DESIGN THINKING WORKSHOP

CO-DESIGNING A VR LEARNING ENVIRONMENT ABOUT SEAWATER DESALINATION

Dr. Stella Kanatouri, DLR, Institute of Data Science

DLR

German Aerospace Center

At a Glance

Domain-independent methods

Represented in all DLR research domains

German Aerospace Center

At a Glance

~ 11.000 Employees

55 Institutes and Facilities

30 Sites (Headquarter in Cologne)

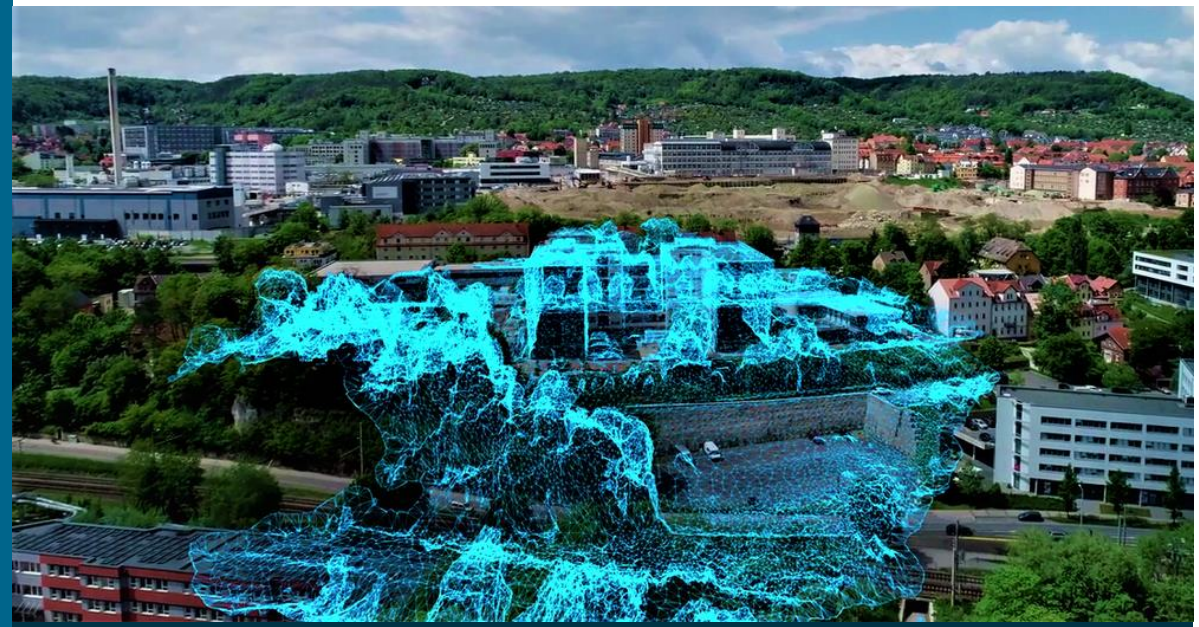
External offices: Brussels (EU), Paris (ESA), Washington, Tokyo

Space Agency and two Project Agencies

Independent partner and advisor to policymakers on the topics of aerospace, energy, transport, security and digitalisation

DLR Institute of Data Science

At a Glance



Facts

Location Jena | founded in 2017 | ~ 80 employees | HPDA Cluster

Goal

Enabling new applications for data and data spaces beyond the state of the art

Our Approach

Developing methods and applications along the entire data life cycle for DLR and external partners

THE **WATER LAB** PROJECT

🎯 A Virtual Reality learning environment about water resources management for students

Midjourney image

CO-CREATION

Design **FOR** you

VERSUS

Design **WITH** you

Midjourney image

OUR DESIGN CHALLENGE:

What should a VR scenario look like that students can use to acquire the specialist knowledge & skills they need to plan a seawater desalination plant?

Midjourney image

Traditional problem solving mindset

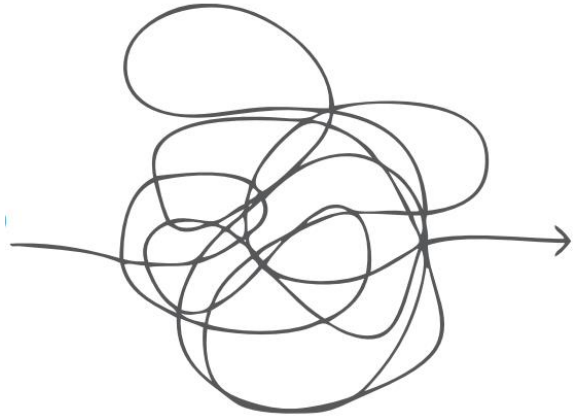
- **Linear, rational** thinking to eliminate problem
- **Cause & effect**
- **Well-defined** problems

OUR DESIGN CHALLENGE:

What should a VR scenario look like that students can use to acquire the specialist knowledge & skills they need to plan a seawater desalination plant?

