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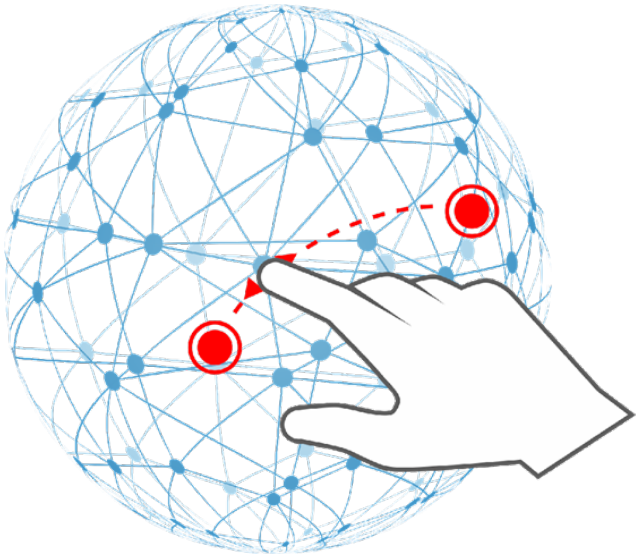

VRinHE

VIRTUAL REALITY IN HIGHER EDUCATION

Module 4:

Introduction to VR

24.04.2023 | CARDET, UniLatvia

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“At every level of education, virtual reality has the potential to make a difference, to lead learners to new discoveries, to motivate and encourage and excite” (Pantelidis, 2009)

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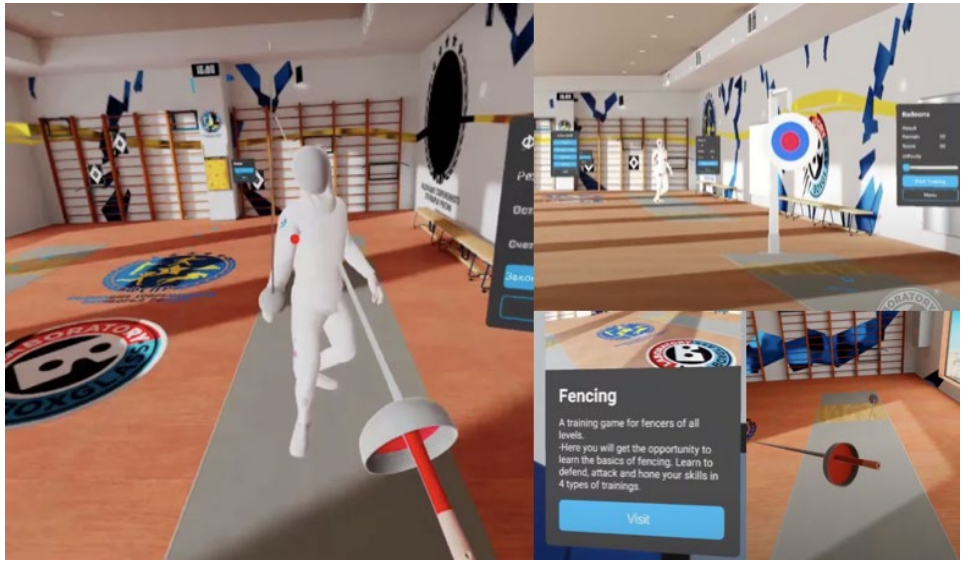
From teaching to LEARNING



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What's in a name?

