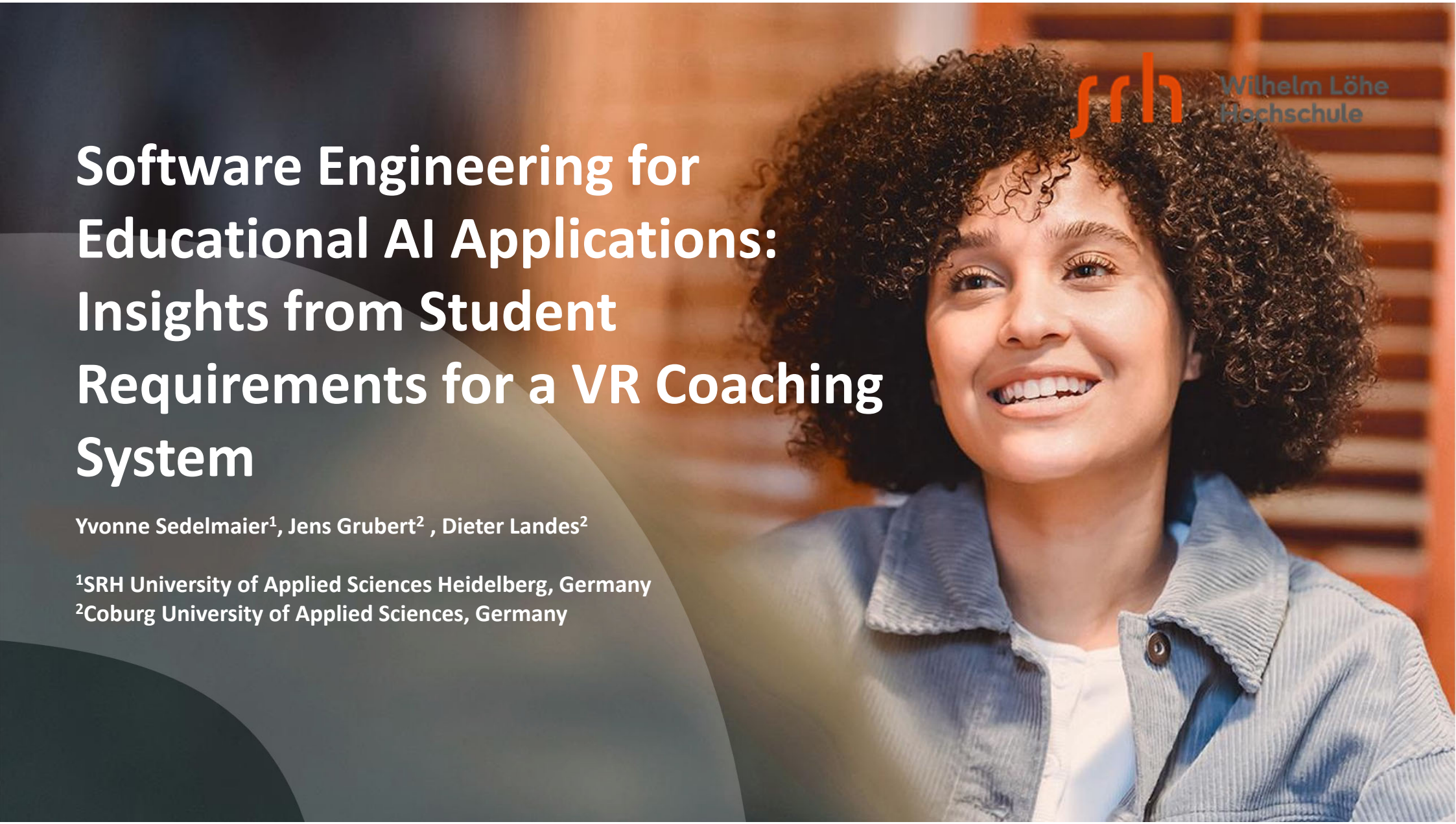

Software Engineering for Educational AI Applications: Insights from Student Requirements for a VR Coaching System

