GFG FOUNDATION | Powered by Rewise

GFG Foundation
Student Programme Workshops

Powered by Rewise

Blast Furnace
Lesson Plan

Key Information

Resource Type	Workshop
Duration	5 hours
Location	Romania
Max number of students	20, split into pairs
Facilitator	GFG staff, teachers
Room setup	Desks and chairs arranged facing a screen with session presentation and connection to sound. Place learners to work in pairs or groups of 3.
Required materials	☑ Blast furnace kits x 12 ☑ Blast furnace kit spares ☑ Wiring instructions ☑ Blast furnace instructions ☑ Blast furnace card game cards ☑ Lesson plan ☑ Powerpoint ☑ Workbook ☑ Scoresheet 1/person ☑ Blast furnace cards ☑ Feedback forms 1/person ☑ Certificates 1/person ☑ Trophy ☐ Pens and pencils ☐ 9V batteries ☐ Wet wipes (for any scorch marks from the laser-cut pieces)

Key:

☑ = Provided by Rewise

☐ = Tick when packed

Session Aims and Objectives

In this workshop, students will learn about blast furnaces and how they are being replaced with modern electric arc furnaces to combat climate change. In pairs students will use STEM (Science, Technology, Engineering and Maths) skills to construct a model blast furnace from wooden and electrical components. Pairs will then engage in a game to make all LED lights within the model's chimney to glow red. Finally, the blast furnace course helps to improve a range of soft skills such as working as a team, communication, working under pressure, following instructions as well as provoking an interest in the steel industry and climate change.

Learning Outcomes

1. To develop soft skills, such as teamwork, communication, problem solving skills, patience, etc..
2. To develop STEM skills (Science, Technology, Engineering and Maths)
3. To educate on green technologies within the evolving steel industry
4. Prepare for GFG Student Programme year 2 & the Rewise week
5. Have fun!

Workshop Timetable

Activity	Guide Timings (minutes)
Course introduction	15
Year 1 recap	45
Break	20
Blast furnace vs electric arc furnace	30
Familiarisation activities	30
Break	20
Blast furnace build	60
Lunch	30
Blast furnace game	30
Summary	20

Activity Breakdown

Guide Timings	Activity	Description/instruction	Facilitator to check learning by	Resources
10	**Introduction**	**Introduction Objectives - Powerpoint slide 1** Staff to introduce/re-introduce themselves to the students, communicating their name and role within the GFG Foundation. Staff to hand out workbooks (1/pair) Staff to use PowerPoint as a visual aid to introduce the overview of the course, course and outcomes. **Overview - Powerpoint slide 2** Students will learn about blast furnaces and how they are being replaced with modern electric arc furnaces to combat climate change. In pairs students will use STEM (Science, Technology, Engineering and Maths) skills to construct a model blast furnace from wooden and electrical components. Pairs will then engage in a game to make all LED lights within the model's chimney to glow red. **Outcomes - Powerpoint slide 3** 1. To develop soft skills, such as teamwork, communication, problem solving skills, patience, etc.. 2. To develop STEM skills (Science, Technology, Engineering and Maths) 3. To educate on green technologies within the evolving steel industry 4. Prepare for GFG Student Programme year 2 & the Rewise week 5. Have fun!	Ensure that learners are engaged and listening to the introduction of the course	Powerpoint, Workbook

