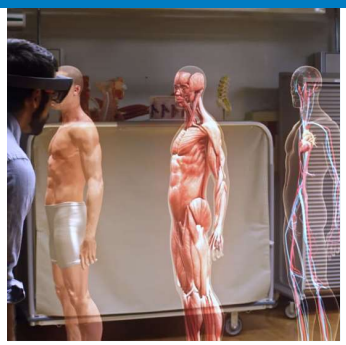
Leids Universitair Medisch Centrum

Educational technologies shaping the health sciences curriculum of tomorrow

VII INTERNATIONAL CONFERENCE ON MEDICAL EDUCATION
Puerto Vallarta, June 17, 2022



Peter GM de Jong, PhD
Center for Innovation in Medical Education
LEIDEN UNIVERSITY MEDICAL CENTER

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Editor-in-Chief *Medical Science Educator*
President-Elect 2022-2023
International Association of Medical Science Educators (IAMSE)

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Technology in Learning

Todays presentation:

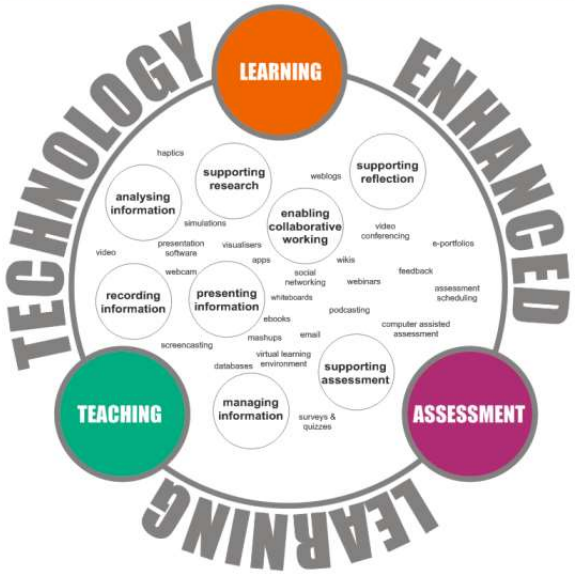
History of technology use in education
How can technology transform education?
How to use it well
Examples in medical education

Technology Enhanced Learning

The application of technology to teaching and learning

Any technology that enhances the learning experience

Technology Enhanced Learning



1. Administrative systems
2. Teaching tools
3. Learning resources
4. E-learning and simulators
5. Collaboration tools
6. Digital testing
7. Distance learning

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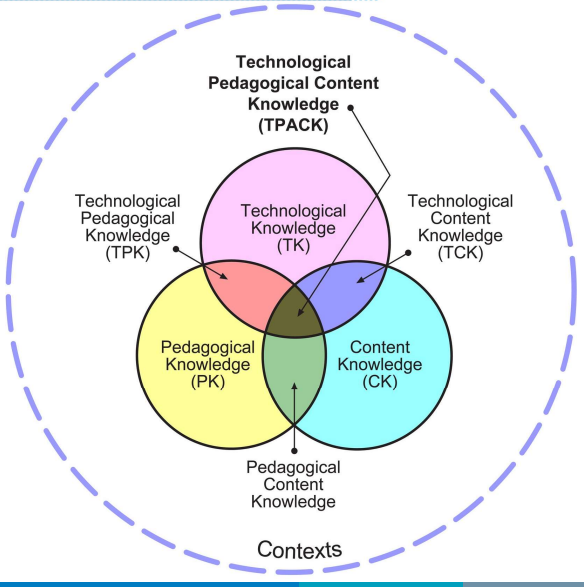
Technology Enhanced Learning

Multiple disciplines involved

TPACK model



Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teachers' knowledge. Teachers College Record, 108 (6), 1017–1054

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Technology Enhanced Learning

Advantages

- To make teaching and learning time and place independent
- To make teaching and learning more active
- To make teaching and learning adaptive/personal tailored
- To create options for distance education
- To teach in new ways impossible without technology