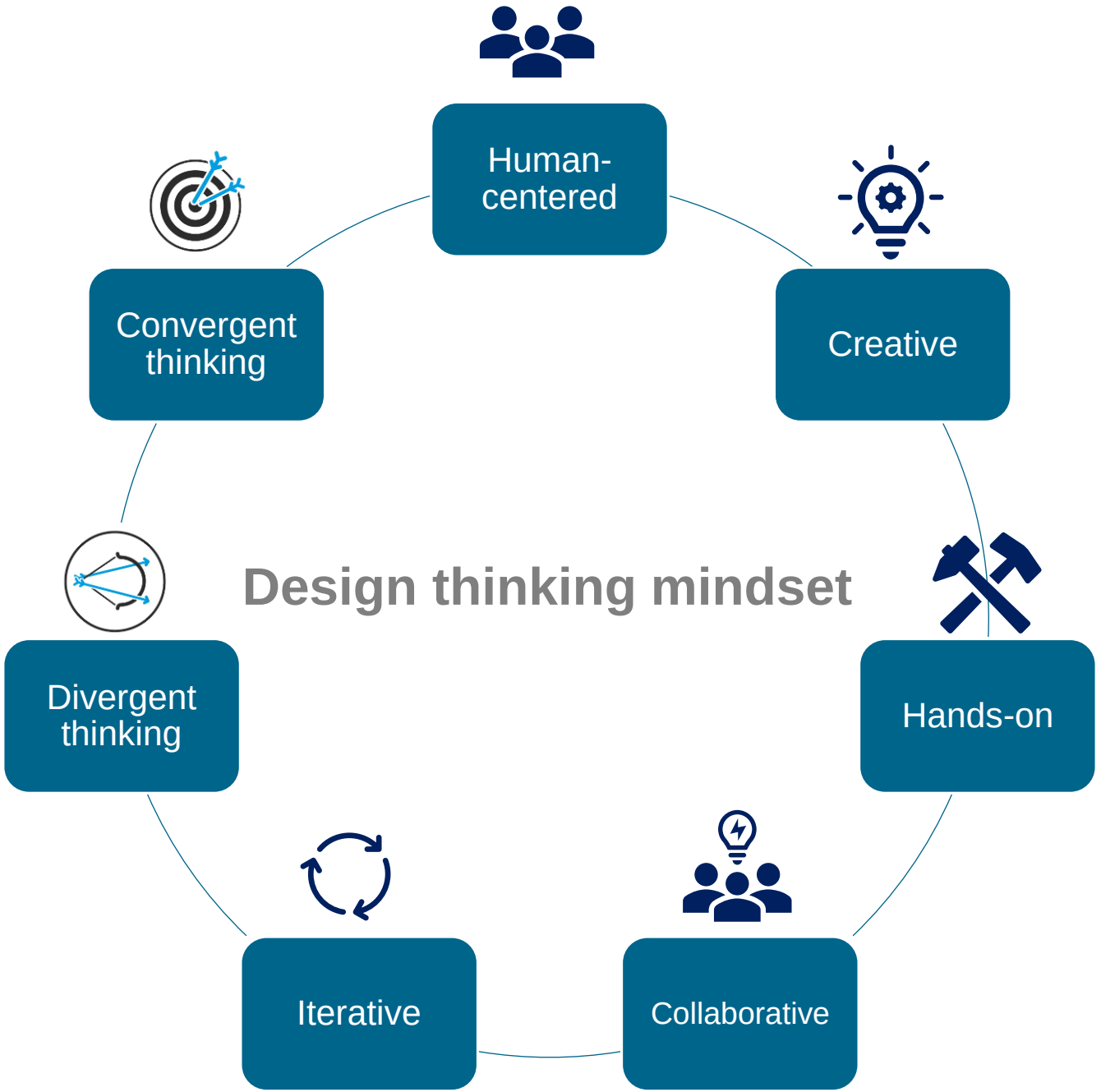
Wikimedia Image

Creative problem solving



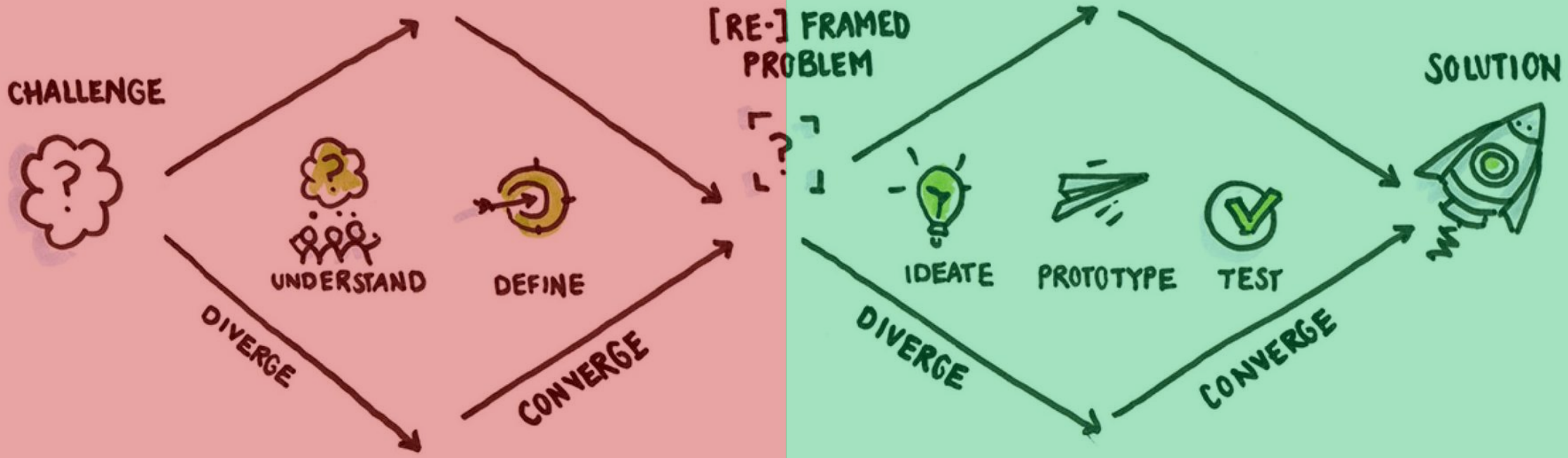
- **Ill-defined, wicked** problems
- **Many possible** design solutions
- Requires **creativity**
- Aim to **understand** the problem
- Aim to **iterate** our way to a solution
- **Collaborative** approach to innovation