Guide Timings	Activity	Description/instruction	Facilitator to check learning by	Resources
45	**Year 1 recap**	**Year 1 recap Objectives** Staff to recap the outcomes of year 1 and congratulate participants on passing the qualification Engage in group discussions around year 1's topics Observational walk to see the plants from the seed bombs **GFG Student Programme Year 1 recap - Powerpoint slide 4** Ask participants what events they remember from last year: 1. Drag race car 2. Motivation and environmental awareness (Rewise week) 3. Seed bomb Give a brief overview of the courses and what the participants achieved. **STEM - Powerpoint slide 5** Click through the 3 points and ask participants to contribute to the discussion. 1. What does STEM stand for? Science, technology, engineering and maths 2. What STEM skills can you think of? Problem solving, engineering, creativity, communication, coding, etc… 3. What careers require stem skills? Engineers, coders, architects, designers, electricians, mathematicians, health and safety, etc… **Motivation - Powerpoint slide 6** Ask participants to contribute to the discussion around motivation. 1. What is motivation? 2. Has what motivates you changed? 3. Are you motivated for year 2? **Seed Bombs - Powerpoint slide 7** Ask participants what they remember about the Seed Bomb event. Partake in an observation walk to see how the plants are growing. **Congratulations - Powerpoint slide 8** Congratulate all participants on passing their qualification and handout certificates.	Ensure that learners are engaging in open discussions	Powerpoint

Guide Timings	Activity	Description/instruction	Facilitator to check learning by	Resources
30	**Blast furnace vs electric arc furnace**	**Rewise video - Powerpoint slide 9** Play the Rewise interview video **Social Media - Powerpoint slide 10** Ask participants to follow GFG on all social media platforms and to tag them in any photos. **Blast furnace vs electric arc furnace objectives - Powerpoint slide 11** Staff to use PowerPoint as a visual aid to introduce this activity and the definition of a blast furnace and an electric arc furnace. **Definitions - Powerpoint slide 12** Ask learners if they can define what a blast furnace is and what and electric arc furnace is. The definitions are on the next two slides **Blast furnace definition** - Powerpoint slide 13 A furnace in the form of a tower into which a blast of hot compressed air can be introduced from below. Such furnaces are used chiefly to make iron from a mixture of iron ore, coke, and limestone. **Electric arc furnace definition** - Powerpoint slide 14 A furnace which uses an electric arc as a heat source, especially for steel-making. Can also be powered via a renewable energy sources, such a a wind or solar farm. - Staff are encouraged to input additional information and their own knowledge on blast and electric arc furnaces. **Blast furnace video - Powerpoint slide 15** Inform learners that the video will provide answers to the upcoming blast furnace card game. **Blast furnace card game - Powerpoint slide 16** Staff to split participants into pairs for this and all following activities. Each pair to receive a set of the blast furnace card game cards. The three topic cards are “Blast Furnace”, “Electric ARC Furnace” and “Definitions”. Learners, in their pairs, must read through all of the cards and assign them under each card’s related topic card. **Answers:** **Blast Furnace;** “uses hot compressed air”, “produces C02 emissions” and “is in the form of a tower” **Electric ARC Furnace;** “Will help GFG Liberty Steel achieve net zero”, “Powered by wind and solar energy”, “Galati is investing in two of these”, “Switching from natural gas to hydrogen”, Reduces C02 emissions” and “Is the equivalent of switching to electric cars from petrol and diesel. **Definitions:**	Ensure that learners are engaged	PowerPoint Card game

Guide Timings	Activity	Description/instruction	Facilitator to check learning by	Resources
30	**Familiarisation Activities**	**Familiarisation objectives - Powerpoint slide 17** Staff to use the powerpoint as a visual aid to introduce the activity. The aim of the familiarisation activities is to give learners time to organise their kit's components and learn about them before they start building. Staff hand out blast furnace kits (1/pair) **Arduino Motherboard explained - Powerpoint slide 18** Talk learners through the different pins used on the motherboard before asking them to match the correct descriptions to the correct pins. Descriptions and Answers to the matching activity **GND:** Pins that provide a negative charge, can also be labelled as - or G. **3.3V:** Pins used to output (give) 3.3 volts of power. **5V:** Pins used to output (give) 5 volts of power. **Breadboard:** Pins that can be used as an extension cable. **Pin 0 - Pin 13:** Digital pins that can be programmed to do a certain job. **A0 - A5:** Analogue pins that can be programmed to do a certain job. Learners complete this activity within their workbook - Page 4 **Organise and label components - Powerpoint slide 19** Learners to open their blast furnace kits and follow their workbook activities to organise and label their components - Page 5 Learners organise their wooden pieces in order of part number "A1, A2, A3, A4, etc…). Tick once completed. Learners label the pins on the button, neopixel and LED strip. Tick once completed. Answers Buttons: White cable = - or GND. Purple cable = + (example completed) Neopixel: Yellow cable = 5V , green cable = DIN and light blue cable = GND (from top to bottom) LED Strip: Black cable = GND, dark blue cable = DIN and red cable = 5V (from top to bottom)		Powerpoint, Workbook, Blast furnace kits
10	Break			

