

MiGAEI

MINING GAME FOR EDUCATION AND LEARNING



INFO-PACKAGE FOR OPERATORS IN MINING INDUSTRY



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HELLO OPERATORS IN THE MINING INDUSTRY!

Gamification, it seems to be a hot topic on everyone's lips.

The versatile use of technology is an integral part of almost every field, and different technological solutions can promote both the quality of product services and, for example, marketing.

Gamification not only reaches new and younger audiences, but can also raise interest in older audiences. We set out to test these benefits of technology in the mining industry in the Miguel project, in which we have created a variety of game exercises from different work scenarios at the mine.

This information package is made especially for mining entrepreneurs. We briefly present the exercises and the technologies used in them, for which we are happy to receive feedback.

WELCOME TO GET TO KNOW THE PROJECT!

WHAT IS THE MIGAEL PROJECT ABOUT?

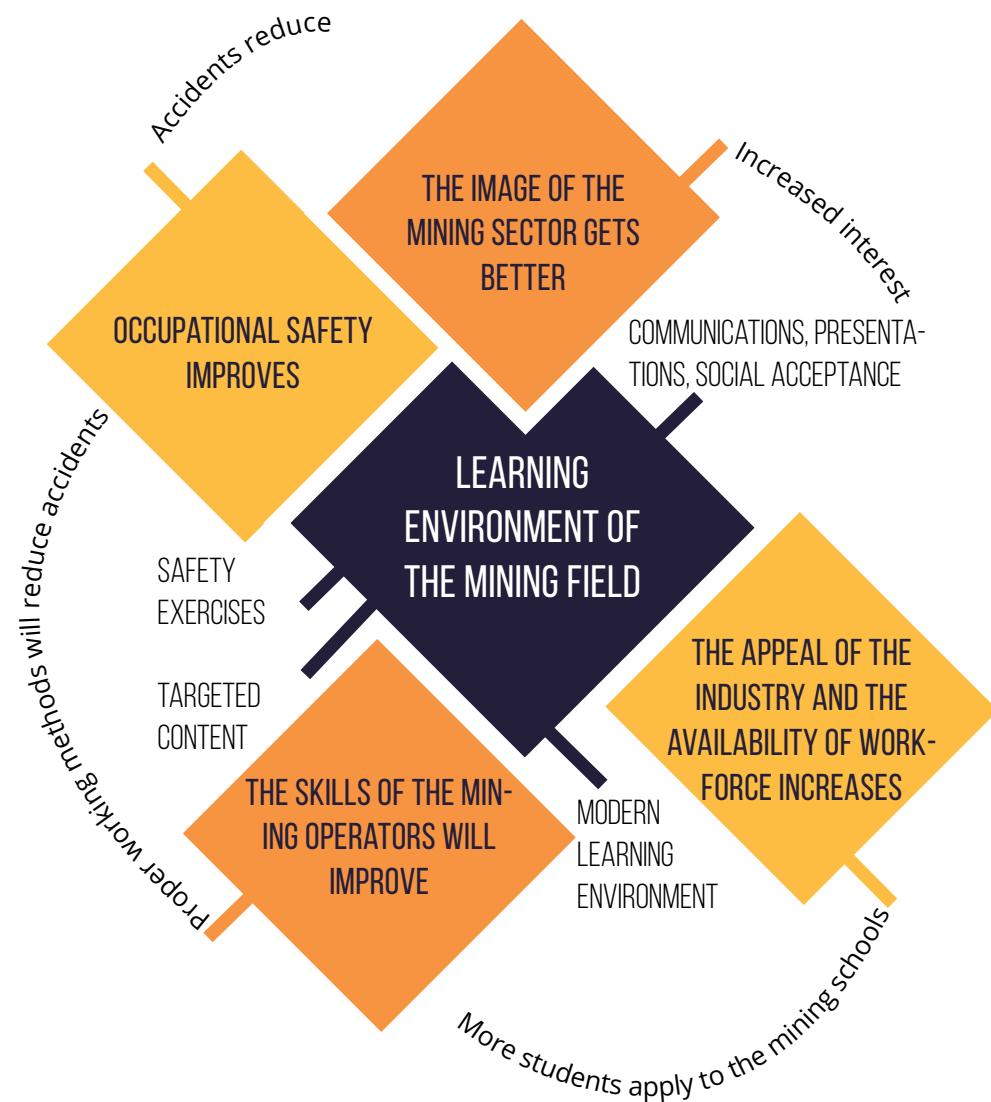
Mining Game for Education and Learning (MiGaEL) is a gamified learning environment that aims to develop mining education by utilizing new technologies. The aim of the project is to develop the skills of those working in the mining sector, to improve the occupational safety of the mining industry, to increase the attractiveness of the field and to promote both the application of students for the sector and the availability of workforce.