„How might we design a VR learning environment about desalination? “


Human-centered
Creative
Hands-on
Collaborative
Iterative
Divergent thinking
Convergent thinking
Design thinking mindset

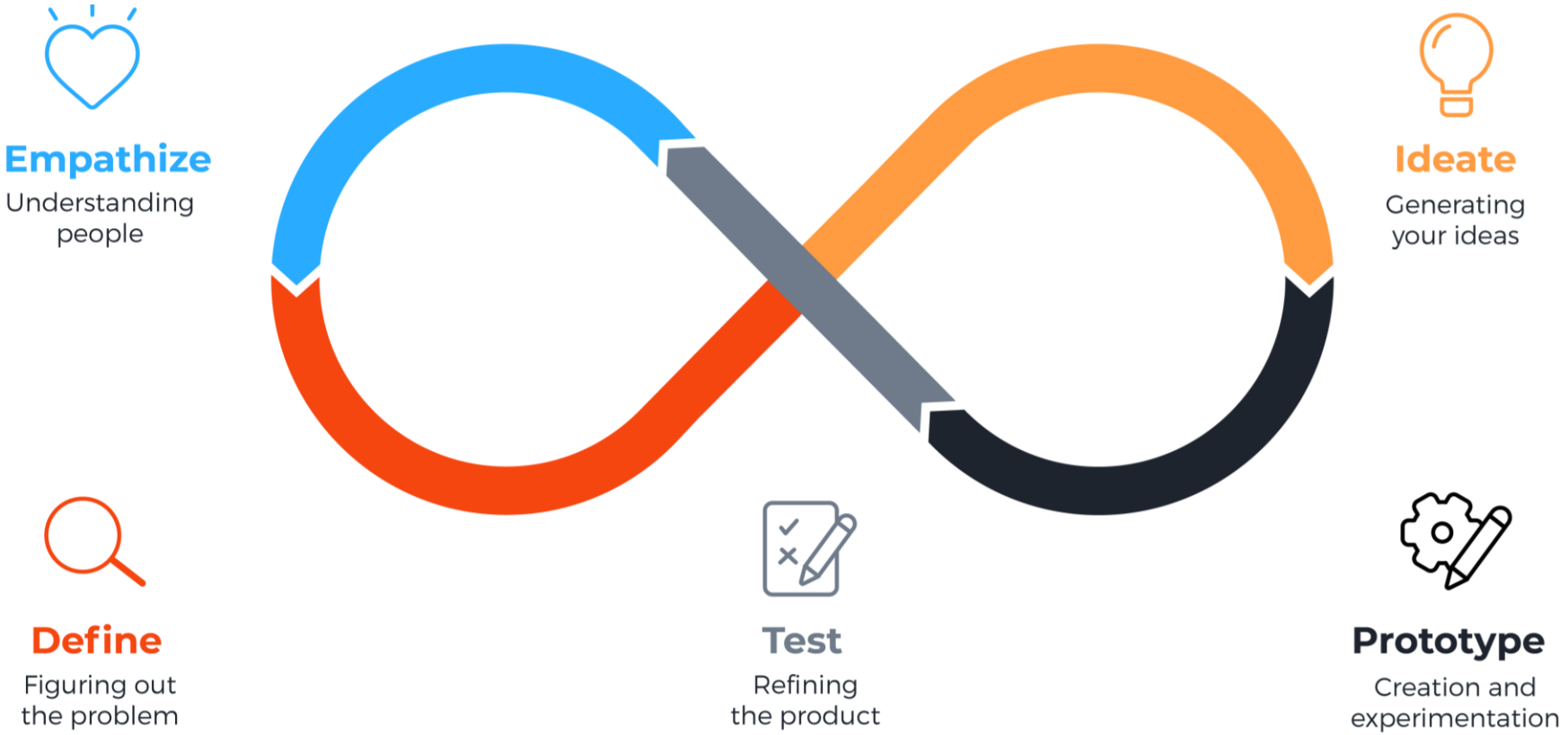
Problem space

Solution space



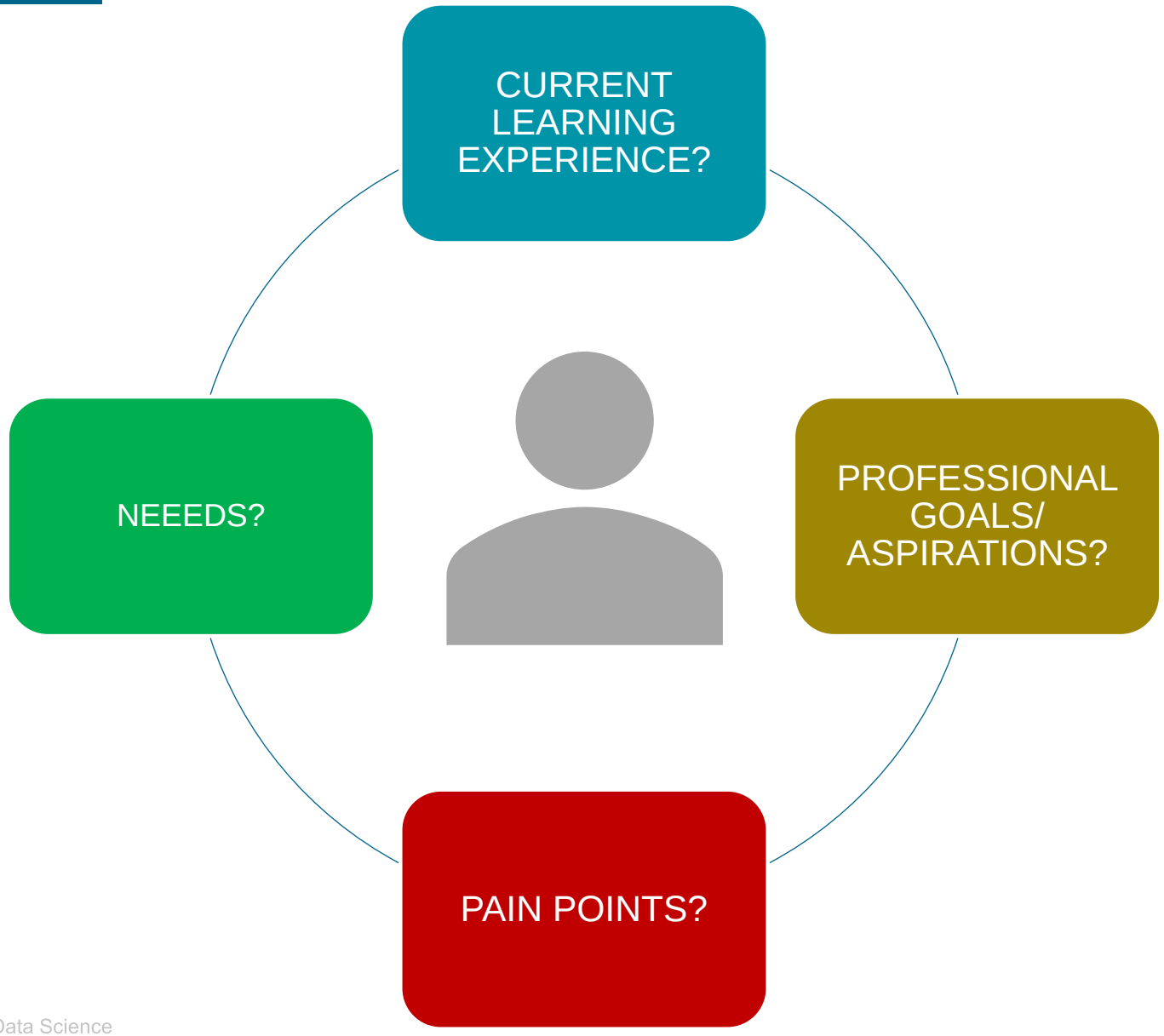
Medium.com

Five-stage process

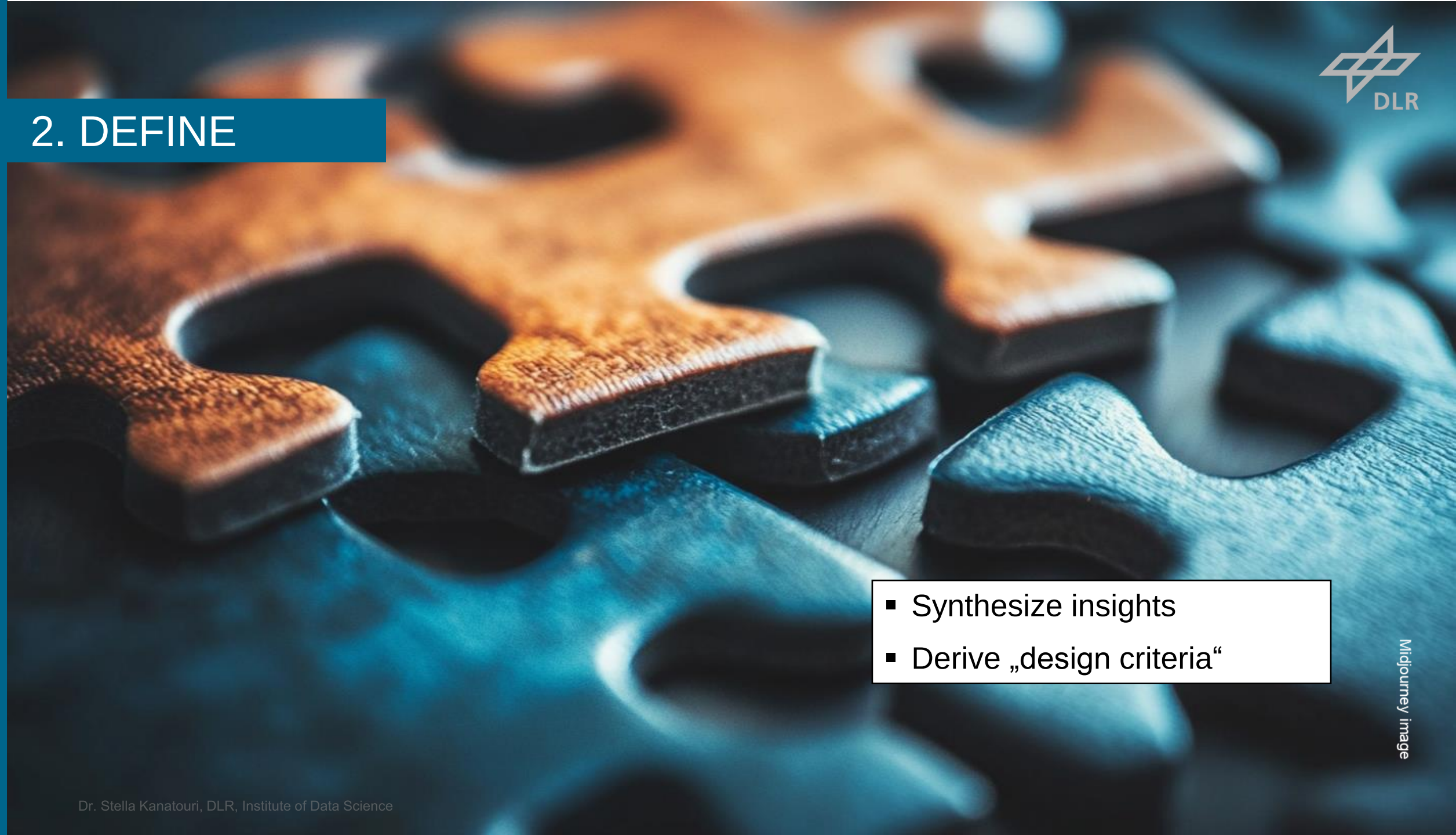


Hasso-Plattner Institute
Institute of Design at Stanford
[Stanford d.school]

1. EMPATHIZE


CURRENT LEARNING EXPERIENCE?
NEEEDS?
PROFESSIONAL GOALS/ ASPIRATIONS?
PAIN POINTS?

2. DEFINE



- Synthesize insights
- Derive „design criteria“

Midjourney image

3. IDEATE

dreamstime.com

4. PROTOTYPE

Businessdesign.org

5. TEST & REFINE PROTOTYPE

A. Scholl (2024) Zentrum für Digitale Transformation Thüringen (ZeTT)

Rules

D Discovery… recommended

- We seek originality! There is no right or wrong!

R Respect… of other

- Don´t criticize others´ ideas!

E Express… all ideas

- 1 idea=1 Post-it note.
- Be open, be present!

A Associate… based on others´ ideas

- Build up on others´ ideas and let others´ ideas inspire you!

M Maximum… ideas

- As many as possible – good and bad!

Agenda

DAY 1

09:30-10:30	Familiarization with VR
	Coffee Break 10:30-10:40
10:40-11:45	Familiarization with VR (cont´d)
	Lunch Break 11:45-12:45
12:45-14:15	Seawater desalination – Content ideas
	Coffee Break 14:15-14:30
14:30-16:00	Design criteria, learning objectives & topics