Guide Timings	Activity	Description/instruction	Facilitator to check learning by	Resources
60	**Blast furnace build**	**Blast furnace build objectives - Powerpoint slide 20** Staff to use PowerPoint as a visual aid to introduce this activity. Staff to hand out blast furnace kits, wiring instructions and building instructions (1 of each per pair). Staff explain to learners that the circuit will be built and tested separately to the model initially before being dismantled and built again within the model itself. This is to ensure that learners can work the circuit before the model becomes involved, which will make it more difficult to diagnose and troubleshoot any issues. Learners firstly use the wiring instructions to wire their circuit. Once the circuit has been built it needs to be tested. Connect the circuit to the battery pack and test the led strips by pressing the buttons. **Blast Furnace Build - Powerpoint slide 21** Once the circuit is completed and is fully working pairs must disconnect all circuit connections before using the blast furnace instructions to build their models. **Tips & Troubleshooting** - Ensure that all pieces are aligned before applying pressure, to avoid breakages. - Always try to apply counter when connecting a new piece/component. - Ensure that all wires are pushed all the way in. **Safety** - Ensure that the circuit is unplugged when not in use. - Disconnect from power straight away if any of the components are hot. Double check the wiring before reconnecting the power.	Ensure that students are on task and are following the instructions appropriately.	PowerPoint, Wiring instructions, Build instructions, Blast furnace kits, Spares

Guide Timings	Activity	Description/instruction	Facilitator to check learning by	Resources
20	**Blast furnace game**	**Blast furnace game objectives** Staff to introduce the challenge through the PowerPoint. Staff to handout scorecard worksheets 1/person Participants, within their pairs, take turns in scoring their teammate's attempts in the blast furnace game. **The blast furnace game - Powerpoint slide 22** Participants takes turns in pressing and holding the button on their model blast furnace. Holding the button activates the lights within the chimney. The lights loop from yellow through orange and red before starting again at yellow. The aim of the game is for the participant to release the button when all the lights are red. Their teammate logs their number of attempts on the scoresheet. Teammates take turns to play and score. Like a penalty shootout in football, each teammate plays 5 times with the person achieving all red lights in fewer attempts in each round scoring the point. After each round, press the other button to increase the level of difficulty. The level is indicated by the colour of the light on the base of the furnace. Level 1 = Red Level 2 = Yellow Level 3 = Green Level 4 = Blue Level 5 = Purple The overall winner is the pair who completed all 5 levels in the least amount attempts after all attempts have been tallied. Trophy to the winner		PowerPoint Model Scoresheets Pens

Guide Timings	Activity	Description/instruction	Facilitator to check learning by	Resources
10	**Summary**	**Summary objectives - Powerpoint slide 23** Staff to introduce the challenge through the PowerPoint. Ask participants to match the correct definitions to furnace, blast furnace and electric arc furnace - participants to answer verbally. Staff to recap the learning of the day. Going over all of the following skills that the participants used: - STEM - Patience - Teamwork - Communication - Problem solving Participants complete their feedback forms. **Congratulations - Powerpoint slide 24**	Ensuring that students are on task.	Powerpoint Feedback forms Pens Certificates Trophies