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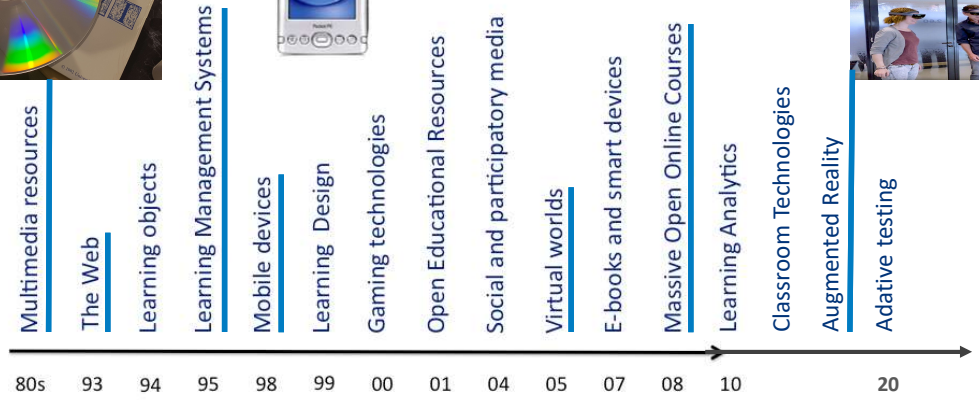
Technology Enhanced Learning Timeline



Adapted from Gráinne Conole and Wilfred Rubens (2014, blog)
https://www.te-learning.nl/blog/de-geschiedenis-van-ict-in-het-onderwijs/

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Theoretical backgrounds on transformation through educational technology

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THE SAMR MODEL

Dr. Ruben R. Puentedura

S **SUBSTITUTION**

Technology acts as a direct substitute, with no functional change

Source: Wikimedia, creative Commons

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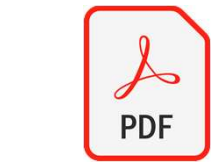
Technology as Substitution

Was:	Becomes:
Lecture	Recorded lecture on demand
Book	PDF file for download
Slides on paper	Slides as PowerPoint file
MCQ Exam on paper	MCQ Exam on the computer
Interview/presentation	Video clip



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THE SAMR MODEL

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Technology acts as a direct substitute, with no functional change

A **AUGMENTATION**
Technology acts as a direct substitute, with functional improvement

Source: Wikimedia, creative Commons

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Technology as Augmentation

Significant enhancements to the student experience

Was:	Becomes:
Book	eBook with multimedia
Slides on paper	Recorded PowerPoint with multimedia and voice over
Exam on paper	Adaptive computer exam with multimedia and feedback
Illustration	Animation
Paper patient case	Computer patient simulation

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ENHANCEMENT

Source: Wikimedia, creative Commons

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M **MODIFICATION**
Technology allows for significant task redesign

ENHANCEMENT

Source: Wikimedia, creative Commons

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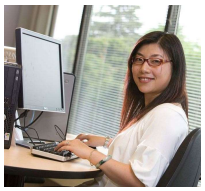
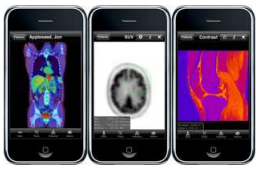
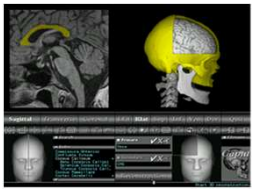
Technology as Modification

Actual change to the design of the lesson and its learning outcome

New:
eModule at own pace/time/ place/level with assignments
Discussion board place/time independent
Online collaboration with peer feedback
Authentic testing







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M **MODIFICATION**
Technology allows for significant task redesign

R **REDEFINITION**
Technology allows for the creation of new tasks, previously inconceivable