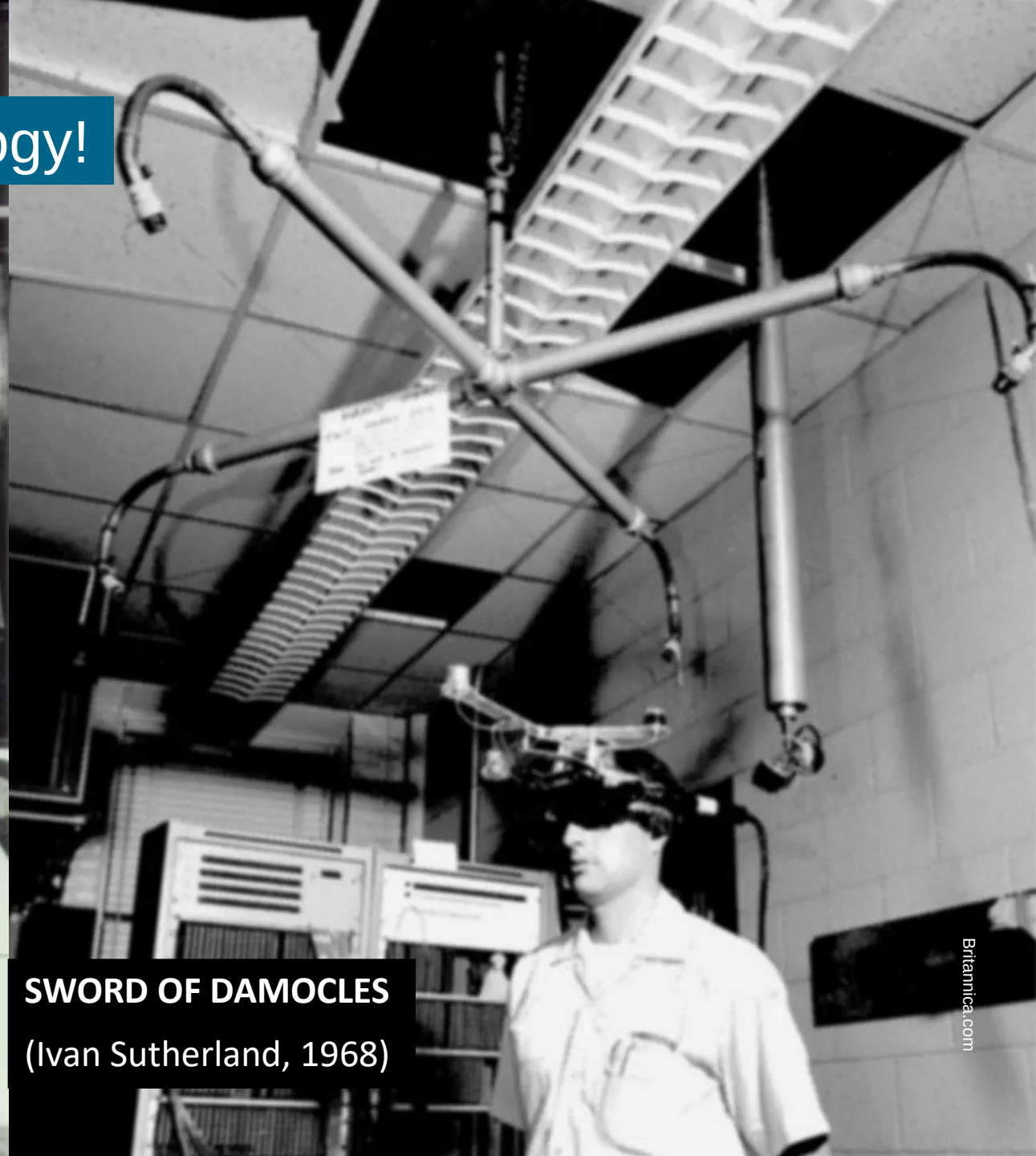
DAY 2

09:00-10:30	Lego® Serious Play® session 1 (skill building)
	Coffee Break 10:30-10:40
10:40-11:40	Lego® Serious Play® session 2 (individual models)
	Lunch Break 11:40-12:40
12:40-14:30	Lego® Serious Play® session 3 (collective model)
	Coffee Break 14:30-14.45
14:45-15:30	Prototype testing in VR
15:30-16:00	Wrap up

Immersive VR – not a new technology!

SENSORAMA
(Morton Heilig, 1962)

historyofinformation.com



SWORD OF DAMOCLES
(Ivan Sutherland, 1968)

Britannica.com

Today´s consumer-ready immersive VR…

- Head and hand motion tracking
- Detailed interaction
- Haptic feedback

Midjourney Image

Why Virtual Reality?

- A viable alternative when physical presence is limited
- Highly memorable contents

Common use cases

- Hazardous situations
- Costly set-up
- Ethical constraints
- Abstract concepts
- Memorize complex procedures
- Social learning and collaboration

