dörner et al., 2019)

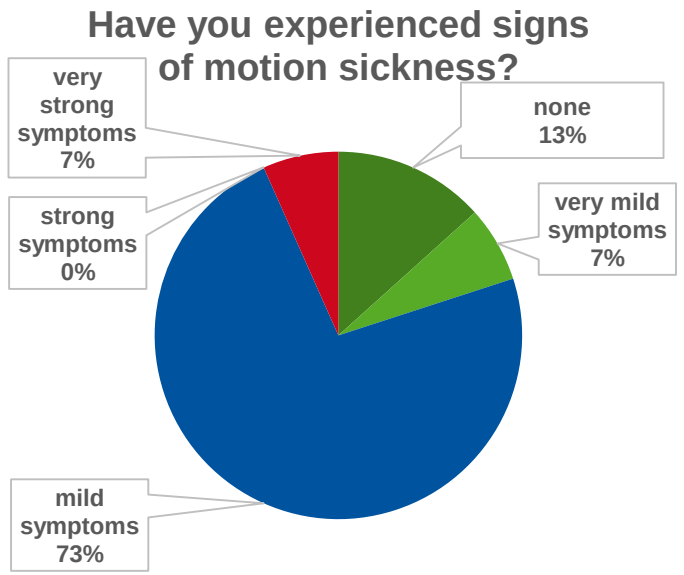
Motion sickness

- Inconsistencies in perception of movement and actual movement
- Symptoms may be delayed after use but disappear by themselves
- Everyone reacts differently

How to deal with motion sickness in exercises with students?

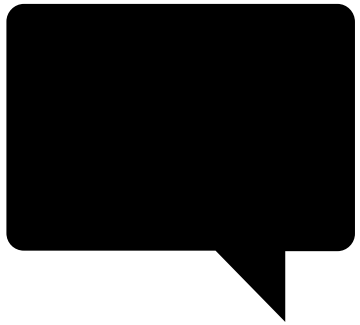
- Enlightenment and slow habituation
- Few rotations of the user
- Max 15 min. sessions, breaks
- Continuous optimisation of the VR environment

N = 15



scale

Evaluation of the VR-Mine experience



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Evaluation of the VR-Mine experience

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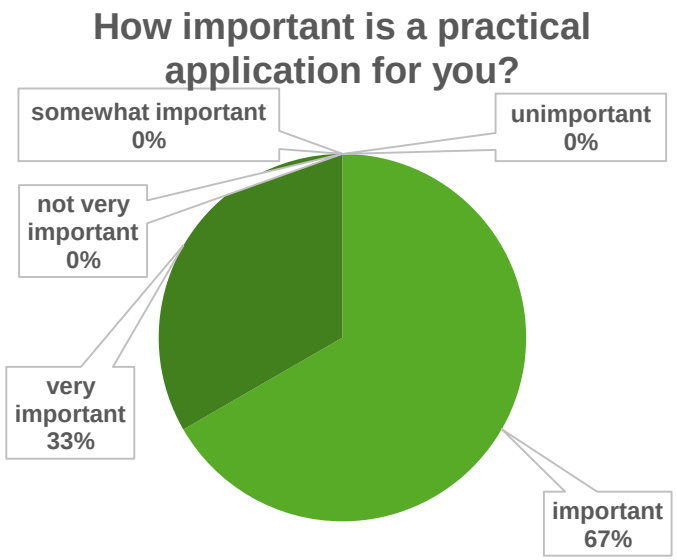

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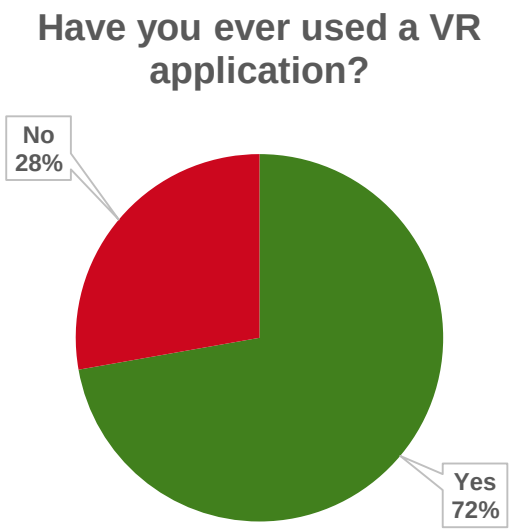