Although the main target audience for the game exercises is students in the mining industry, the use of the exercises is not limited to students. Mining operators and experts in the field, regardless of age, are also more than welcome to try out the games. Feedback has been

collected by testing games with a wide variety of audiences, and in addition to improving previous exercises, feedback is taken into account in the development of new exercises.

NOW, WE WOULD LIKE TO INTRODUCE THE GAME EXERCISES FOR YOU, THE OPERATORS IN MINING INDUSTRY, AND HEAR YOUR VIEWS AND FEEDBACK ON THE EXERCISES AND TECHNOLOGIES USED IN THEM!

READ MORE
www.migael.fi/en



1. EXERCISE: CHARGING/BLASTING

PC + VR (RIFT)

Using modern game technology, the first game exercise in Migael was created to be played on a computer and VR set. The exercise lets the player test different charges and examines the extent of the explosion either on a PC or in a VR view.

The exercise is located in an open pit and is designed to visualize the charge and blasting in a virtual environment. The player creates charges on the computer and activates the explosion mode to be displayed either on the computer screen in 3D mode, or alternatively, use a custom control button and watch the explosion with the VR

CHARGING CAN BE DONE ON A COMPUTER



BLASTING CAN BE VISUALIZED ON A COMPUTER SCREEN OR WITH VR GLASSES.



AN EXERCISE LIKE THIS SIMULATES THE CHARGING AND BLASTING IN A MINE, WHICH CAN BOTH SAVE MONEY AND RESOURCES AND PRACTICE THE OPERATION SAFELY.

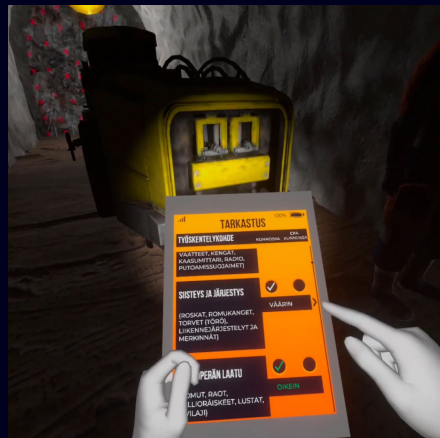
2. EXERCISE: SAFETY CARD

VR (QUEST & RIFT) + ANDROID SMARTPHONE

The safety card exercise moves to an underground mine, and the player has to go through a checklist before underground drifting and mining. The exercise was produced with the Unity 3D game engine and works on both VR and mobile.