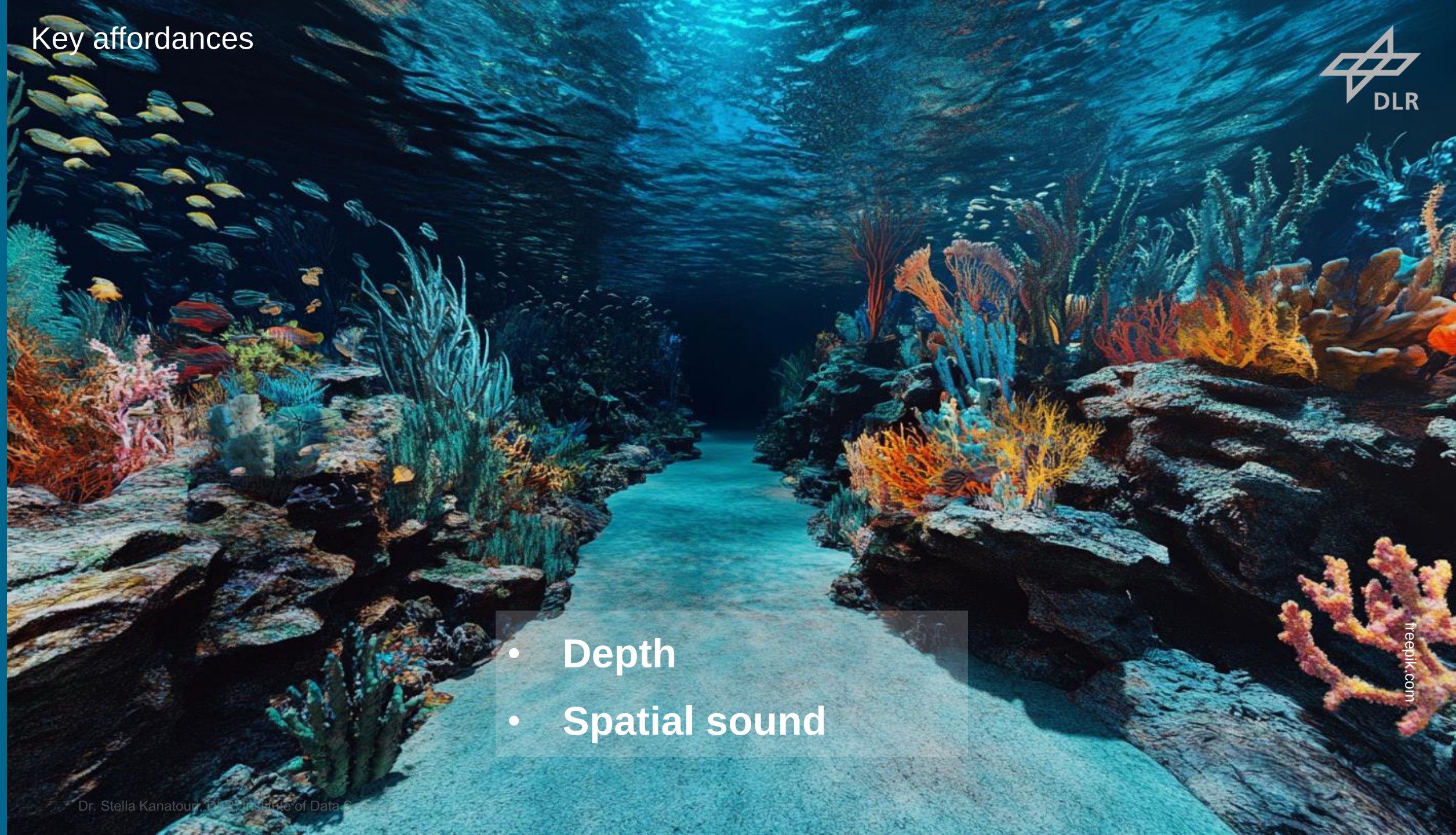
Key affordances

Spatial presence

„the feeling of being present in the virtual environment“

Coco VR app for Meta Quest

Key affordances



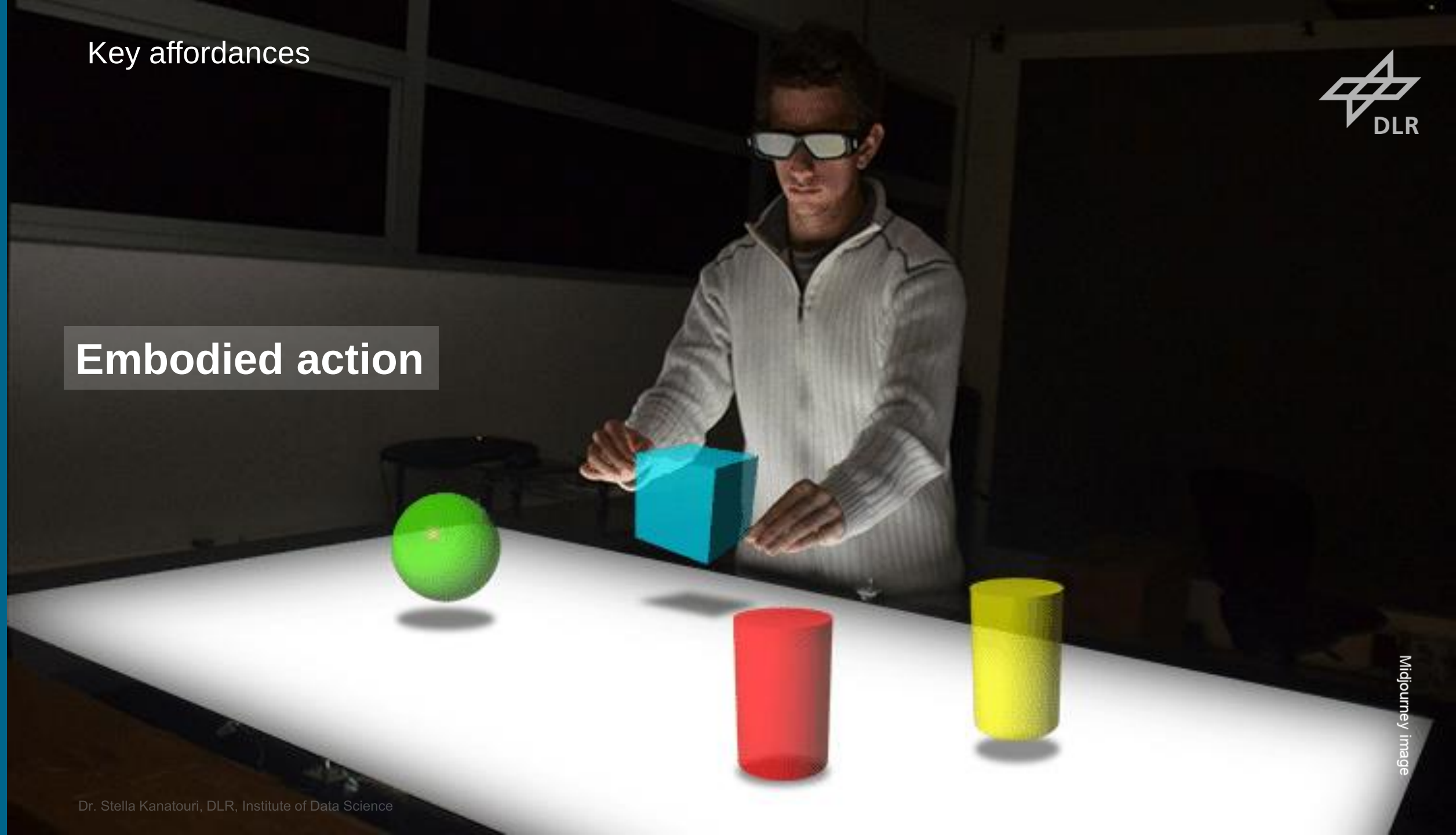
- **Depth**
- **Spatial sound**

Richie´s Plank Experience App for Meta Quest


Subside app for PC VR

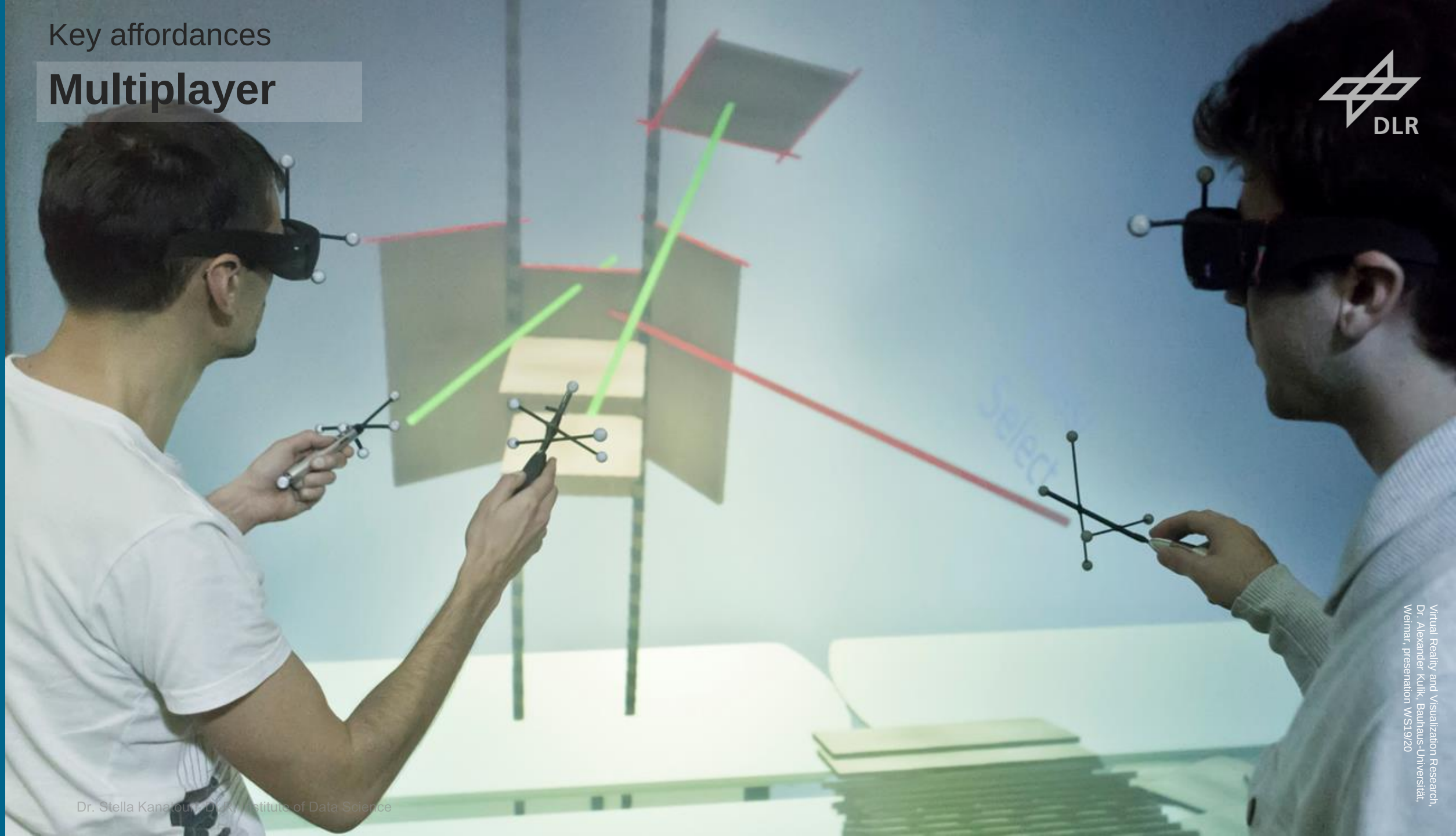

Real-life scale
Midjourney image


Gravity Sketch, private video


Embodied action
Midjourney image

Key affordances

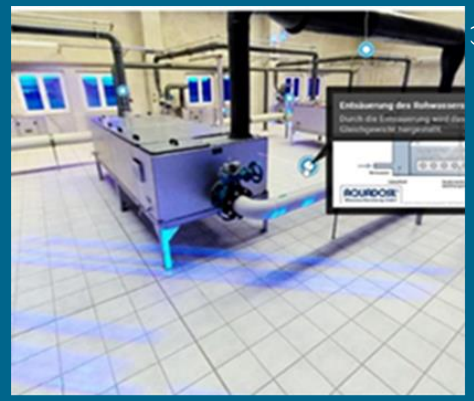
Multiplayer




Grab App for Meta Quest

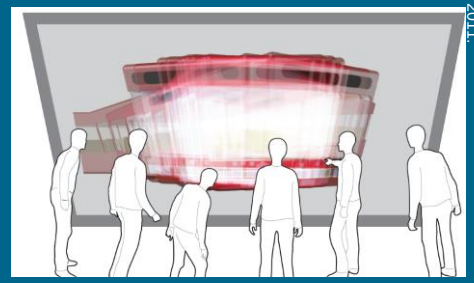
Design elements - examples

Virtual tours