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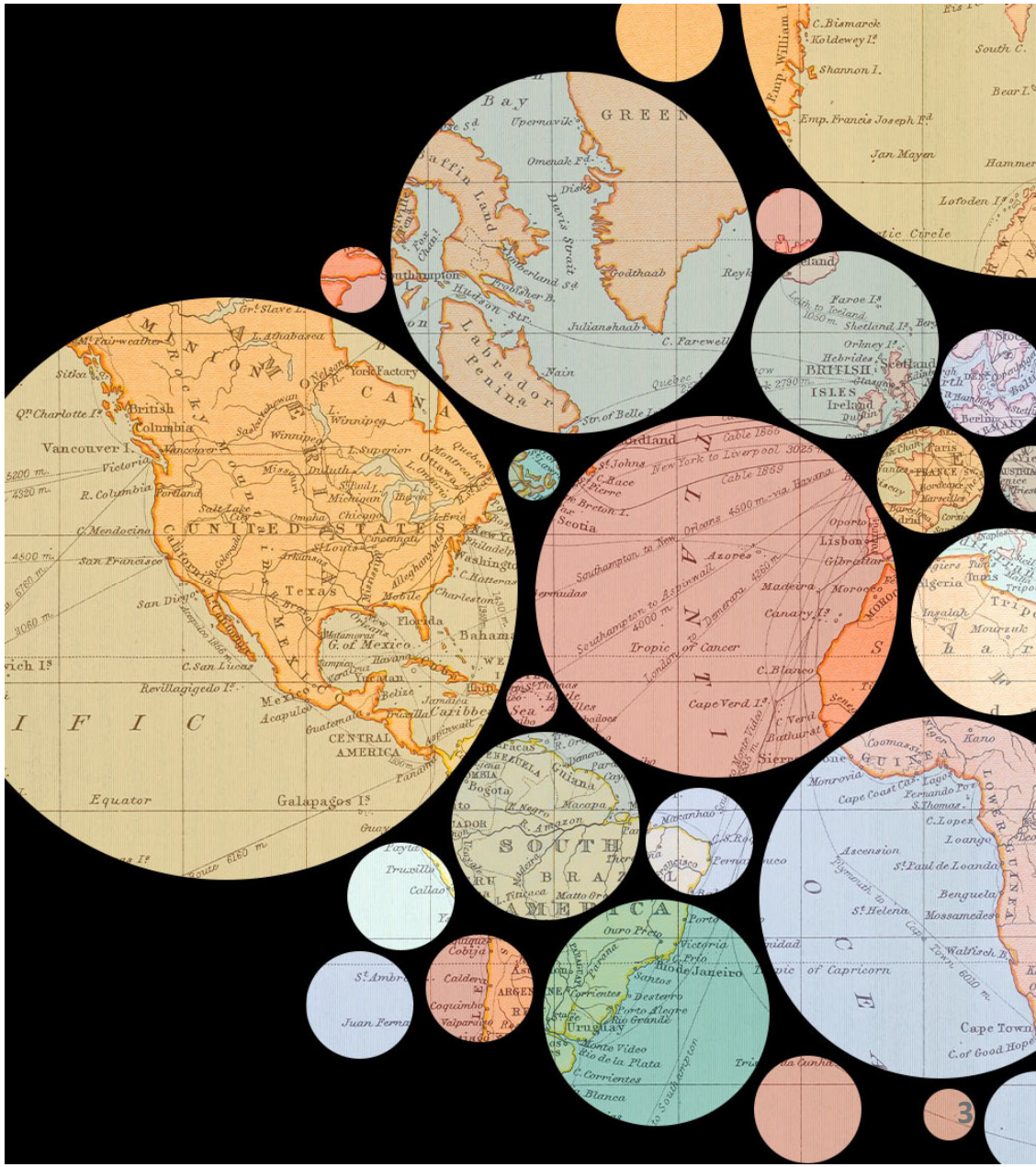
Agenda

Motivation

- The rapid advancement of Artificial Intelligence (AI) and immersive technologies such as Virtual Reality (VR) has opened new possibilities to enhance teaching and learning experiences e.g. in higher education.
- But: formats of academic assessments have remained largely unchanged: Written examinations still dominate the assessment landscape, followed by oral examinations.
- In particular, oral examinations are often associated with discomfort, anxiety, and uncertainty.
- These emotional barriers can significantly affect performance and learning outcomes.
- Possible solution: AI-based learning companions – specifically, virtual coaches using VR and conversational AI.