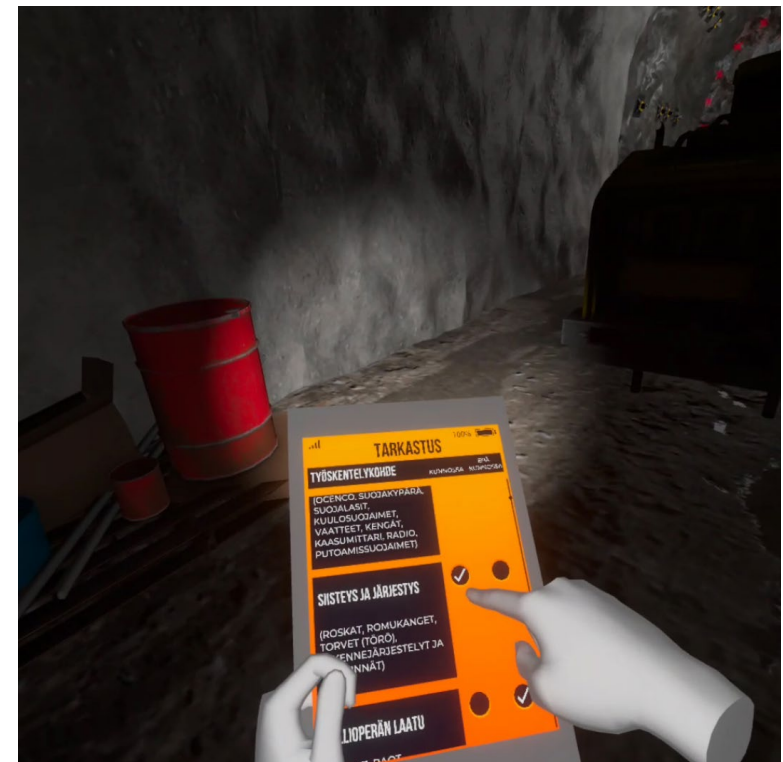
The player moves around the mine and monitors the environment according to the inspection card, such as personal protective equipment, environmental cleanliness and order, access restrictions and markings, the condition of driveways and many other things. The player marks right or out of order items in the list and receives feedback from the game on correct and incorrect answers.



GO CHECK OUT THE
TRAILER!



THE EXERCISE GIVES A PRACTICAL TOUCH TO THE **ENVIRONMENT AND EQUIPMENT USED IN THE MINE**, AND TEACHES TO CONSIDER THE IMPORTANCE OF CHECKING THEIR CONDITION.



3. EXERCISE: DRIVING DEPARTURE

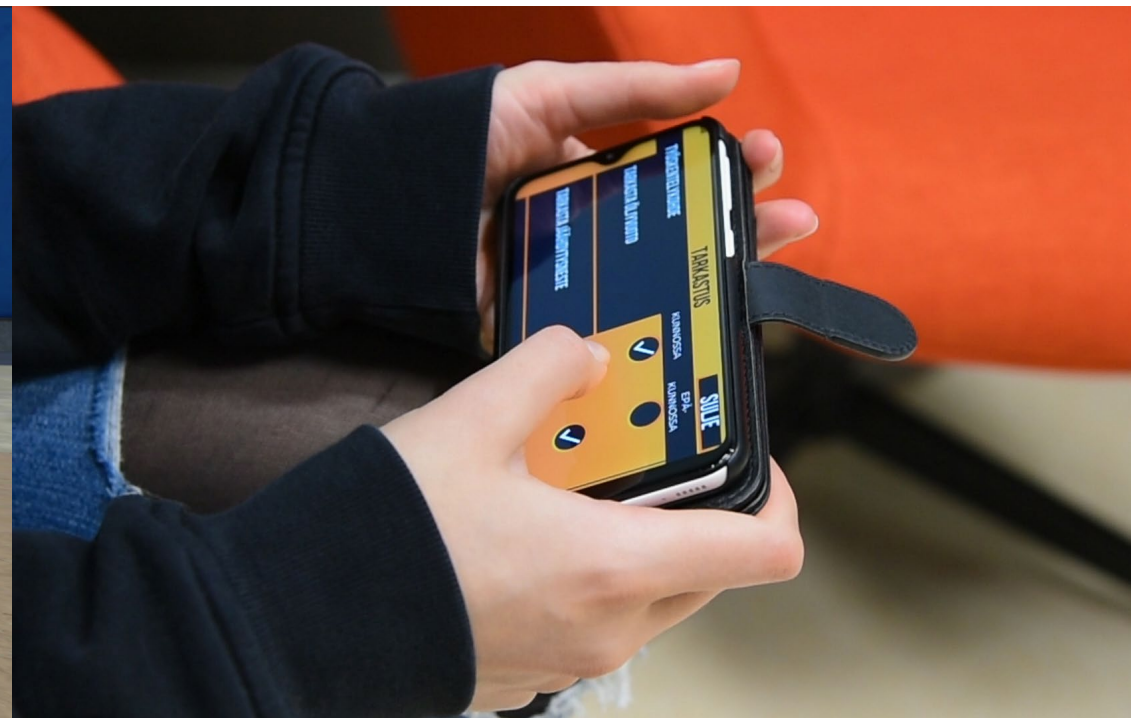
VR (QUEST & RIFT) + ANDROID SMARTPHONE + AR (ANDROID)

The third game exercise returns on top of the ground to check the condition of the mining machine as well as the miner's equipment. The game is playable on both VR and smartphone, and is the fastest to play through of all Migael-exercises.