Virtual Reality = Combination of two main attributing terms – 'virtual' and 'reality'

"The definition of 'virtual' is near and reality is what we experience as human beings. Respectively, the term 'virtual reality' basically means 'near - reality'. This could, of course, mean anything but it usually refers to a specific type of reality emulation" (Virtual Reality Society)

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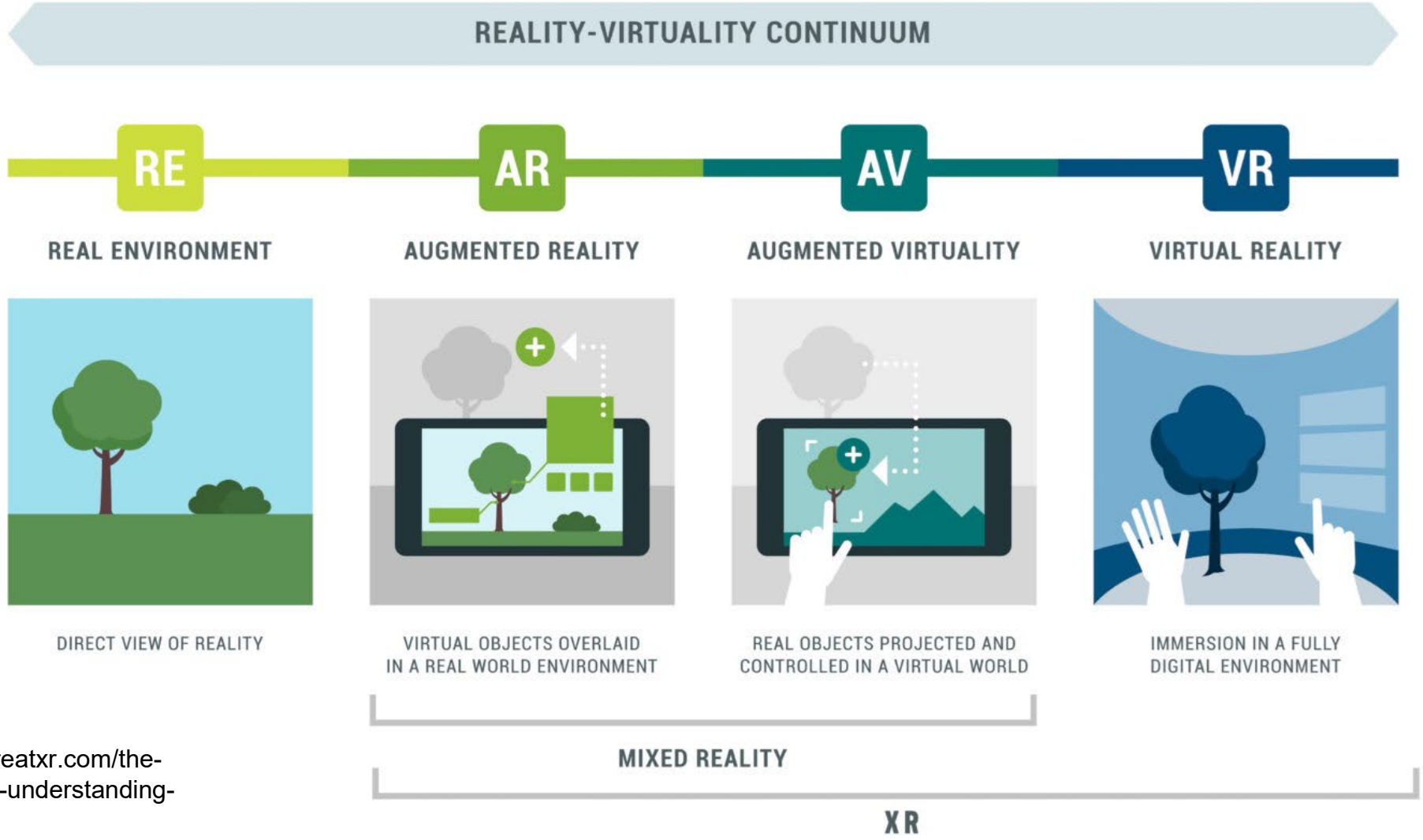
Levels of Virtuality – Immersive Technologies



Source: https://creatxr.com/the-virtuality-spectrum-understanding-ar-mr-vr-and-xr/

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Levels of Virtuality – Immersive Technologies

1. Physical reality – no digital information overlay, interactions are entirely dependent on interaction in physical environment;
2. Augmented Reality (AR) – interaction with the real world while using an ‘additional’ digital information overlay;
3. Augmented Virtuality – a virtually augmented physical environment;
4. Mixed Reality (MR) – interaction with both real world and the digital (virtual), including the functionality of interaction and manipulation of objects; and
5. Virtual Reality (VR) – a completely digital environment, closed off from the physical environment.

