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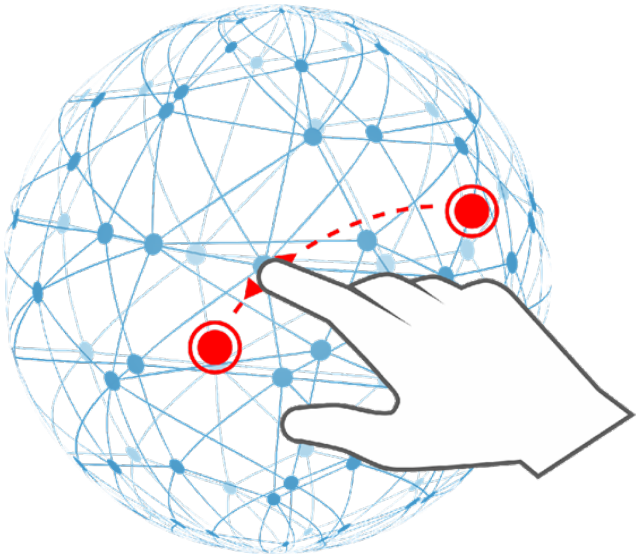

VRinHE

VIRTUAL REALITY IN HIGHER EDUCATION

Module 3

Introduction to VR; terminology, types, devices, applications in HE education

April 24th 2023 | CARDET, UNIC

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Module 3: Introduction to VR

- Do you have any experience with VR?
- Why would you be interested in experiencing VR?

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Learning objectives for this module

By the end of this module you will be able to:

- Define Virtual Reality (VR) and understand its key aspects.
- Identify different types of VR solutions.
- Recognise the challenges associated with the use of VR.
- Describe the potential applications and benefits of VR in higher education.

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What is Virtual Reality (VR)?

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Introduction to Virtual Reality (VR)

Virtual Reality is a powerful medium which "***immerses users in a fully artificial digital environment*** (Tokareva, 2018)", without any visual and auditory interference from the real world.

This happens with the use of ***head-mounted devices (HMD)***, also known as ***VR headsets***.

VR headsets provide simulated ***audio-visual experiences***. VR devices come together with other input devices that allow users to interact with the virtual environment.

The HTC Vive HMD.

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The Key Aspects of VR

- **The effect of immersion**, where the user experiences as “being there” in the virtual environment, is achieved usually through HMDs.
- **A full, freely navigable 360-degree viewport** which is used to realistically visualise the virtual environment, objects, other VR users.
- **Human-machine interactions** that provide complete freedom for the user to manipulate the perceived environment and objects therein.

Wu, B., Yu, X., & Gu, X. (2020). Effectiveness of immersive virtual reality using head-mounted displays on learning performance: A meta-analysis. *British Journal of Educational Technology, 51*(6), 1991-2005.

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VR Head-Mounted Displays (HMDs)

VR headsets can be divided into three categories:

- **Tethered/PC-Based VR Devices**
  - HTC Vive Pro 2
  - PlayStation VR
  - Valve Index
- **Smartphone-Based VR Devices**
- **Standalone Devices**
  - Oculus Quest
  - Oculus/Meta Quest 2
  - Meta Quest Pro

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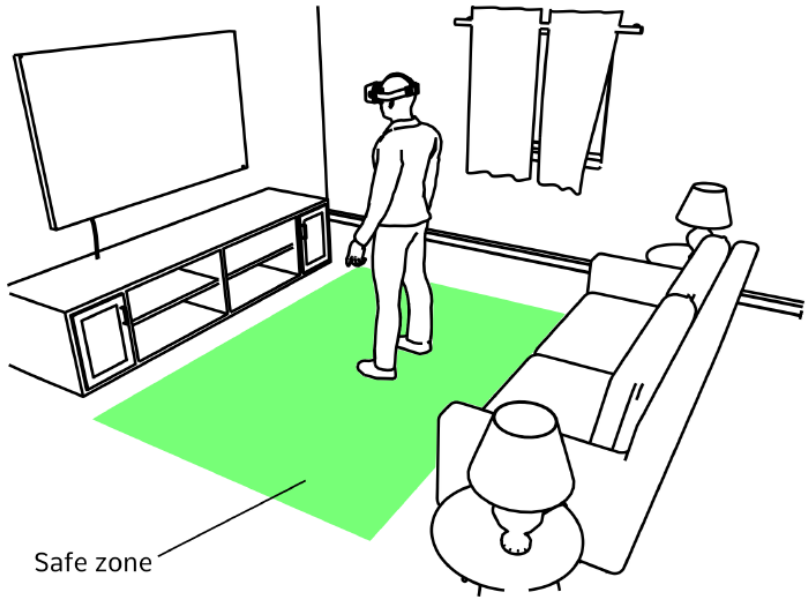
VR Equipment