The player first inspects the miner's equipment and marks them on the checklist. The player can move around the mining machine and check the general condition of the machine, such as gauges and other things. The game gives the player tips and feedback on the checklist answers.



THE EXERCISE FOCUSES PARTICULARLY ON THE CONDITION AND **USABILITY OF THE MINING MACHINE** AND EMPHASIZES THAT THE MACHINE WILL NOT BE PUT INTO SERVICE UNTIL IT IS SAFE AND DRIVABLE, AND THE SUPERVISOR HAS GIVEN APPROVAL FOR THE RIDE.



4. EXERCISE: SAFETY PROCEDURES BEFORE AND AFTER BLASTING

PC

In Migael's fourth game exercise, we took another course with the technology from VR to a traditional computer game since the subject in hand was very versatile. During the game design stage, the project group decided that to learn dozens of different safety actions, it could be done best by doing them yourself – as in, by playing.

A variety of safety measures must be done at the mine before and after the blasting. The player interacts with the objects in the game, answers questions and performs actions according to the answers. In addition to the tips of the game, the player is accompanied by a blasting operative and a mine foreman, who give instructions and feedback on the game actions.



THE GAME IS A CHEERY AND MORE TRADITIONAL EDUCATIONAL GAME THAT IS PLAYED SOLELY ON A COMPUTER.

IT GOES THROUGH A WIDE RANGE OF SAFETY MEASURES FOR BLASTING AND THEIR ORDER OF PRIORITY.



5. EXERCISE: STAGES OF DRIFTING

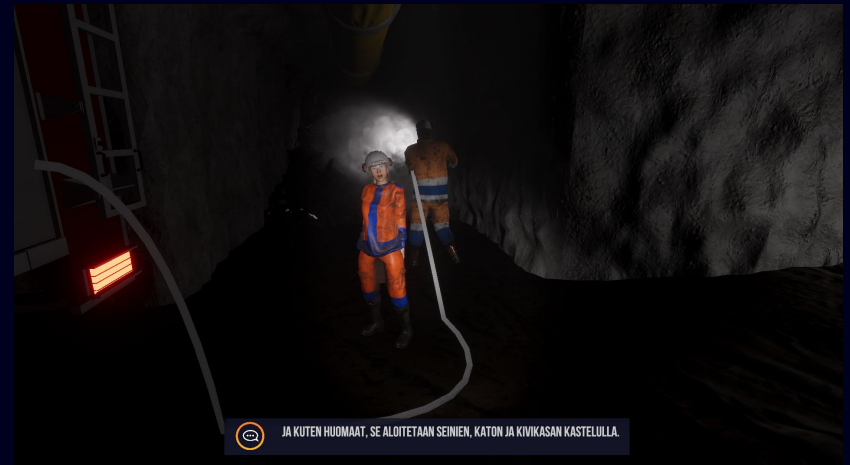
PC + VR (RIFT)

The latest game exercise done in the project goes through the various stages of drifting: surveying, drilling, charging, blasting, loading and transport, scaling and ground support. As the topic area is broad, an interactive story game was chosen as its implementation method. This exercise is also especially suitable for people who have no previous experience with games.

The player can choose which drifting phase they want to play, where the forewoman will instruct the player about the specific phase. The story is told both outside the mine and underground, and the player interacts with both the forewoman and the environment. In addition, the player has a notebook with them and can test their knowledge about each phase with tests.