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There are three primary and interconnected directions in which VR technology research can be explored:

1. Hardware – including: lenses, headsets, connectors and transmissions, haptic VR technology, delay in input and output, potential and limitation of CAVE as an environment.
2. Software – including 3D design and functionality (interaction with objects), AI, analytics, hardware limitations and boundaries with software potential and limitations, collaboration potential and functionality.
3. Applications – including user demand, functionality, industry (specific fields oriented needs), learning and training.

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Learning theories

1. Piaget and Vygotsky - CONSTRUCTIVISM

Students learning by doing and create their learning experience

1. Papert - CONSTRUCTIONISM

By integrating technology with traditional constructive activities, students themselves create new experiences and new ways of thinking

1. Siemens - CONNECTIVISM

The most important skill is to know where to find reliable information. To think critically and analyse the information obtained pragmatically

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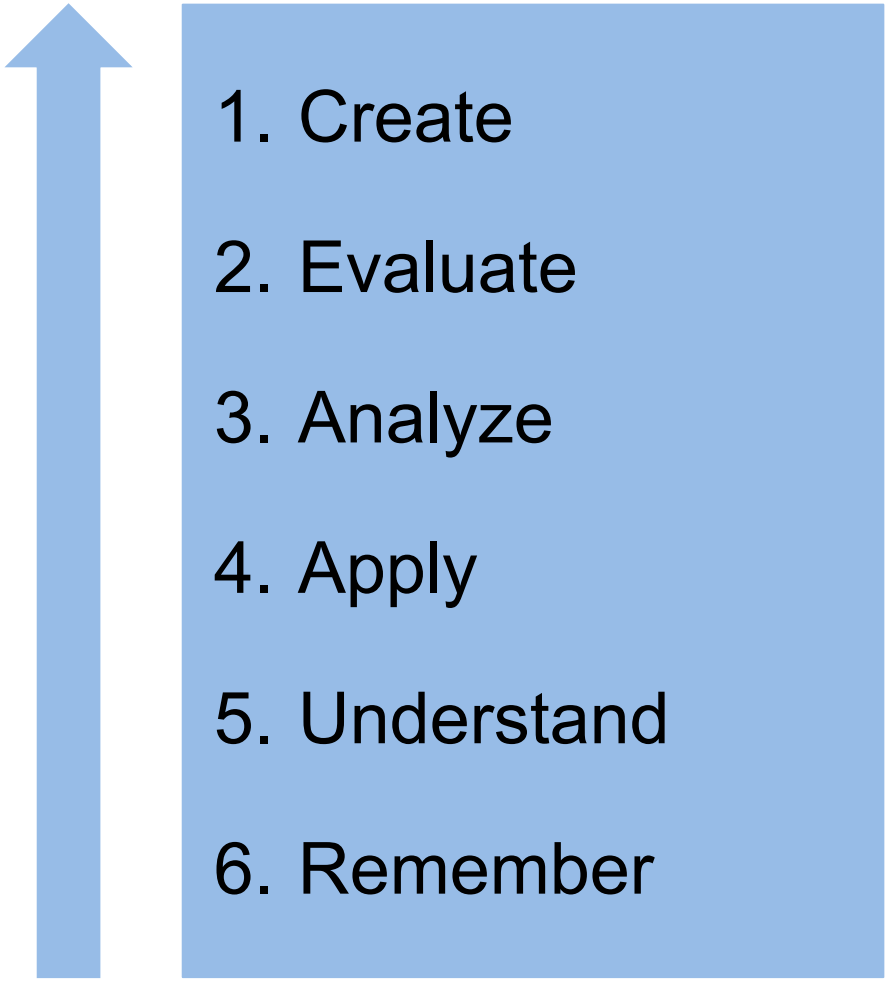
Cognitive process dimensions (Anderson & Krathwohl, 2001)