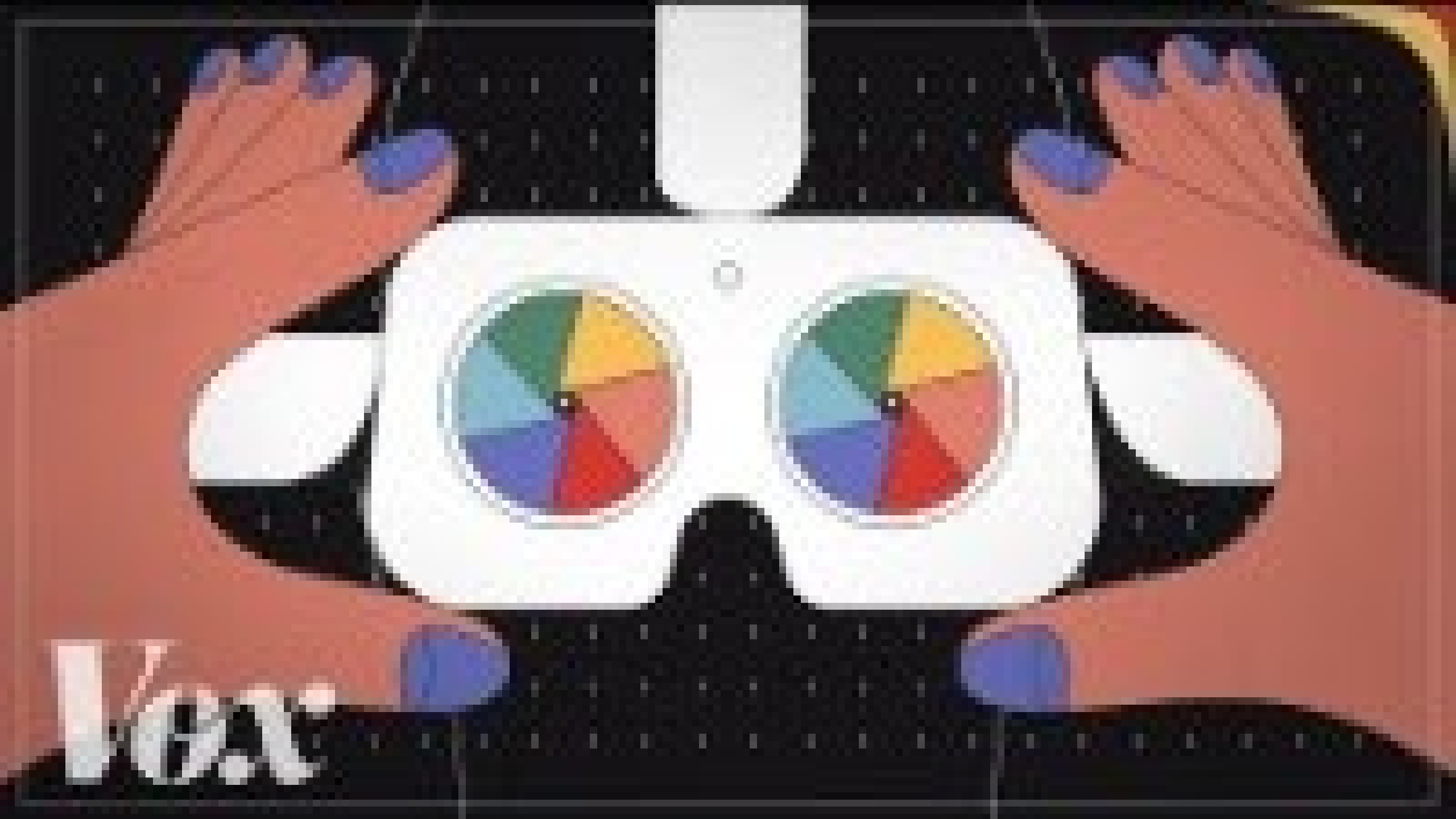
Key hardware properties to choose an appropriate hardware solution

An example: how typical VR HMDs works:

1. User wears the headset.
2. The user sees the dynamic stereogram through the lenses which is formed out of two separate and slightly offset images for the left and right eyes.
3. The headset blocks the surrounding environment. The user is immersed into the artificial environment.
4. The tracking technology (be it outside-in or inside-out tracking) follows the user's movements to accurately change the viewpoint in the artificial environment.
5. The user observes and interacts with the artificial environment.



