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Teaching Methods With VIRTUAL REALITY

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WHAT'S ALL THE FUSS ABOUT

VR, AR, MR & XR

Virtual reality (VR) involves immersing users in computer-generated environments that simulate real-world settings. Users typically engage with these environments using VR headsets and accompanying equipment, such as joysticks, to interact with the simulated world.

Despite its futuristic appeal, VR has roots tracing back further than many realize. The Sensorama, a machine featuring an integrated seat that showcased 3D movies, emitted scents, and generated vibrations for an enhanced experience, is often regarded as one of the earliest VR devices, emerging in the 1950s. Over the ensuing years, advancements in software and technology have led to gradual enhancements in interface design and device capabilities.

Nowadays, VR finds applications across diverse fields such as gaming, healthcare, and education, yet its complete potential is yet to be fully realized. When discussing VR, it is essential to differentiate it from related concepts, such as XR, AR, and MR, all of which involve the fusion of reality and computing. So, what precisely defines VR, and how does it set itself apart from these other technologies?

VR (Virtual Reality) is a fully artificial digital environment that blocks out the physical world entirely.

AR (Augmented Reality) overlays digital content onto the real world, enhancing users' perception of their surroundings.

MR (Mixed Reality) merges real and virtual worlds, allowing digital and physical objects to coexist and interact in real time.

XR (Extended Reality) is an umbrella term encompassing all immersive technologies, including VR, AR, and MR.

WHY TO USE VR

How VR can enhance learning

Alright, let's address this upfront: VR is not intended to supplant conventional education nor is it appropriate for every classroom. This technology should be considered a supplementary tool to enhance education across various disciplines, rather than replacing conventional teaching methods. The effective integration of VR into educational settings depends on setting realistic goals, planning carefully, and being clear about its application. When used correctly, VR can unlock a plethora of opportunities and provide unique benefits that traditional methods may lack.

One of the most significant benefits of VR is its ability to engage students. It introduces a novel element to the classroom, serving as a powerful catalyst for learning by immersing students in experiences. With VR, students can participate in events rather than merely reading about them or watching them unfold on video.

Unlike other media, VR can invoke vivid memories, create immersive sensory experiences, and foster empathy and emotional connections. This makes VR particularly valuable in fields where evoking strong emotions or recognizing and addressing them is key, such as marketing, management, or healthcare.

Additionally, VR excels in making abstract concepts tangible and comprehensible. It can transport students inside a gigantic microscope to observe subatomic particles, immerse them in pivotal historical events or places, or introduce them to individuals impacted by environmental issues or global crises. As traditional methods have effectively taught subjects like subatomic particles for years, it is clear that using VR is not a must. However, incorporating VR can significantly enhance the educational experience by bringing abstract concepts to life and engaging students in a deeply immersive way.

VR could become a vital skill across various fields in the future. Given its status as an emerging technology, its full impact remains uncertain. So, it is important to start preparing now. In this brief guide, we provide insights, suggestions, and practical examples to help you integrate this exciting technology into your teaching.

WHEN TO USE VR

Ask yourself, "Why incorporate VR?"

We firmly believe in using technology to enrich education with meaningful learning experiences, prioritizing substance over novelty and excitement. So, before you commit significant time to preparing your VR class—an endeavor that undoubtedly requires some effort—we recommend a moment of reflection.

Ask yourself, "Why incorporate VR?"

Will it truly add value for the students, or could the same objectives be more effectively achieved using conventional methods? This introspective approach ensures that the integration of VR into your curriculum is purposeful and genuinely enriches the educational experience, whether for practical or engaging purposes.

If you decide to incorporate VR into your teaching, the next step is to clearly outline your goals and objectives. These could focus on delivering specific course-related knowledge to students, such as complex scientific concepts, historical events, or artistic techniques. Or, you might focus on developing transferable skills that are valuable across various professions. For example, you might use VR to enhance language abilities, improve networking techniques, or refine presentation skills. Establishing these targets early on will help you create a focused and effective VR learning experience that aligns with your educational aims.

