DOI: 10.5281/zenodo.18492729

Co-Creation of a Virtual Reality (VR) Learning Scenario with Masters Students, Faculty Members and VR Experts of the RWTH Aachen University.

A two-day workshop.

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25.-26. January 2025

Workshop structure

1 – German Aerospace Center (DLR), Institute of Data Science, Jena (Germany)

2 – RWTH Aachen University, Academic and Research Department Engineering Hydrology, Aachen (Germany)

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DAY 1

1.INTRODUCTION – CONTEXT, AIMS, FRAMING

WHEN?	WHO?	MATERIALS	WHY?
09:00-09:30 a.m. (30 minutes)	Moderator	Powerpoint - Projector	Students understand job to be done and their role in the process
WHAT/HOW?			

• **Project objectives**
• **Workshop objectives – Design challenge**
• **Roles**
• **How are we going to work? Introduction to design thinking**
  ○ *What is design thinking?*
  ○ *Design thinking phases – empathize, define, ideate, prototype, test*
• **Rules**
  ○ no right or wrong, no self-censorship, do not criticize ideas, build on them, 1 idea per Post-it ®, openness			

2. VR SENSITIZATION SESSION

WHEN?	WHO?	MATERIALS	WHY?
09:30 a.m.- ca. 12:10 p.m. **(ca. 160 min)**	○ Moderator ○ RWTH VR team	Powerpoint & Head mounted displays (HMDs)	Students become familiar with VR
WHAT/HOW?			

• **VR presentation (moderator, ca. 20 min)**
  ○ Evolution of virtual reality (VR)
  ○ Rationale for using VR & common use cases
  ○ Key affordances (slides and videos to illustrate):			

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1. Spatial presence 2. Depth 3. Stereoscopic sound 4. Real-life scale 5. Embodied action 6. Location independent collaboration (multiplayer) ○ Lay out options: VR technologies and design elements • **VR tutorial (RWTH VR team, ca. 15 min)** ○ Adjusting HMDs, using controls
Coffee break 10 min
• **VR demo of existing applications (RWTH VR team, ca. 90 min)** ○ First Steps app ○ MyScore social app (pick up cup of coffee, play chess outside, socialize etc.). ○ MyScore existing desalination scenario • **Discuss student impressions (moderator, ca. 30 min)** ○ Likes, dislikes, concerns ○ Points to retain for our learning scenario
Lunch break 60 min

3. DEFINE SITUATION AS IS

WHEN?	WHO?	MATERIALS	WHY?
Ca. 1:30-2:30 p.m. (ca. 60 min)	○ Moderator	○ **Synthesized interview insights are hanging on the walls. Presented by the moderator and discussed in the group (30 min)** ▪ Empathy maps	• Synthesis of insights (general learning needs and pain points, map out current knowledge, discuss knowledge gaps) • Specify design challenge

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		▪ Summary of pain points and needs ▪ + VR impressions (points to retain Post-its®) • **Group mind map to lay out all aspects of desalination the students have learned about (ca. 20 min)** • **Discussion – gaps (10 min)**	
Coffee break 10 min			

4. IDEATION

WHEN?	**WHO?**	**MATERIALS**	**WHY?**
2:40-4:00 p.m. **(ca. 80 min)**	○ Moderator & faculty members	Whiteboard, Post-it® notes	• Ideas for VR learning – important aspects I want to learn more about, how to address needs previously discussed
WHAT/HOW?			
• Individual reflection using Post-it® notes (10 min) • Group work (into 2 groups with a faculty member each) • Present ideas, reflect, cluster • Groups come together to consolidate their ideas / clusters.			
Coffee break 5-10 min			

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5. USER STORIES

WHEN?	WHO?	MATERIALS	WHY?
4:10-5:30 p.m. **(ca. 80 min)**	○ Moderator	Templates	• Considering generated ideas, to reflect on first potential solutions (concepts)

WHAT/HOW?

Task: develop 1 story per person, using 2 templates (ca. 20 min)

- **Template 1 – reflection, pre-work for template 2**
  - Describe the topic and learning objectives in detail
  - Reflect on the need
  - Reflect on the expected outcome / benefit
- **Template 2 – concise statement development: "As a learner, I want…** (general learning goal e.g., a memorable and engaging environment) **to learn about…** (specific learning goal e.g., how to optimize efficiency in a seawater desalination plant), **because** (expected impact/ benefit/what problem will this solve?) … ."

Coffee break 10 min (3:50-4:10 p.m.)

- **Present and discuss user stories (ca. 5-10 min per person)**
  - Each student sticks user story on the wall and presents.
  - Discussion of each user story

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DAY 2

6. LEGO® PROTOTYPES

WHEN?	WHO?	MATERIALS	WHY?
10:00 a.m.-3:00/4:00 p.m.	○ Professor and moderator	○ LEGO®	• Hands on 3D storyboard development

WHAT/HOW?

- **Skills building (ca. 90 min)**
  - **Warm up:** Choose a board and build a tower. The tower should be as high as possible but still stable. The tower should also look nice.
    - All present their tower and explain why it is nice
  - **Thinking in metaphors:** The participants build back their models and select a total of 8 Lego® bricks that they want to use for the next task. Each participant receives a card with a technical term from the field of seawater desalination and has one minute to build a model of the term with the 8 bricks.
    - The term must then be explained using the stones without naming the term (as in the taboo method).
  - **Storytelling:** Participants create a model of the learning objects that they would like to use in a VR scenario. Each brick represents a particular learning object, a learning method or any function that is desired. The individual models are placed on the work table and the participants stand behind their models. The participant standing to the right of each model must now explain in detail the meaning of the individual bricks.

Coffee break

- **Individual prototypes (ca. 60 min)**

Construction stage 1: Single model

- Build a model of a VR scenario with which international students can independently acquire the technical skills and knowledge to plan a desalination plant.
  - Criteria:
    - Teaching and learning method used
    - learning media used
    - Definition of teaching objective
    - Time required
    - Single-person scenario versus multi-person scenario
- Each person presents and explains model

Lunch break 60 min

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- **Collective prototype (ca. 120 min)**

Construction stage 2: Team model

- Each person proposes their model or parts of it for the team model. Each extension is discussed by the entire group. If a participant does not agree with a proposal, a compromise must be found. When the facilitator considers that a final state has been reached, each participant chooses a stone (green, yellow or red) and reveals this stone when the facilitator has counted to three. A green stone means that you agree 100% with the team model; a yellow stone indicates that you are satisfied overall, even if you do not accept all the content; a red stone means that there is still content that you do not accept. If one or more participants uncover a red stone, the discussion must continue until the concerns have been resolved. If only yellow and green stones are visible, the construction phase is complete. Duration: ca. 105 min

Construction stage 3: Prioritize

- Determine the priorities: Each participant is given six bricks that correspond to priorities (2 x green for priority 1, 2 x yellow for priority 2, 2 x red for priority 3). The participants then place their priority stones next to the model parts that they want to prioritize.
  Duration: 5 min

Construction stage 2: Documentation

- Video documentation of the team model is created. One participant explains the model and its individual elements while another participant records the individual parts of the model. Duration: ca. 10 min

7.VR PROTOTYPE

WHEN?	WHO?	MATERIALS	WHY?
Prepare during workshop after user stories presentation **(3-4 hours)** Demonstrate to students at the end of the workshop **(60 min)**	○ RWTH VR team	ShapesXR	• VR prototyping to transfer analogue prototypes to the VR medium and gain first feedback from students