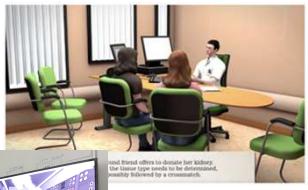
ENHANCEMENT

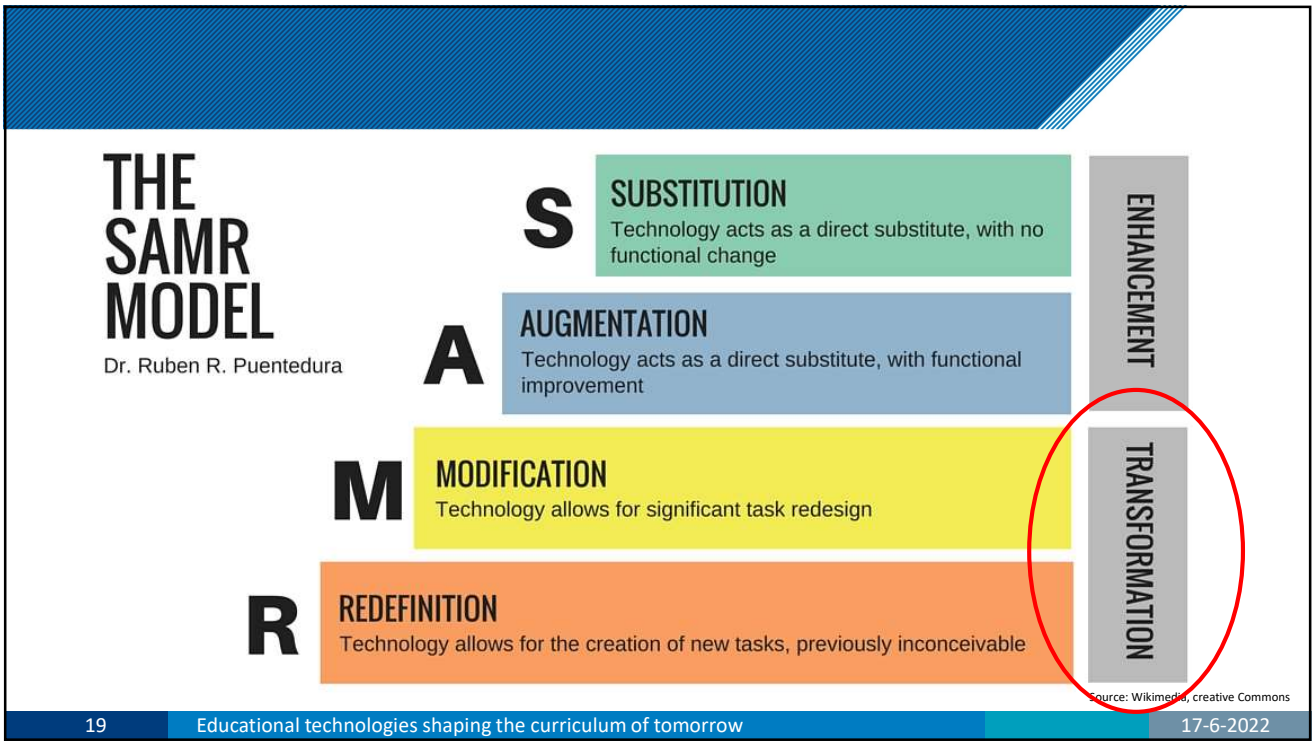
Source: Wikimedia, creative Commons

Technology as Redefinition

Creating a learning experience not possible without technology

New:
Serious game
Virtual Reality
Augmented Reality
3D/360-degree video





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How to use it?

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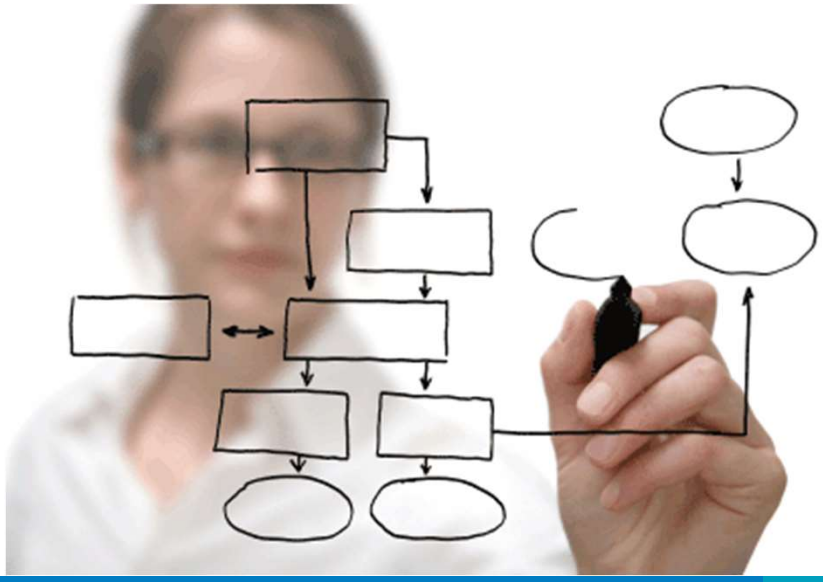
Curriculum design



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Blended Learning

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Blended Learning

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Examples of Technology Enhanced Learning in Medical Education