Learning through immersive technologies has the potential to facilitate the development of the highest cognitive processes

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The potential of virtual reality in education (1)

1. Deep long-term impact in the acquisition of new knowledge
2. Natural extension of human learning
3. Learning through exploration and experimentation
4. Individual control of the learning environment / interaction
5. More easily raise awareness of abstract concepts
6. Learning anywhere and any time
7. Linking real life to learning tasks

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The potential of virtual reality in education (2)

1. Natural interaction with learning content
2. Authenticity of space and interaction
3. Understanding the context and achieving the learning objectives
4. Motivation to learn is increasing
5. Develop creativity
6. Visualize the “unseen”
7. Feeling of presence

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Main limitations: Technologies

1. Kinestosis (or seasickness)
2. The quality of lenses, as well as the availability of optometric solutions that are easily accessible, are both factors to consider.
3. There is still a need for further enhancement of the resolution and overall quality of the images
4. It is necessary to have content and models in 3D that are of high quality
5. Format compatibility
6. The response time, including spatial and haptic responses, needs to be improved

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Main limitations: Learning how to learn in virtual reality

1. The pedagogical principles that underlie learning in VR need to be organized systematically
2. A better understanding of VR's potential as a learning environment is crucial for VR designers to make optimal use of the 3D VR space
3. It is important to know how to apply the right pedagogical principles, how to choose the right software and hardware, and how to use the right teaching strategies to support learning
4. The challenge of developing good educational material
5. Cognitive overload as a result of underdeveloped content and technical shortcomings
6. Educators lack the knowledge and experience of developing teaching materials in VR environment

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The unique aspects of VR environments

Single-user virtual environment			
Aspect	**Authors**	**Aspect**	**Authors**
Immersion	Hedberg and Alexander (1994)	Presence	Whitelock, Brna and Holland (1996)
Fidelity	Hedberg and Alexander (1994)	Representational Fidelity	
Active learner participation	Hedberg and Alexander (1994)	Immediacy of control	

Multi-user virtual environment (MUVEs)	
Aspect	**Author**
Social fidelity (social familiarity, social reality)	Brna (1999)
Immediacy of discourse	
Social presence / co-presence	

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Instructional design strategies for virtual environments

adapted from Kapp, O'Driscoll (2010)

1. Conceptual orienteering	2. Critical incident	3. Operational application	4. Other
Understanding of a key concept. This concept can be taken **beyond physical perception.** You can give a learner an **experience of what it is like** to have a mental condition like schizophrenia or a physical impairment like blurred vision of sudden dizziness	Teaching people how to: Plan and react to conduct activities that are **unexpected, infrequent or considered to be dangerous**	Interaction and manipulation of objects for the purpose of **gaining proficiency in functionality and performance** Learners are challenged to apply **physical world rules** to objects in the virtual world	1. Avatar Persona 2. Role Play 3. Scavenger Hunt 4. Guided tour 5. Co-Creation 6. Small Group Work

Source: Dreimane, L. F. (2020). Taxonomy of learning in virtual reality.