Using VR in a residential environment. It is important to mark the safe zone before running immersive content in the HMD.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What are the most relevant or important hardware properties and other VR aspects are to your specific educational context or discipline, or your work in general?

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VR Equipment

Room scale, locomotion and teleportation

Room scale refers to the ability of the VR system to track the movements of the user in a large area. It is supported by practically all modern AR/VR devices.

While room scale tracking clearly provides benefits in making movement in the virtual environment realistic, it also presents a challenge as **the safety of the user must be ensured**.

The motion controller—a device that allows to manipulate the VR environment— let the user choose the location in the virtual world that is one of the most common techniques to overcome this challenge. If it is an allowed target area for the teleport jump, the user is instantly transported to the desired location.

Teleportation, therefore, solves the issue of limited space while still allowing the user to naturally navigate the environment in the confines of the safe zone. There is also a drawback, however—teleportation is by no means a common real-life experience, hence constant use of it contributes to breaking immersion.

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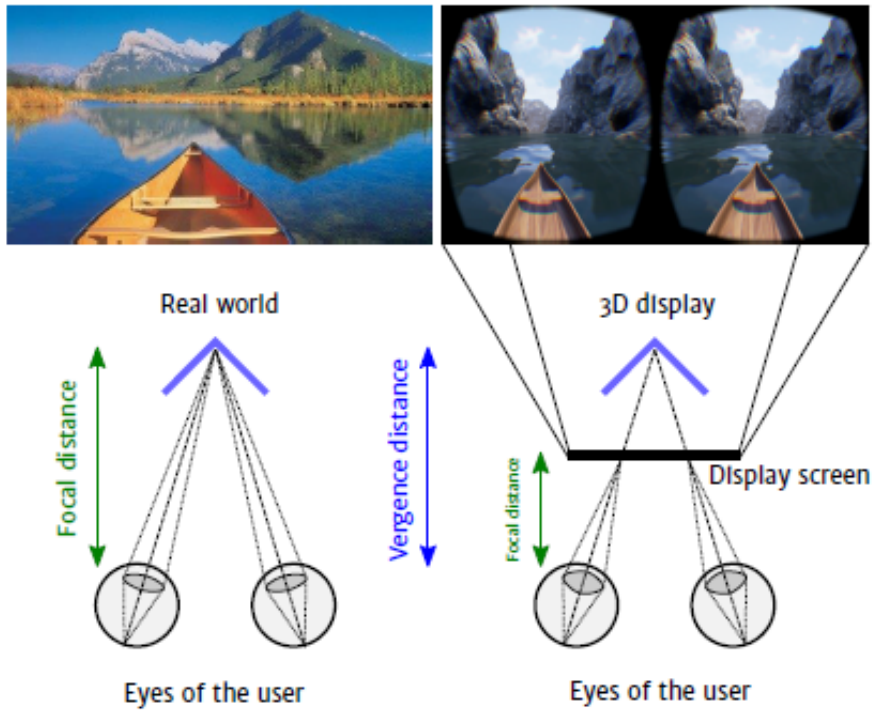
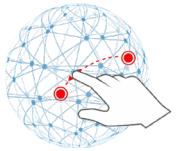
VR Equipment

Key challenges of VR Equipment use

- Motion sickness
- Tracking and display delays
- Fatigue
- Hygiene
- Injuries during use
- Field distance and vergence distance conflict



Differences in the visual system when looking at real world objects and when using an HMD. Cross-eye method also works for the boat stereogram on the right.