THE EXERCISE CAN BE PLAYED ALONE ON A PC AS WELL AS ON VR. **STORYTELLING IS A GREAT WAY TO TEACH A WIDE RANGE OF THEORETICAL TOPICS,** AND ACTIVE INTERACTION WITH THE ENVIRONMENT KEEPS THE PLAYER INTERESTED AND AWAKE AT THE SAME TIME.



WHAT TECHNOLOGIES AND PLATFORMS DO WE UTILIZE?

One of the goals of the Migael project is to expand the virtual learning opportunities and utilize gamification in the mining industry.

Many factors have been taken into account in the choice of the game technologies, for example: what is the aim of the exercise, how the learning ensembles of the topic can be gamified, what learning tools can be created by certain technology platforms, or how much active interaction the platform allows. In the planning of the exercises, priority has been given to the fact that the subject area and learning ensembles can be learned smoothly and meaningfully. The scope and level of difficulty of the topics have a big impact, especially on which things about the topics can be gamified and on what platform interactive (playable) elements can be created. That is why we have come up with versatile solutions in the exercises on a case-by-case basis.

PC (COMPUTER)

A wide variety of gaming implementations or visualizations can be made on the PC platform, making it one of the most versatile technology platforms. Migael's 4th exercise was implemented as a traditional educational game because the scope of the topic required varied functionalities to teach things. The 5th exercise, an interactive story game, is also playable on a computer only. PC implementations enable a more diverse spectrum of interactions and functionalities.

PROS

- Almost everyone has a desktop or laptop at home
- **Almost unlimited gaming possibilities and functionalities**

CONS

- Some games / visualizations can be heavy and require a more powerful computer to run
- **It is challenging to make educational games interesting while maintaining educational goals**



SMARTPHONE (ANDROID)

Mobile and tablet implementations run alongside other game builds in Migael because they are relatively easy and light to implement. Mobile gaming is popular and can often be practiced completely regardless of time and place. However, playing with a small screen reduces the visual impact more than it could be in VR, for example.

PROS

- Can be used almost everywhere: people usually have a phone with them
- **Generally lighter and easier to implement**
- Low threshold to try

CONS

- A smaller screen and limited interaction may be less interesting
- **Movement and functionalities can sometimes feel poor**

VIRTUAL REALITY (VR)

Virtual Reality (VR glasses and controllers) has been utilized in almost every Migael game exercise. Because VR gaming technology is part of our laboratory's core competencies, we have found its immersion to be very useful in learning. VR can bring the player as close as possible to the right experience, which is why it is useful in many areas in educational use. VR does not have to be the only platform for the exercise, but it can bring added value as an additional platform.

PROS

- Immersive and realistic gaming experience
- **Modern technology that raises interest and a desire to experiment**
- VR equipment has become cheaper over the years and can be found in many price ranges
- **VR develops rapidly (eg Oculus Quest does not require the installation of motion sensors)**

CONS

- VR view may limit or make it difficult to deploy some elements (e.g. texts and more complex interactions)
- **Requires a slightly more powerful computer (always check the min. device-specific requirements)**
- VR hardware from different brands is often incompatible (game builds are made on a device-by-device basis)
- **It may seem complicated to a new person and a higher threshold to try**

FEEDBACK FORM

You have read through the entire information package!

I hope you got something new and interesting out of it. Next, we would like you to respond to a feedback form about Migael's gaming exercises and the technologies used in the project.

Feedback is of great importance in considering and understanding the **perspective of operators in the mining industry** in our project.

You can find the feedback form from this link:

<https://link.webpolsurveys.com/S/E5F98417A835C98B>

IT TAKES **2-5**
MINUTES TO
ANSWER!



MIGAEI PROJECT PLAYLIST



FIND THE **MIGAEI-**
PROJECT
ONLINE!



You can find trailers of the game exercises in the FrostBit YouTube!

READ MORE AND DOWNLOAD THE
EXERCISES AT www.migael.fi/en

The total cost of the project is **EUR 450,002** of which the Northern Ostrobothnia Center of Economic Development, Transport and the Environment has granted funding from both the European Social Fund (ESF) and the state funding (EUR 337,502).

The project's implementation period is **01/08/2019 – 31/12/2021** by FrostBit Software Laboratory of Lapland University of Applied Sciences.

