

VR for Traffic and Signal Regulations

1. Title of the lesson: Use of VR for TRAFFIC AND SIGNAL REGULATIONS//Trains and traction vehicles using VR
2. Class/Department: 1st grade/ Railway traffic worker (Adult education program)
3. Duration: 120 minutes
4. Description:

1. Understanding of basic terms and types of trains
2. Getting to know the types of towing vehicles and their functions
3. Application of VR technology for interactive learning

5. Specific learning objectives

Knowledge: Understand the principles and procedures related to trains and traction vehicles.

Skills: Develop competence in handling and managing different types of trains through VR simulations.

Application: Apply theoretical knowledge to simulated scenarios using VR technology.

Evaluation: Evaluate the effectiveness of different strategies and techniques in train management using VR.

6. Advantages of using VR:

Safe and controlled environment: VR provides a safe, controlled environment for trainees to practice skills without risk.

Increasing engagement and motivation: interactive VR scenarios increase the engagement and motivation of participants.

Real-time feedback: VR simulations offer real-time feedback, allowing trainees to learn from their mistakes and improve their skills.

Diverse Scenario: Allows trainees to experience different scenarios that may not be readily available.

7. Required materials:

VR headsets with software: Ensure a sufficient number of VR sets with pre-installed software.

VR software module for specific topics: install and prepare modules covering the topics of trains, traction vehicles, numbering and rolling stock traffic.

Provide safety guidelines: provide safety guidelines for the use of VR equipment.

Projector/Demonstration Screen: Set up a projector and screen to demonstrate the content in front of the whole group.

Worksheets and digital tools: prepare worksheets and digital quizzes for knowledge testing and evaluation

Relevant physical models/tools for hands-on teaching: provide train and traction vehicle modules for hands-on demonstration and handling.

8. Lesson content:

1. Introduction to trains (20 minutes)

- definition and basic characteristics of trains
- types of trains according to purpose (passenger, freight, mixed)
- VR activity: virtual tour of the train museum (pre-made content)

<https://store.steampowered.com/app/1160420/EducationXR/>

- EducationXR is an immersive VR, mobile and desktop learning platform focused on training and education. It's core concept is multi device support: Build once, deploy anywhere. Share lessons through our proctoring multiplayer services across devices or go through courses individually.
- EducationXR is an advanced 3D training and education platform. Making education visual and engaging, it enables educators to create, deploy and distribute their immersive creations to VR, mobile, desktop and tablets.

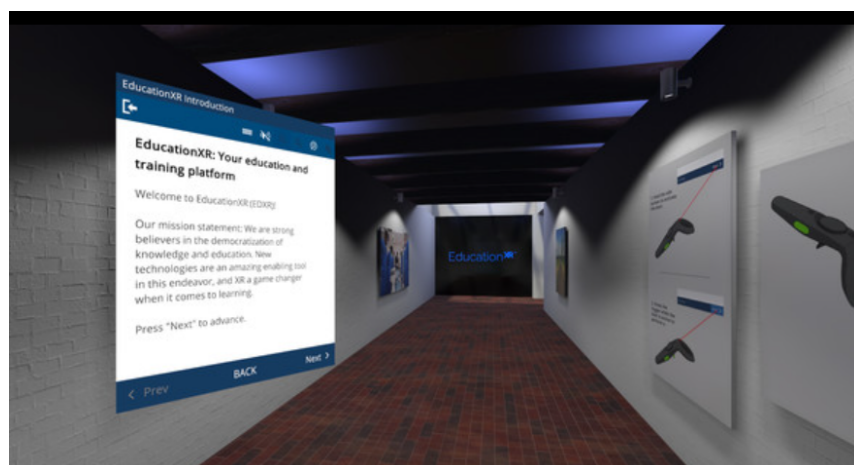


Figure 1 Education XR (source: <https://store.steampowered.com>)

Resources: VR set, computer, presentation

2. Towing vehicle and its types (20 minutes)

- Definition of towing vehicle
- Types of traction vehicles (working and non-working locomotives, in service and out of service)
- VR activity: driving simulation of different types of towing vehicles
[https://store.steampowered.com/app/277777/Train Simulator Weardale Teesdale Netwark_Route_AddOn/](https://store.steampowered.com/app/277777/Train_Simulator_Weardale_Teesdale_Netwark_Route_AddOn/)

- The app allows the user to learn to operate officially licensed locomotives from historic steam to modern day electrics and explore realistic detailed routes from around the world. Train Simulator Classic 2024 is the simulation made by railfans for railfans. Journey to five countries and take a tour of over 450 km of rails. Explore the picturesque North Wales Coast Line in the UK. Travel through the Saxony countryside in Germany with Riesa – Dresden. Head to the USA capital and ride the bustling Northeast Corridor. Race through breathtaking scenery in France with Marseille - Avignon. And discover the stunning Alpine landscape of Austria with Mittenwaldbahn. Officially licensed, authentic and detailed - Climb aboard 12 locomotives in Train Simulator Classic 2024. Push the throttle to experience high-speed with the Amtrak Acela®, Avanti 'Super Voyager' or SNCF TGV Duplex. Keep to time on regional passenger services with locos including the BR Class 158 'Sprinter', ACS-64, and DB BR 442 'Talent 2'. Deliver heavy freight with the versatile DB BR 189 and the ÖBB 2016 'Hercules'.