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Virtual Reality in Higher Education

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Benefits of VR in Education

- Easy access
- Interactivity / gamification
- Immediate engagement
- Improves social skills

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VR in Higher Education

VR has a wide range of potential applications in higher education, including:

- Enhancing student engagement and motivation
- Providing immersive learning experiences
- Simulating real-world scenarios for hands-on training
- Facilitating collaborative learning and teamwork

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VR Applications in Higher Education

VR has a wide range of potential applications in higher education, including:

- Medical training simulations
- Engineering and architecture visualisations
- Language and culture immersion
- Historical and archaeological recreations

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Challenges of VR in Higher Education

There are also several challenges to using VR in higher education, including:

- High cost of hardware and software
- Lack of accessibility for students with disabilities
- Integration with existing curriculum and technologies
- Limited research on the effectiveness of VR in education.

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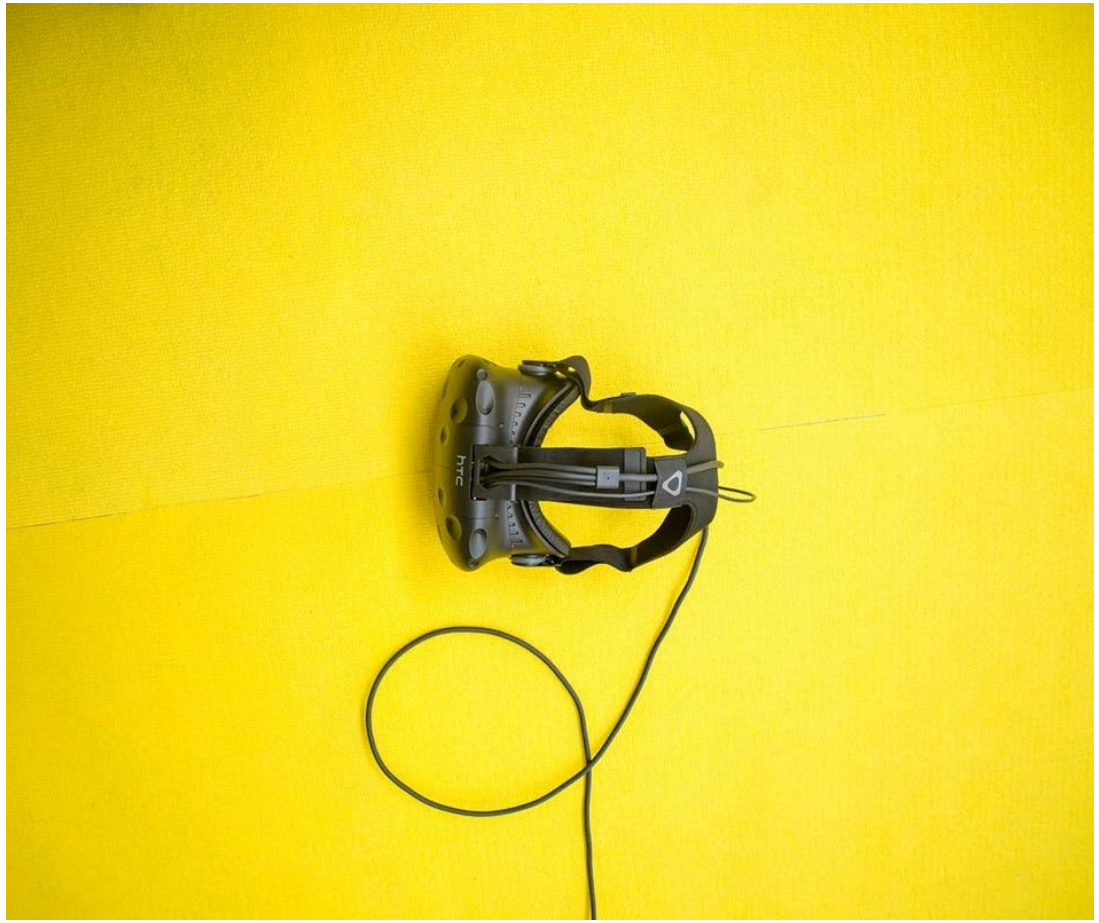
Potential Use Cases for VR in Higher Education

There are many potential use cases for VR in higher education, including:

- Simulations of scientific experiments and procedures
- Virtual field trips and explorations
- Virtual reality language labs
- Training simulations for emergency response