Research Aim & Research Questions

Research Aim:

- better understand students' needs and expectations regarding the use of a virtual coach to prepare for oral examinations in higher education.
- explore if students are generally open to learning with a virtual coach, and if so, what their intended learning outcomes are.
- identify students' requirements and preferences for a virtual coach that supports the preparation for oral examinations.

Research Questions (RQ):

1. Would students be willing to use a virtual coach for exam preparation?
2. What are their learning goals when using such a tool? Which purposes do students associate with using a virtual coach?
3. Which requirements and expectations do they have with respect to the functionality and behaviour of a virtual coach?
4. Which features or behaviours would lead students to reject or avoid using such a coach?

Qualitative Research Design

- paper-and-pencil questionnaire containing open-ended questions:

“Imagine you had the ability to prepare for oral exams with the support of virtual reality. What should such a VR-based training system look like, what should it be able to do? Please complete the following sentences:

- The most stressful thing for me before or during an oral exam is ...

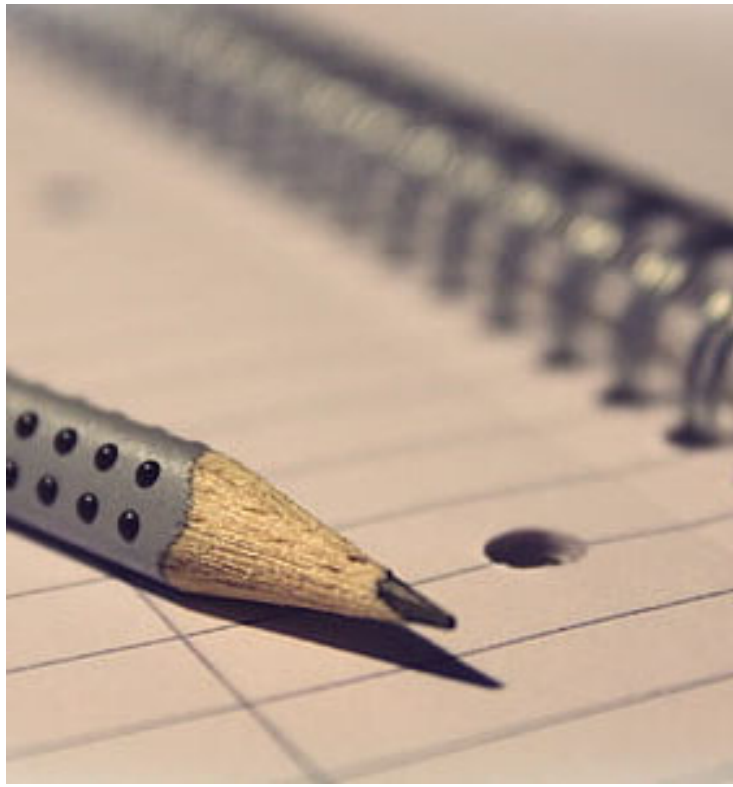
- From a VR-coach I expect ...

- I would like to train with a VR coach...

- I’d love to...

- It’s not possible that ...”

- A total of 44 participants from informatics (bachelor) and data science (master) completed the survey in the middle of the summer term 2025.



Qualitative Content Analysis (QCA) following Mayring

Definition and Selection of Material
Analysis of the Context of Material Production
Formal Characterization of the Material
Determination of the Analytical Perspective
Theory-Guided Differentiation of the Research Question
Selection of Analytical Techniques
Definition of Units of Analysis
Conduction of the Material Analysis

Results in Detail (1)

Students want to …	Bachelor	Master
… gain certainty and reduce excitement	21	6
… close knowledge gaps and understand the content	0	18
… learn answers to all possible questions	7	0
… build knowledge	2	0

- → There is a striking shift in undergraduates’ and graduates’ focus from the "soft" issues, e.g. gaining security and reducing examination anxiety, to deeper content- and knowledge-related aspects.

Results in Detail (2)

Students want to …	Bachelor	Master
… get real feedback rather than an imposed, standardized interaction	12	17
… be motivated by a VR coach	2	1
… get personalized feedback from the VR coach	1	7
… have realistic scences, as real situations as possible	15	16
… see pictures of the real examiners and the examination room	5	5

- → In terms of proximity to reality, both groups are very similar in their statements and see this as essential requirement and prerequisite for using a VR coach.