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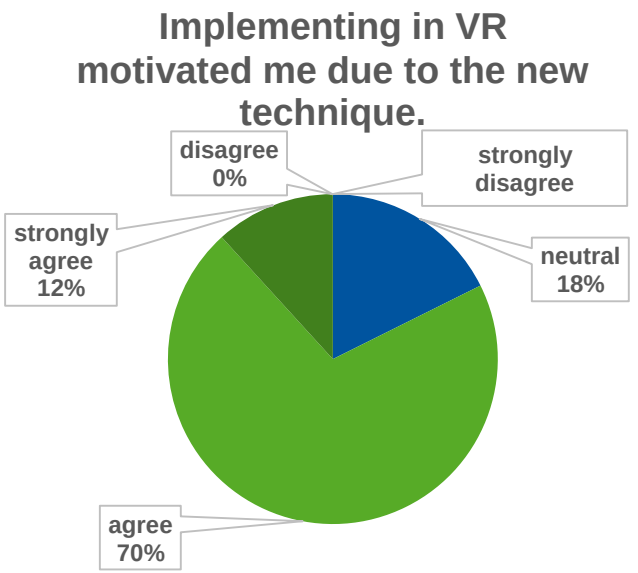

Evaluation of the VR-Mine experience

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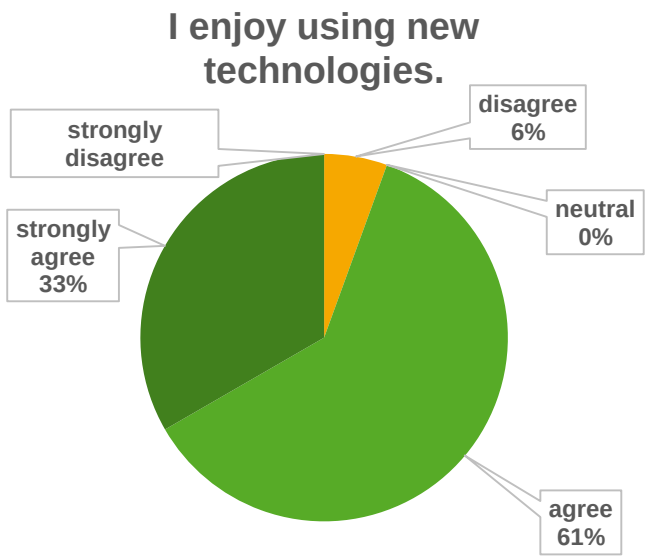

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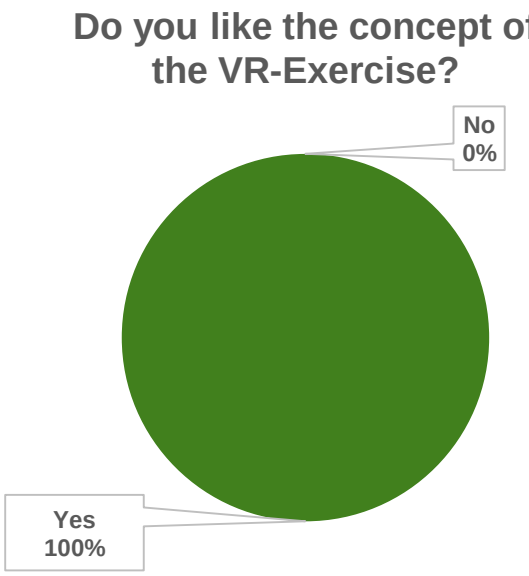