PREPERATION

Prepare thoroughly and always have a plan B

Preparing for a VR teaching session, much like any other session that relies on technology, demands meticulous planning and coordination. There are numerous components to consider, and even well-planned sessions can encounter unexpected issues. Prepare thoroughly and always have a plan B—or even a plan C—in place to swiftly and effectively manage any issues that might arise. Here is how you can get ready for your VR class:

1

Get your technology ready

2

Take care of logistics

3

Structure your session

4

Choose the software

1 Get your technology ready

Internet

VR headsets require an internet connection to function properly. To minimize potential streaming issues during your session, consider downloading the VR experiences directly onto the devices. VR headsets managed by Åbo Akademi University (ÅAU) come with pre-configured Wi-Fi settings, so you do not need to worry about setting up the network. However, if you are using a VR headset that is not managed by ÅAU, make sure to connect it to the Åbo Akademi Guest Wi-Fi for a smooth experience.

VR glasses

At our XR labs we currently have:

XR lab in Turku	XR lab in Vaasa
1 Microsoft HoloLens 2	10 Meta Quest 3
10 Meta Quest 3	4 Varjo XR-4
6 Varjo XR-4	
2 HP Reverb G2 (Windows Mixed Reality)	

At ÅAU, technology is frequently updated, so it is essential to verify which models are available and suitable for your intended use.

Headphones

Headphones are recommended to minimize distractions and enhance immersion in the VR environment. For hygiene reasons, it is advisable for users to bring their own headphones with a 3.5mm cable; Bluetooth-enabled headphones are not advised.

Other materials

For some software, like VirtualSpeech (for more see the practical example on page 15), effectiveness is enhanced when students prepare beforehand. Before using VirtualSpeech, students must prepare a presentation and potentially upload slides and notes. It is crucial to communicate any preparation requirements for VR software well in advance to ensure readiness.

2 Take care of logistics

Booking spaces

While many VR experiences do not necessarily require a specialized lab, it is crucial to book adequate and appropriate rooms for these sessions. If feasible, consider reserving multiple rooms to facilitate simultaneous sessions, which can greatly enhance the efficiency of your VR teaching initiatives.

When booking additional rooms beyond the dedicated XR lab, ensure that these spaces offer privacy. This is particularly important if the rooms have glass walls or are in high-traffic areas, as the visibility into these rooms could compromise the psychological safety of participants using the VR glasses. Consider printing out notices and placing them on the doors of the rooms where the VR sessions will take place. These notices should clearly inform everyone that a VR session is currently in progress and specify the hours during which entry should be refrained.

On ÅAU's intranet, you should also check which rooms are compatible with XR devices, ensuring they have Wi-Fi and screencasting capabilities.

Access

Ensure that both you and your students have access to the XR lab or the rooms where the session will be conducted.

3 Structure your session

Pedagogical approach

When selecting a pedagogical approach for your learning objectives, consider the effectiveness of the flipped classroom model, especially when incorporating VR software. This approach involves students independently engaging with instructional content before class, freeing up class time for interactive activities. By combining flipped learning with VR software, students can explore concepts independently and then immerse themselves in the virtual environment during class.

Session length

To avoid overwhelming students and to maximize the impact of the VR experience, consider conducting short sessions, ideally around 15 minutes each.

Pedagogical assistance

Determine how many assistants you will need to help manage the students and equipment during the session. Plan who will assist whom, ensuring all students receive the necessary support.

Technical assistance & VR usage

For any questions related to VR (and other XR technologies), you should consult ÅAU's XR intranet pages. These pages offer detailed information on using XR headsets, troubleshooting tips, and best practices.

4 Choose the software

Finding and selecting software

Explore different sources to find the VR software that aligns best with your educational objectives. You can review the suggested platforms below, consult the ÅAU's XR intranet pages or chatbot, or seek guidance from digimentors at ÅAU.

	Types of resources	Web page
Meta (Oculus) store	VR apps, games, interactive videos	www.meta.com
Steam store	VR games, interactive videos	www.store.steampowered.com
SIDEQUEST	VR games and experiences	www.sidequestvr.com
YouTube VR	VR videos and experiences	www.youtube.com/@360
CTRL Studio	Creating your own XR-content	https://ctrl.studio/
Engage	Eduverse and content creation	https://www.engagevr.io

Preloading content

To ensure smooth operation, preload the VR experiences onto the headsets. ICT services at ÅAU manages the VR headsets using management systems, taking care of content installation and configuration. If you need to install specific software on the VR headsets or computers in the XR lab, please reach out to ICT services for assistance.

