Brandenburgische Technische Universität
Cottbus - Senftenberg

Weisswasser Camp

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SoSe 2024

Museum input – an interactive way for memorizing

In today's rapidly evolving educational landscape, the integration of interactive methods into traditional learning environments has proven to be a game-changer. We explored the innovative use of museum input, particularly through game-based learning, as an effective approach to enhance students' understanding of complex topics like coal mining.

The workshop began with an introduction to the fundamental concepts of coal mining. Students were provided with a brief overview of the significance of coal as an energy resource and its critical role in industrial development.

Key topics covered include:

- The importance of Welzow-Süd and El Cerrejón as significant coal mining sites and how their operations affect local environments and communities.

- An introduction to the differences between lignite mining in Germany (Welzow-Süd) and bituminous coal mining in Colombia (El Cerrejón), focusing on the distinct geographical, technological, environmental impacts, and socio-political contexts of each site.

Game Introduction

Many researches have demonstrated that using games in learning environments is highly beneficial, as they increase student engagement, motivation, and comprehension. According to Licorish et al. (2017), game-based platforms, such as Kahoot! significantly improve classroom dynamics by encouraging participation, particularly from students who may be less active in traditional settings. By offering a competitive yet enjoyable atmosphere, Kahoot! encourages students to stay focused and interact with the material and their peers. The real-time feedback and leaderboard rankings integrated into the game drive participants to engage more deeply, creating an engaging and efficient learning experience.

The primary goal of our study project was to create an effective method for presenting our findings to the museum. To accomplish this, we opted to use a game as the central medium for explaining the differences between the Welzow-Süd and El Cerrejón mining sites. We believe that incorporating a game into the educational process not only simplifies the act of teaching but also enhances the overall learning experience.

Building on these insights, we chose Kahoot! as the platform for our educational game. For this game, we designed a series of cards that featured information about both mining sites. The card-based game is divided into two sections, each covering distinct aspects of the sites, such as Technology, Extractivism, Excavation, History, and Environmental Issues. Each card contains a brief explanation accompanied by an image relevant to the content. The cards are shown below.

Step-by-step with Kahoot!

Our Kahoot! game was designed to provide an interactive and engaging way for students to learn about the differences between the two coal mining sites, **Welzow-Süd** (Germany) and **El Cerrejón** (Colombia), focusing on technological, environmental, and social aspects.

1. Game Setup and Introduction

Before starting the game, we introduced the purpose of using Kahoot! as a fun and competitive way to reinforce the knowledge students gained throughout the workshop. We explained that the questions would cover various topics such as **technology**, **environmental impacts**, and **social consequences** related to the two mining sites. Players had 20 to 30 seconds to choose the mining site corresponding to the information on the card.

This fast-paced format not only fosters dynamic learning but also encourages participants to rapidly process and apply their knowledge.

Steps:

- The students were asked to join the game using the Kahoot! code displayed on the screen.
- They used their phones, tablets, or computers to connect, with each student or group entering their chosen nickname.
- They had to answer a set of questions focused on the mentioned subjects. This brought a sense of closure, reinforcing all key concepts discussed throughout the workshop.
- Each question was displayed with a time limit (20-30 seconds), and students had to choose the correct answer from multiple options.
- After each question, a leaderboard was shown, displaying the top scorers based on both accuracy and speed, which motivated students to remain engaged.
- The final leaderboard was displayed, showing the top-scoring students, with a brief celebration of the winners.

2. Game Explanation

The first set of questions focused on the technological aspects of the two mining sites. This round aimed to test students' understanding of the different mining methods and equipment used in Welzow-Süd and El Cerrejón.

Example Questions:

- "Which mining site uses bucket-wheel excavators for lignite extraction?"
  - Answer: Welzow-Süd
- "Which site faces significant issues with water scarcity due to the diversion of a major river?"

- ▪ Answer: El Cerrejón
- "Which mining site has implemented plans to convert its open pits into artificial lakes?"
  - ▪ Answer: Welzow-Süd
- "Which indigenous group has been heavily impacted by water scarcity caused by mining operations?"
  - ▪ Answer: The Wayuu people (El Cerrejón)
- "Which mining operation plans a coal phase-out by 2038?"
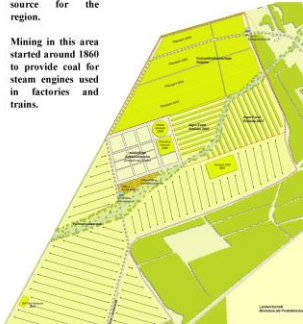 - ▪ Answer: Welzow-Süd