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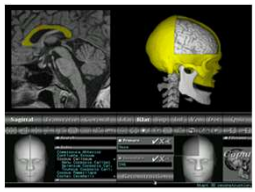
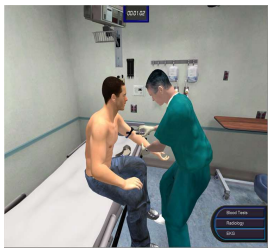
E-learning Modules



E-Learning modules

Simulations & serious games



Laboratory simulations

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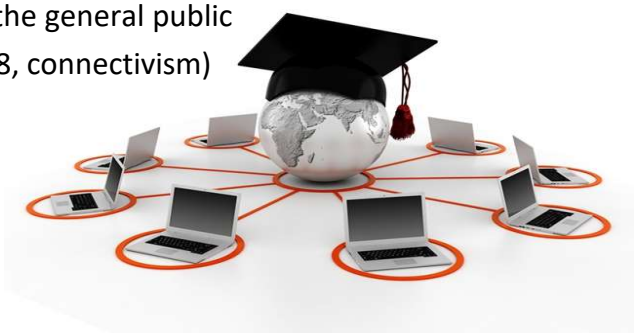
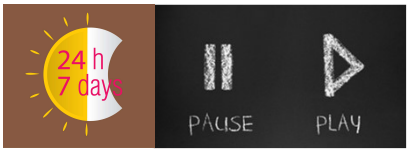
The use of MOOC's in the Curriculum

MOOC's have originally been designed for the general public "outside of university" (Downes, 2005/2008, connectivism)



Characteristics:

- **Online** only
- **Open** – free – no requirements
- Often structured as a classroom course
- **Large number** of participants worldwide



- Study place and time independent
- Study at your own pace

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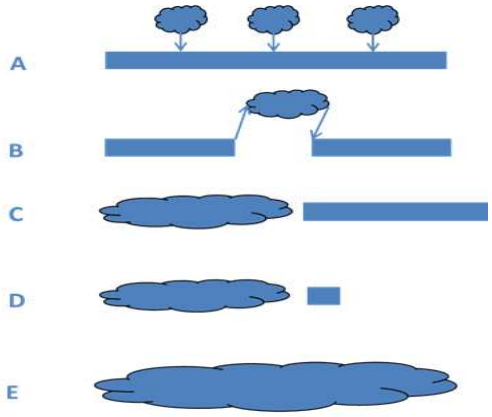
The use of MOOC's in the Curriculum

Integration designs in Campus

A: use as **learning objects**
B: use as **replacement**
C: **required preparation** for a course
D: use as **stand-alone course with assignment**
E: use as **stand-alone online with credits on completion**



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Hybride classroom

Leuven University, Belgium

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Hybrid Classroom

Synchronous education with students in the classroom and on a distance at the same time

- Technically complex
- Didactical challenging
  - *Attention*
  - *Engagement*
  - *Motivation*

Leuven University, Belgium

Proctoring for Digital Testing

From: https://www.ncarb.org/blog/exam-evolution-when-can-we-expect-remote-proctoring

Basic Sciences Podcasts

Use audio recordings to explain anatomy and pathology

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Virtual Reality

Virtual reality (**VR**) is an interactive computer-generated experience taking place within a simulated environment, that incorporates mainly auditory and visual, but also other types of sensory feedback like haptic.

- look around in an artificial world
- move around in an artificial world
- interact with virtual features or items
- transmission of vibrations
- VR headset screen in front of the eyes
- VR room with multiple large screens