Practice

Each VR software is different so it is important to practice using the software a few times yourself before the students arrive. This way you can also identify any potential issues that might arise during the session.

DURING THE VR SESSION

Give clear instructions

Every VR session should start by giving clear instructions to students. Here are a few points you might want to touch upon in your instructions:

Zone	Explain to the students that they need to remain within a pre-defined zone to properly use the VR software. If they see blue lines appearing around them or suddenly view the real world despite wearing the VR glasses, this indicates that they have stepped outside of the designated area. They should return to the zone to continue their VR training.
Handling joysticks	Provide a short explanation of how to use the joysticks and what each button does.
Adjusting volume	Teach participants how to adjust the volume on their headsets.
Pre-screening videos	If your session includes introductory videos or instructional content, consider showing these in advance.
Behavioral guidelines	Clearly communicate expectations about behavior during the VR experience. Encourage participants to be mindful of others by maintaining quiet if they finish their tasks early or need to leave the room.

Safety

- Unless the VR experience, such as “The Key” used in the Effects of Marketing course, specifically recommends standing, advise participants to remain seated.
- Encourage students to keep hand and leg movements minimal to prevent accidental strikes or falls.
- Motion sickness is real. Inform students about it and instruct them to remove the VR headset at the first sign of discomfort. Once the headset is off, they should sit or lie down in a comfortable position and notify the teacher or facilitator. Consider having anti-nausea medication available, particularly for longer sessions or more intensive VR experiences.
- Implement a “buddy” system where students are paired to monitor each other. This is particularly beneficial in courses with many students or smaller XR labs where the teacher cannot observe all students simultaneously. Partners can help ensure that their counterpart does not inadvertently move out of a safe area or interact hazardously with the environment or other students.
- Before to any VR session, ensure that the area is clear of obstacles that could pose a risk. Remove any unnecessary furniture and secure loose cables to prevent tripping. At ÅAU Turku lab we have soft pads that could be placed on the floor. This could indicate to students where they should stand.
- To minimize the risk of tripping, make sure to place all outerwear and bags in the lockers next to the XR lab.

AFTER THE VR SESSION

Encourage deep reflection and critical thinking

Integrating VR sessions into your teaching requires thoughtful planning to ensure they are not only engaging but also pedagogically effective. To maximize the educational value of VR experiences, consider implementing complementary activities that encourage deep reflection and critical thinking. Below you will find some examples of these activities:

Guided reflection

After a VR session, you, as a teacher, could facilitate guided reflection. This could involve prompting students with specific questions related to the VR content, asking them to connect the experience with course materials, or discussing how the VR experience changed their understanding of the topic.

Group discussion

You could organize small group discussions where students could share their insights and diverse perspectives. This might be especially suitable for courses with more than 40 participants.

Reflection papers

Another option could be assigning students to write reflection papers where they analyze their VR experience in the context of the course content.

Project-based assignments

One could extend the learning from the VR session into a project-based assignment where students can apply what they have learned in a practical, creative way.

Practical VR Teaching Examples from Åbo Akademi University

Small-sized course (up to 25 students)

Introduction to Marketing 2023 by Ilia Gugenishvili

Objective: Training in Soft Skills
VR software used: VirtualSpeech
This software allows soft skills training. These skills include presentation skills.

Implementation details

The course began with students forming small groups (3-4 members) to brainstorm startup ideas. Throughout the course, key marketing topics were introduced. Each group developed a marketing plan for their startup, which they refined during the seminars. The course culminated in a seminar, where industry experts and marketing researchers attended student presentations and gave feedback. VirtualSpeech was used to prepare for these final presentations. This VR training was strategically scheduled later in the course once the marketing plans were nearly finalized.

Logistics and preparation

- Students were instructed to prepare for their presentation training in the VirtualSpeech. The software cannot analyze the content without it being presented by the student first.
- The training schedule was pre-set and students were allowed to choose the individual training time slots in advance.
- Students were required to submit their slides and notes in advance.
- Since the students were required to present, the teacher chose to conduct independent sessions where students were given instructions and then left alone to practice.
- Pre-defined questions may be submitted by the teacher to VirtualSpeech but we opted not to.