3. Game Scheme
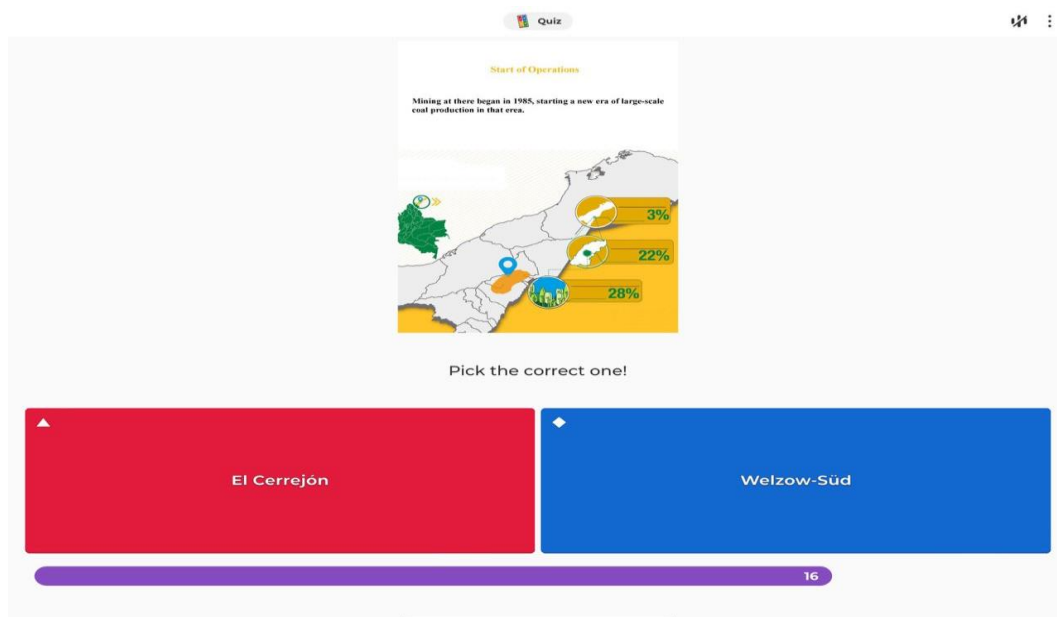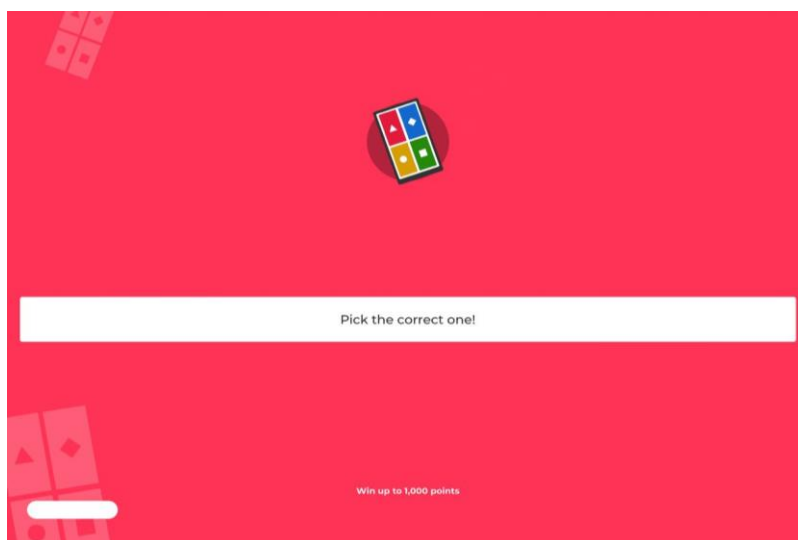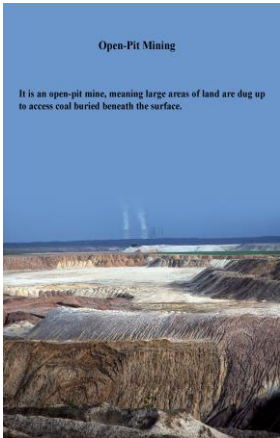
4. Cards

Early Beginnings

its mine began large-scale lignite (brown coal) extraction in 1966, becoming a key energy source for the region.

Mining in this area started around 1860 to provide coal for steam engines used in factories and trains.
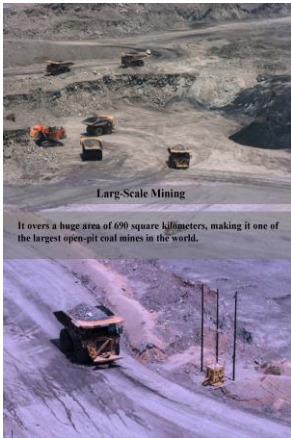
Open-Pit Mining

It is an open-pit mine, meaning large areas of land are dug up to access coal buried beneath the surface.