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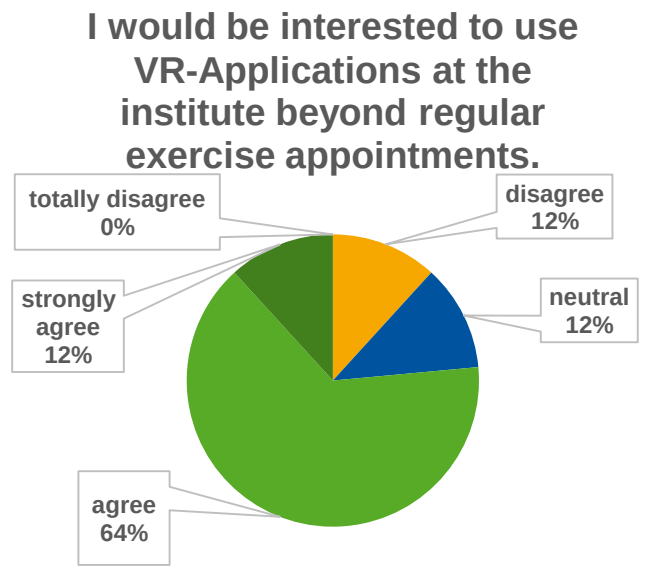

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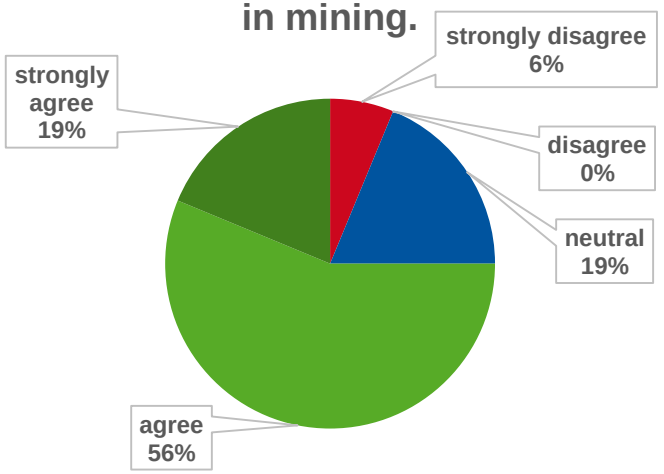
Evaluation of the VR-Mine experience: added benefit

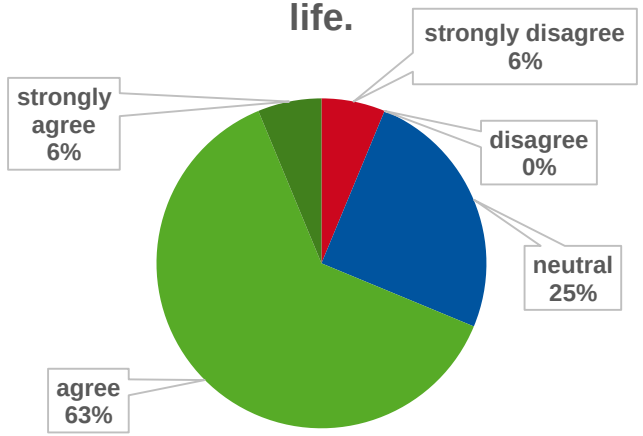
N = 16

After using the VR mine, I am more aware of safety issues in mining.



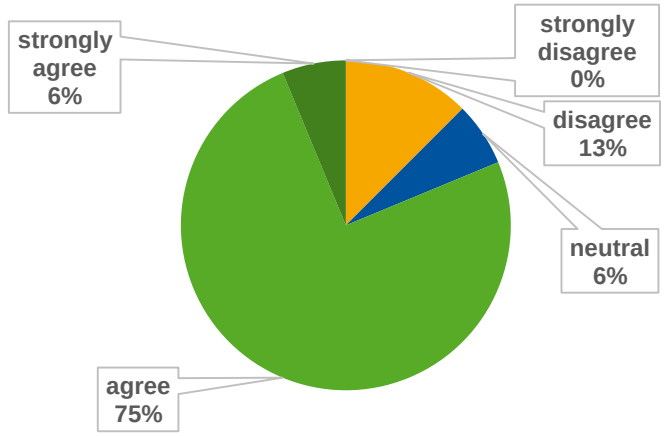
N = 16

I think the VR application will help me for my professional life.



N = 16

The VR application helped me understand the subject matter through visualisation.



Innovative VR-technology in teaching of mining engineering students

What is planned for the future?

- Further expansion and improvement of the VR-mine
  - Using the feedback of the students

- Analysis of the evaluation results to date and further surveys
  - Effects of the new learning method?
  - Not only evaluate user satisfaction, but:
    - Evaluation of the learning progress
    - Evaluation of added benefit (of the VR exercise)

“Prepare mining students for the job market.”

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Questions?

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