Mid-sized course (up to 40 students)

Effects of Marketing 2024
by Ilia Gugenishvili & Katayoon Pourmahdi

Objective: Building empathy and understanding what marketing variables mean
VR software used: The Key
This interactive software illustrates the global refugee crises from the first-person perspective.

Implementation details

The course starts by discussing consumer behavior and the importance of empathy. It then covers descriptive, predictive, and prescriptive analytics. The VR experience was introduced right before discussing variables to engage students and provide a concrete example of empathy in consumer interaction. Students were divided into two groups; one engaged with the VR content while the other discussed pre-exposure discussion questions. Then the first group continued with discussing post-exposure discussion questions, while the second group engaged with the VR content.

Pre-exposure discussion questions:
1.How do personal beliefs and experiences affect the way people view and reach nonprofit marketing?
2.How do feelings like trust, empathy, kindness, and fear affect how people feel about refugee issues and respond to marketing about them?

Pre-exposure discussion questions:
1.How did the VR content make you feel, and what influenced your perception and reaction to this nonprofit marketing content?
2.How can marketers make their messages about refugee crises more personal and engaging, considering that different people have different needs and preferences?

The rotation ensured all students had an opportunity to view the content and then engage in a classroom discussion. During this discussion, students identified independent variables (e.g., empathy, VR content appeal, guilt) and dependent variables (motivation to donate, motivation to help, engagement) that the VR content intended to influence. This exercise not only highlighted the relationships between these variables but also enhanced the students' understanding of how different factors can impact human behavior.

Logistics and preparation

- DUTAR project leader, Tobias Andtfolk, pre-downloaded the VR content into headsets and pre-set the zones in the VR lab.
- Students were pre-grouped so the entire group was divided equally.
- Several assistants were pre-instructed on their tasks (e.g., leading the second group of students to the VR lab)
- Students were given detailed instructions on their tasks and the teacher and assistants remained in the room to address any immediate issues.

Large-sized course (up to 90 students)

Atomstruktur och kemiska egenskaper
by Thomas Sandberg & Lisa Asplund

Objective: Understanding molecules and molecular modeling
VR software used: Nanome
This software allows for collaboration and learning about various topics and concepts of chemistry.

Implementation details

This is a basic course in chemistry, compulsory for first-year students in chemistry as well as second-year students in geology and cell- and molecular biosciences. The course starts by introducing the symmetry concept, a little bit of computational chemistry, then focusing on the atomic structure and orbitals. At the end of the course, the solid and liquid states are described in detail. The course constitutes two experimental lab works as well as three computer exercises with the software Maestro by Schrödinger, exemplifying the course contents. The VR software Nanome was used as an extention to the existing computational laborations. The same molecules the students had created and worked with in Maestro were imported into Nanome, which gave the students opportunities to work with them in three dimensions as well.

Logistics and preparation

- DUTAR project leader, Tobias Andtfolk, pre-downloaded the VR content into headsets and pre-set the zones in the XR lab.
- Students were pre-divided into smaller groups and were allowed to choose the training time slots.
- Several assistants were pre-instructed on their tasks (e.g., helping students to familiarize themselves with the software)
- Students were given detailed instructions on their tasks and the teacher and assistants remained in the room to address any immediate issues.

DO YOU STILL HAVE ANY QUESTIONS?

XR intranet pages & assistance

For more information, visit the ÅAU's XR intranet pages. Here you can:

- Consult the **FAQ** section for common queries and solutions related to VR.
- Use the **chatbot** for quick answers and guidance on specific questions.

Equipment malfunction or unresolved issues

If your VR equipment malfunctions or you encounter issues that you cannot resolve on your own, please contact the Helpdesk. The Helpdesk team will assist you in diagnosing and resolving technical problems promptly.

VR (and other XR technologies) in teaching

For further insights into using VR as an educational tool, reach out to the digimentors. They can also advise on which content to use and demonstrate how to effectively utilize this technology and the XR lab.

Preloading content on the VR headsets

If you need to install specific software on the VR headsets or computers in the XR lab, please reach out to ICT services for assistance.

We hope this guide has sparked ideas for incorporating VR into your teaching.
For questions about this guide, reach out to the DUTAR project.

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