Structure of Results: Two Super-Categories with Sub-Categories

Learning goal-related aspects (RQ2),

- personal and
- content-related learning outcomes.

Aspects of **the learning process** (RQ3 and RQ4),

- realistic scenarios and the simulation of real instructors and assessors as well as the examination room
- real interaction and individualized feedback
- personalized and individualized support of the learning process including motivation and development of learning paths

Structure of Results

The statements of the students can be summarized into two super-categories with sub-categories:

1. **learning goal-related aspects** (RQ2),
    1. personal and
    2. content-related learning outcomes.
2. aspects of **the learning process** (RQ3 and RQ4),
    1. realistic scenarios and the simulation of real instructors and assessors as well as the examination room
    2. real interaction and individualized feedback
    3. personalized and individualized support of the learning process including motivation and development of learning paths

Students‘ Learning Goals and Purposes (RQs 1 and 2)

RQ1: all but two students have no fundamental reservations against using a virtual coach.

Regarding **learning goals (RQ2**), students expressed both personal and cognitive motivations for using a virtual coach.

- **Personal level:**
  many bachelor students emphasized a desire to **gain confidence in their performance**, **reduce examination anxiety, and manage nervousness** prior to the exam.

- **Cognitive level:**
  Students wish to **identify and close knowledge gaps** and
  assess their own level of understanding.

Requirements for the VR-coach (RQ3)

Authenticity and Realism

The VR coach must …

- … closely mirror real-life examination scenarios, including realistic examiners, spaces, and question types.
- … provide real interaction and meaningful, situation-specific feedback. Simple or generic responses are considered insufficient.

Personalization

The VR coach must …

- … support students‘ individual learning processes by offering customized feedback, motivation, and structured guidance, such as helping to create a personalized preparation schedule.

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“No-Go” Criteria for a VR Coach (RQ 4)

Predefined or incorrect answers

Impolite or insensitive behavior

Above all, a lack of personalization or unrealistic / artificial scenarios

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- predefined or incorrect answers
- impolite or insensitive behavior
- above all a lack of personalization or the use of unrealistic or artificial scenarios

Taken together, these findings suggest that a virtual coach can be a valuable tool for preparing oral examinations – but only under certain conditions. Technically limited or overly generic solutions are unlikely to be accepted by students.

Conclusions from the Survey & Discussion

- High expectations rather than skepticism
- Tension between virtual and real examiners
- Shift from developer to user perspective
- Implications for development: Beyond classical agile approaches
  - While agile methodologies promote early user feedback and continuous improvement, the survey responses suggest that in this particular use case, this can backfire if early iterations do not meet the expected level of realism and content quality. In the case of educational technologies used in emotionally charged situations—such as oral exam preparation—careless early releases may compromise user acceptance.
  - → Each release must meet high quality standards in terms of usability, realism, and content correctness, even in early stages.

Summary

This study presented a qualitative analysis of students' expectations for a VR-based AI coach to support oral exam preparation. The qualitative data collected from undergraduate and graduate informatics students provides insights into students' learning goals, expectations, and specific requirements for such a tool.

The results clearly show that students express a strong interest in using a virtual coach, especially to manage examination anxiety and improve their confidence in oral settings.

Students also hold clear and demanding expectations: They are critical of systems that feel inauthentic, lack individualization, or provide overly generic responses. They value realism, personalized feedback, and content accuracy, and they require these features to be present from the very first use.

Implications for Educational Software Engineering

These insights have important implications for educational software engineering:

1. strong pedagogical demand for immersive, user-adaptive technologies that support oral communication skills in realistic settings.
2. need for development strategies that prioritize the user experience—not only in terms of interface design, but also regarding the system's pedagogical effectiveness and credibility; otherwise, the technology may neither be accepted, nor used effectively.
3. purely technical focus may fall short if it does not align with learners' expectations for realism and relevance. A VR coach that fails to simulate realistic examiner behavior or classroom dynamics may even increase insecurity rather than alleviate it.

Thank you for your attention!
→ Questions?

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