Figure 2 Train Simulator Classic 2024 (source: <https://store.steampowered.com/>)

[https://store.steampowered.com/app/1422130/SimRail The Railway Simulator/](https://store.steampowered.com/app/1422130/SimRail_The_Railway_Simulator/)

- SimRail is new, advanced railway simulator. Master high-speed long-distance EMU, heavy freight hauls and suburban trains. Travel 500 km of geodetic-data based real routes. Become train dispatcher and control the traffic according to the schedule or

cooperate with other players on multiplayer mode. SimRail is a new era of railway simulators. Realistic driving physics, the environment generated on the basis of geodetic data and an extensive multi-player mode are just some of the elements that game includes. Visit about 500 km of real routes created with all details. Choose present european high speed, long distance and suburban tracks or travel back in time to '80 and drive steam train at sand railway of Upper Silesia, Poland - the socialist land of coal and steel. Includes trains from different eras and drive safely to the final station on time. Most popular steam, diesel and electric vehicles uses realistic physics based on technology known before only in professional simulators for training drivers.



Figure 3 SimRail - The Railway Simulator (source: <https://store.steampowered.com/>)

Resources: Simulator game application, VR set, presentation, computer

Functions of towing vehicles (20 minutes)

- The difference between a working and a non-working locomotive
 - Examples and functions
 - VR activity: view and interact with working and non-working locomotive models
- <https://store.steampowered.com/app/1160420/EducationXR/>



Resources: presentation, computer, VR equipment, application

Motor trains (20 minutes)

- definition of motor vehicles
- types and characteristics
- VR activity: driving a motor train

https://store.steampowered.com/app/1282590/Train_Sim_World_2/

- The app is adding realistic adhesion physics for the first time. Feel the wheelslip and wheelslide in adverse weather and the added challenge of control on steep inclines. Optimised and upgraded visual fidelity also gives Train Sim World 2 dynamic skies and 4K support. Get clearer information on instructions, gradient and speed profiles as you drive, including new HUD displays, clarity to the onboard safety systems, brake controls, power meter and accelerometer. A new controller scheme will give great choices on Camera and Driving modes and allows easier access from external camera mode to enter another vehicle in your consist, all while full physics and simulation are still running.



Figure 4 Train Sim World 2 (source: <https://store.steampowered.com/>)

Resources: Presentation, VR equipment, application, computer

Rail vehicles and traffic (20 minutes)

- organization and management of traffic railway vehicles
- security aspects
- VR activity: simulation of railway vehicle traffic management
https://store.steampowered.com/app/2433610/SUBWAY_SIMULATOR_UNDERGROUND_TRAIN_RIDE/
 - The railway game gives you a chance to feel like a real passenger train driver and explore various train station routes on the subway map. Get a great opportunity to learn how to operate a real passenger train with Subway Simulator. It is undoubtedly one of the most amazing railway games, with the opportunity to choose an underground train and feel like a real train driver. Become part of the ever-evolving subway world! We are sure that everyone will find something for themselves here. Features: Drive trains in 4 different cities, Select one of the 5 available trains that suits you best, Developing skills by passing game levels, 100 levels available, which differ in difficulty.



Figure 5 SUBWAY SIMULATOR: UNDERGROUND TRAIN RIDE (source: <https://store.steampowered.com/>)

Resources: Application, VR set, computer, presentation

9. Evaluation:

- *Observation during VR practice and hands-on activities:* Lecturers observe participants during VR simulations and hands-on activities to assess their skill and understanding.
- *Worksheets or digital quizzes:* Students complete worksheets or digital quizzes after each section to assess their knowledge.
- *Group presentations of projects:* participants work in groups to prepare and present projects related to learned topics.
- *Hands-on demonstration of skills on physical models or tools:* participants demonstrate acquired skills using physical models or tools.

10. Additional Activity:

- *Additional VR modules for sharing and practicing skills:* enable participants access to additional VR modules for further training
- *Encouraging participants to research innovative technologies and present their findings:* preparation of activities where participants research train innovations and present their findings.
- *Organization of visits to relevant objects observation and practice in the real world:* plan visits to railway stations, plants or museums for practical experience.

11. Reflection and feedback:

- *Collect feedback from students about their VR and practical experience:* Use questionnaires or group discussions to collect feedback.



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- *Reflect on lesson effectiveness and identify areas for improvement:* Analyze feedback and evaluations to improve instruction.
- *Discuss how VR can be further integrated into the field education:* Discuss the possibilities of further integrating VR technology into teaching and hands-on training.