Wolf, M. et al. (2021) 360-based virtual field trips to waterworks in higher education. In *Computers, Sept. 2021, 10 (9):118.*

Simulation



A. Kulik, A. Kunert, S. Beck, R.Reichel, R. Blach, A. Zink, B. Froelich, 2011, A stereoscopic six-user display for co-located collaboration in shared virtual environments. ACM SIGGRAPH Asia 2011.

Collaboration in realistic environments

Gamification

Challenges

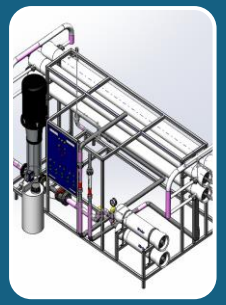
Levels

Badges / rewards

Getting content into VR

3D content libaries - Kitbashing

- Fastest way to get ready to go 3D content
- Several commercial libraries available, e.g. Sketchfab
- Content has variable quality

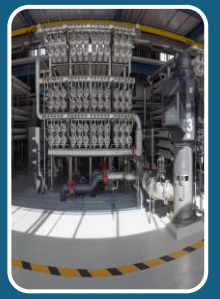


CAD models

- Challenging to get the rights to use as the IP belongs ot the EPC/OO
- Most accurate dimensions

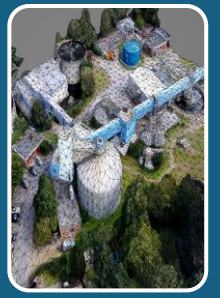
Studio Created 3D models

- Take time and effort
- Requires CAD drawing or model as a basis



360 Spherical Content

- Lowest cost to capture
- No depth



Photogrammetry

- Is a 3D mesh model, usable in game engines

Neural Radiance Field, Gaussian Splats

- Capture method similar to photogrammetry
- Better at capturing detail and reflective environments

Imprint

Topic:	**Co-Designing a VR Learning Environment about Seawater Desalination** Design Thinking Workshop
Date:	2023-01-01 (YYYY-MM-DD)
Author:	Stella Kanatouri
Institute:	DLR – Institute of Data Science
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