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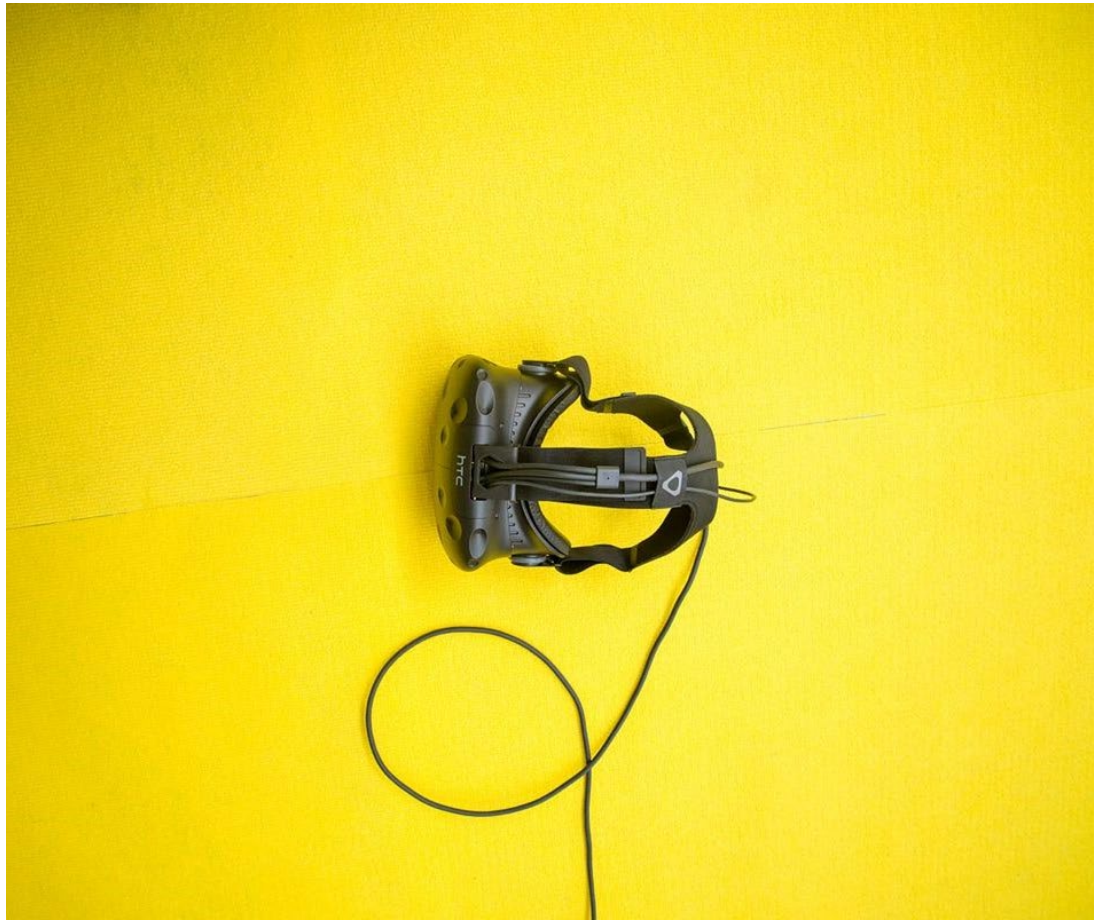
Best Practices for VR in Higher Education

To ensure successful implementation of VR in higher education, consider the following best practices:

- Conduct a needs assessment to identify areas where VR can provide the most benefit
- Develop a clear plan for integration into the curriculum
- Provide adequate training and support for faculty and students
- Ensure accessibility for students with disabilities
- Regularly assess and evaluate the effectiveness of the VR implementation



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Which of the following is NOT a type of VR Head-Mounted Display (HMD)?

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What does room scale refer to in the context of VR equipment?

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Which of the following is a challenge of VR in higher education?

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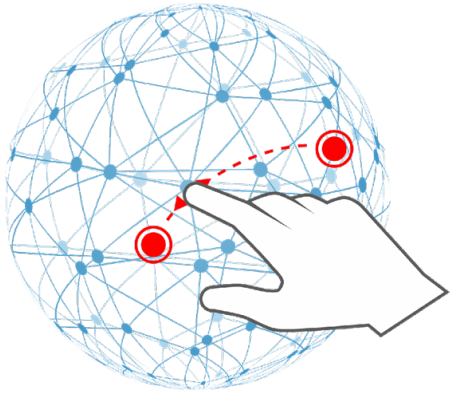

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