Larg-Scale Mining

It overs a huge area of 690 square kilometers, making it one of the largest open-pit coal mines in the world.
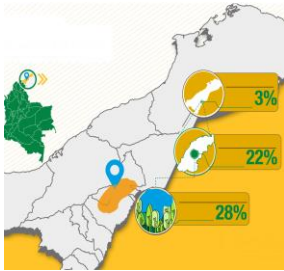
1989

1991

Saving wildlife

Thanks to various initiatives, wildlife rehabilitation, and wildlife-crossing structures, over 600 species have been identified in an improved 25,000-hectare biodiversity corridor.
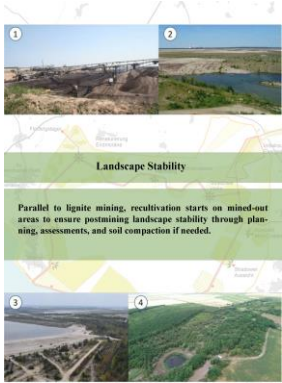
Start of Operations

Mining at there began in 1985, starting a new era of large-scale coal production in that erea.

3%

22%

28%

Landscape Stability

Parallel to lignite mining, recultivation starts on mined-out areas to ensure postmining landscape stability through planning, assessments, and soil compaction if needed.
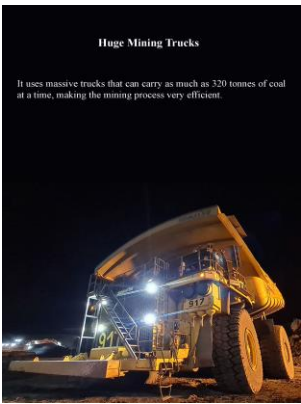
Giant Bucket Wheel Excavator

A giant machine called the SRs 6300 bucket wheel excavator is used. It's 65 meters tall and has a wheel with buckets that scoop up the earth to find coal.

Huge Mining Trucks

It uses massive trucks that can carry as much as 320 tonnes of coal at a time, making the mining process very efficient.

Thick Coal Seams

The mine extracts high-quality coal from thick seams that can be up to 180 meters deep, making it very productive.

Removing Overburden

The F 60 conveyor bridge is used to move large amounts of earth (overburden) that cover the coal seams, making it easier to reach the coal.
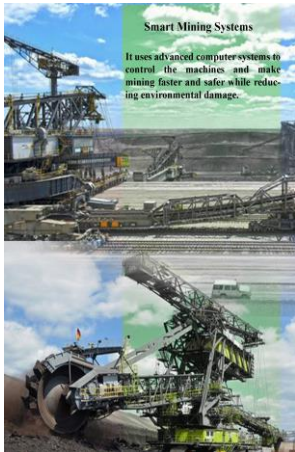
Community Challenges

The mine has faced issues with local indigenous communities who have suffered from environmental and health problems due to mining activities.

Smart Mining Systems

It uses advanced computer systems to control the machines and make mining faster and safer while reducing environmental damage.

4. Weisswasser Camp

Future Vision

For the future vision of expanding this project, one promising direction is to enhance interactivity within the museum experience. Building on the success of our card-based game, incorporating advanced interactive technologies like touch-screen kiosks, virtual reality (VR), and augmented reality (AR) could significantly enrich the learning environment. These immersive tools would allow visitors to virtually explore the Welzow-Süd and El Cerrejón mining sites in a highly engaging way. For example, through VR, visitors could experience a guided tour of the mining areas, witnessing first-hand the differences in excavation methods and environmental impacts. AR could provide a layer of interactivity, where visitors, using devices like tablets or smart glasses, could scan different sections of the exhibit to uncover detailed information, animations, or additional resources related to mining practices. By employing these interactive tools, the museum can provide a richer, more dynamic educational experience that caters to various learning preferences and encourages deeper exploration of the mining sites' socio-environmental narratives. This forward-thinking approach would position the museum as a leader in utilizing cutting-edge technology to convey complex issues in a way that captivates and educates its audience.

Conclusion:

During our participation in the Weisswasser camp, our team developed this interactive and engaging learning module specifically for museum settings. Our objective was to craft an educational experience that captivates visitors while imparting valuable insights into mining practices and their environmental impacts. The card-based game provides a creative and interactive way to educate museum visitors about the Welzow-Süd and El Cerrejón mining sites, making complex topics accessible and engaging. After the game, we analyzed the results and observed that participants had a strong grasp of the complex topics, indicating that the game format had successfully facilitated learning and comprehension of the mining sites and their associated issues.