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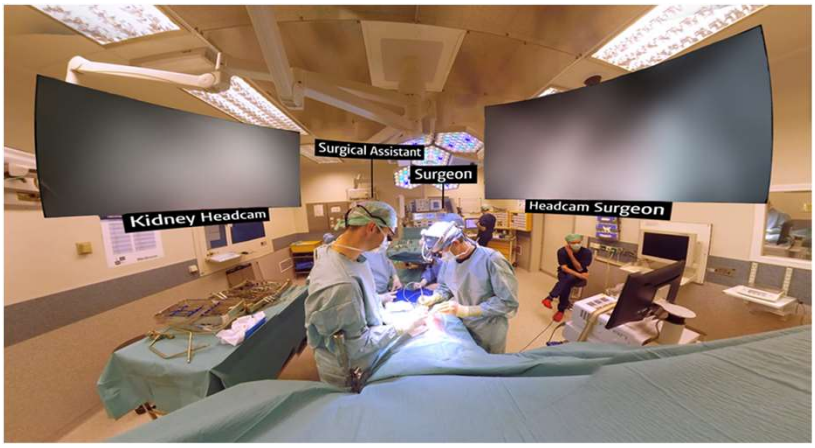
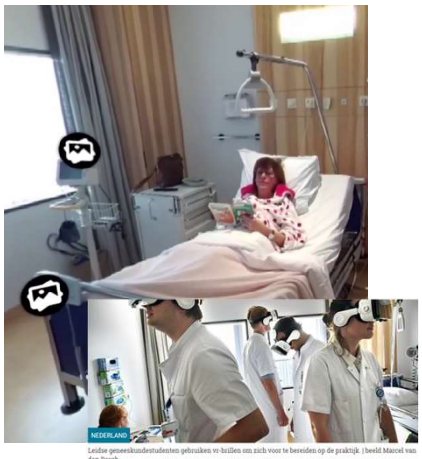
Virtual Reality

Clinical teaching





Leidse geneeskundestudenten gebruiken vr-brillen om zich voor te bereiden op de praktijk. | beeld Marcel van den Bergh

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Augmented Reality

Augmented Reality (**AR**) is an interactive experience of a real-world environment whereby the real-world is "augmented" by computer-generated perceptual information as a layer on top of the real world.

- digital components into a person's perception of the real world
- enhance natural environments
- offer perceptually enriched experiences

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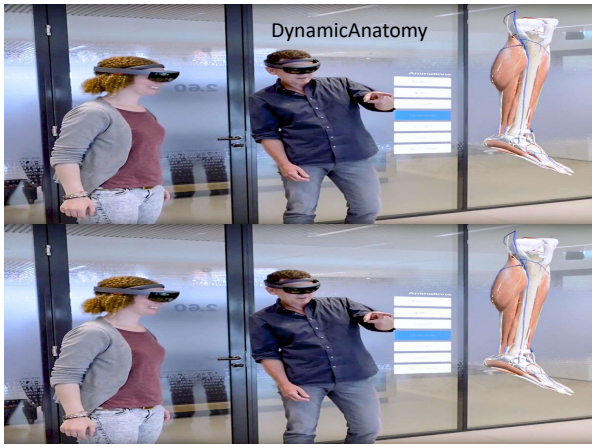
Mixed Reality

Mixed Reality (**MR**) is an interactive experience of a real-world environment where the real-world is "augmented" with computer-generated perceptual information, including visual, auditory and haptic feedback.

- digital components into a person's perception of the real world
- integration of immersive sensations that are perceived as natural
- enhance natural environments
- real world becomes interactive and manipulatable



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Mixed Reality

Augmedicine: Lung cases

Pieterse et al. Design and Implementation of "AugMedicine: Lung Cases," an Augmented Reality Application for the Medical Curriculum on the Presentation of Dyspnea. (2020) Front. Virtual Real. 1:577534. doi: 10.3389/frvir.2020.577534

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Why to use it? Or why not?

> Only if it is useful!

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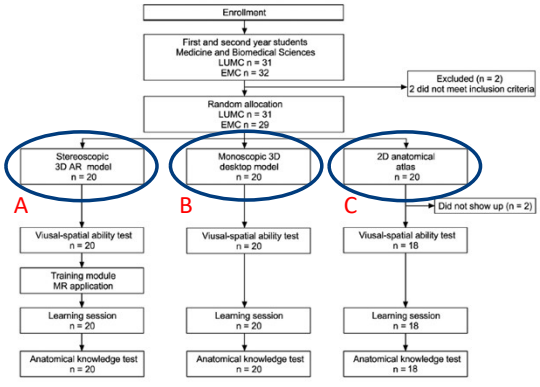
Visual Spatial Ability and 3D learning

MR application *DynamicAnatomy*

- Visual Spatial Ability was measured with Mental Rotation Test (Vandenberg and Kuse, 1978)

58 students, 3 conditions:

A. learning from 3D MR model with Hololens
B. learning from monoscopic 3D desktop model
C. learning from 2D anatomical atlas