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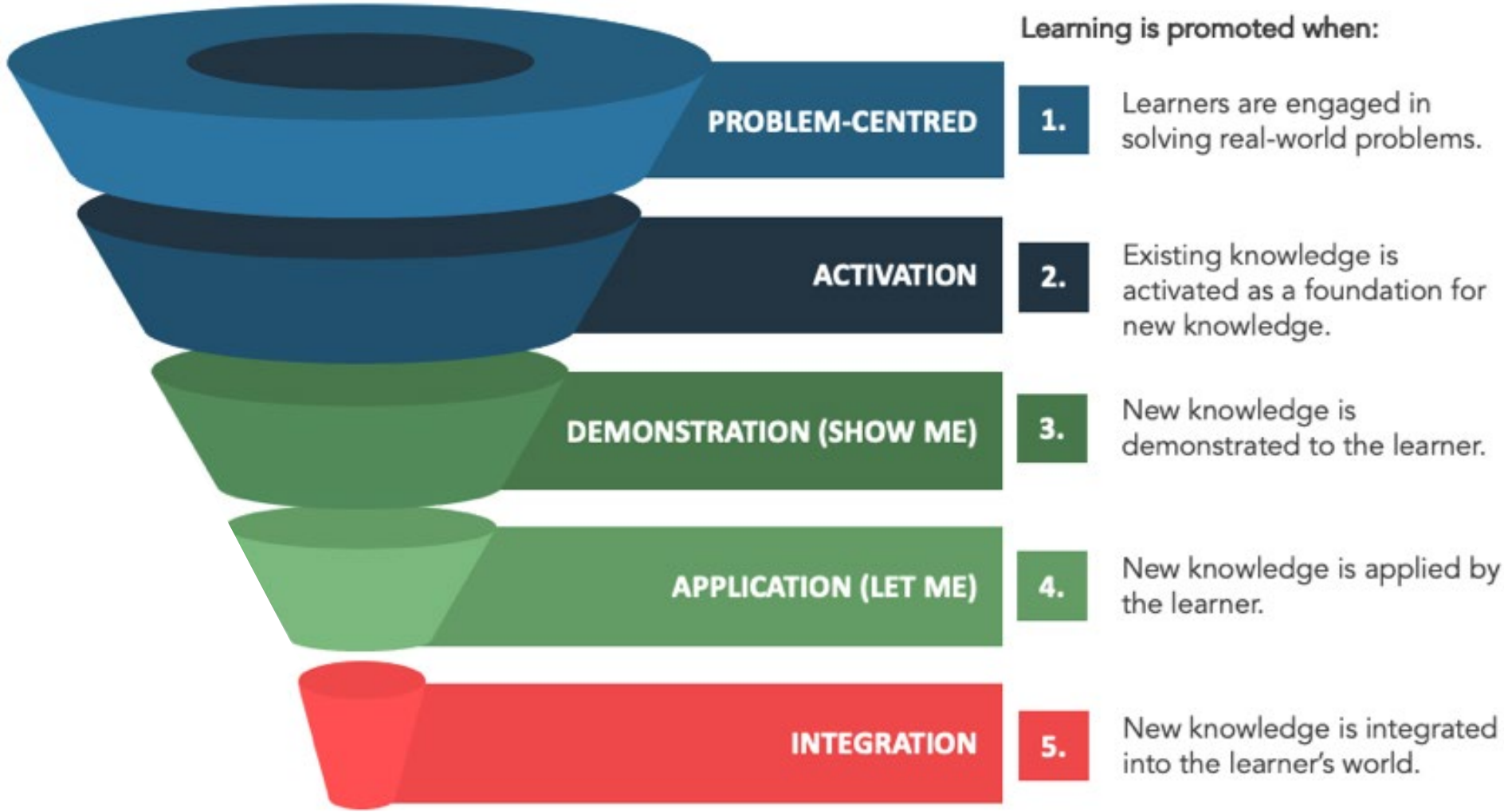
Instructional design (Merrill's, 2002)



Source: https://instructionaldesign.com.au/merrills-instructional-design-principles/

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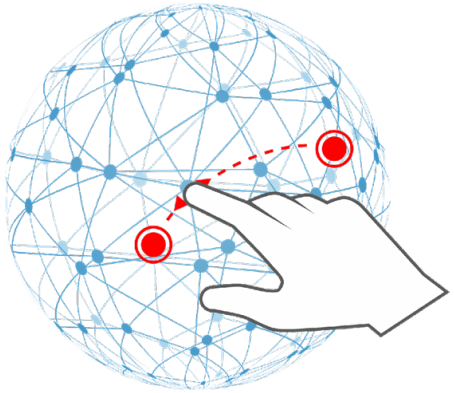
9 events of instruction (Gagne et al, 1992)

(https://www.coursearc.com/gagnes-nine-events-of-instruction/)



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