Katerina Bogomolova et al. The Effect of Stereoscopic Augmented Reality Visualization on Learning Anatomy and the Modifying Effect of Visual-Spatial Abilities: A Double-Center Randomized Controlled Trial, Anat Sci Educ 0:1–10 (2020)

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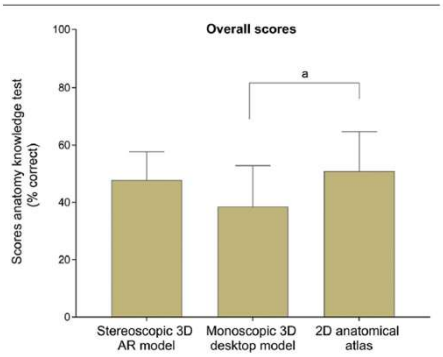
Visual Spatial Ability and 3D learning



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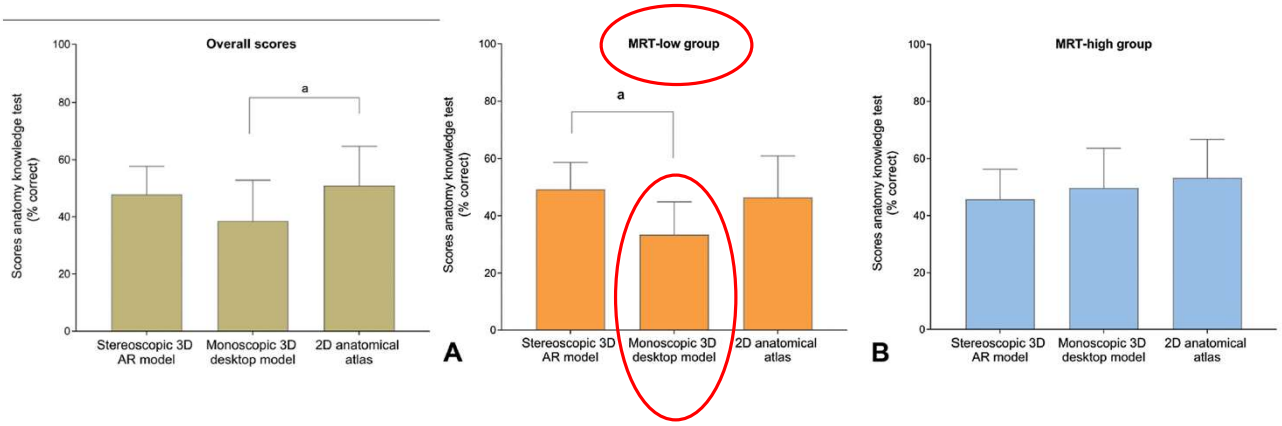
Visual Spatial Ability and 3D learning



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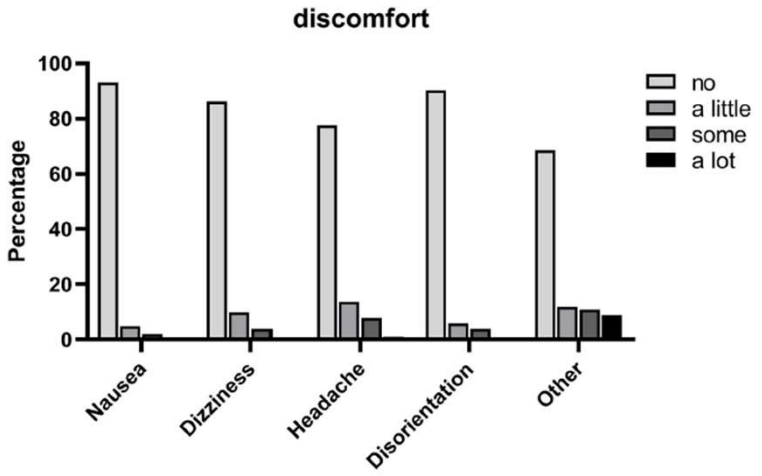
Side effects of Virtual Reality



44.2% no physical discomfort at all; 50% a little to some physical discomfort; 3.8% (4 students) a lot of physical discomfort. Most commonly reported: headache, weight of the headset, dizziness

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Summary

- Technology brings new possibilities to teach
- Develop education technologies in a multidisciplinary team
- Use technology in the correct way in your teaching
- Only use it if it is needed

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Thank you for your attention!

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2023 IAMSE meeting: Cancun

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