STEM THE FLOW

WHAT A RELIEF!

A NEW STEM CHALLENGE FOR GLASGOW'S YOUNG PEOPLE

JACOBS

ECCA Glasgow 2017 Our Climate Ready Future

Glasgow CITY COUNCIL

WHAT IS STEM THE FLOW?

Climate Change is one of the biggest challenges the world faces, and the impacts that it will have on us all will need creative, innovative and exciting ideas and solutions. We want you to be part of that process!

Glasgow is hosting the European Climate Change Adaptation conference (ECCA), where people from around the world will meet to discuss how to adapt to the impacts of climate change. As part of this we are inviting schools to take part in engineering challenges, and we will invite the most innovative and creative projects to the conference at the SECC to show the delegates their ideas.

Glasgow City Council and Jacobs Engineering are joining forces to support "STEM the Flow", three STEM challenges (Science, Technology Engineering and Maths) that will suggest engineering solutions to help tackle flooding in Glasgow and the surrounding areas. Flooding has caused major problem for the city and its residents in the past, and we need to continually look at new ways to protect from extreme weather events.

We are looking for you to research and develop your own ideas about tackling flooding. This could be flood prevention schemes, systems to warn people about flooding or how to deal with flood waters when they appear.

You will have to work as a team to create a timeline, conduct research, draw conclusions and build a model/produce a display to showcase your idea. Your project will run from March to the celebration event taking place in late May, where you will be able to see what other teams have come up with. The most innovative teams will be invited to take part in one of the sessions during the conference (5th-9th of June).

This booklet will help you plan and guide you through your project

Good Luck!

OUR INDUSTRY PARTNER: JACOBS ENGINEERING

This year we are lucky to have top Engineering firm JACOBS work with us as our Industry Partners. Jacobs is committed to developing long lasting sustainable solutions that improve people's lives all over the world and one of the areas in which they do this is through flood and costal management.

All teams taking part will have support from JACOBS, who will be able to give expert advice though their project, which will be invaluable when developing your solution.

Planning is the Key to Success!

Before you get started there are a couple of planning activities your team should complete:

1. You should use the template at the back of this booklet to construct a Gantt Chart. This will give you a solid timeline to work to over the next 8 weeks.

2. Decide how often the team should meet and when. After school once or twice a week, during lunchtime?

3. You should choose team roles so that everyone knows what their responsibilities are within the team.

4. How often are you going to meet with your industry mentor and how will you keep in contact with them?

Good planning at the beginning means you will be more organised and structured as you move through your project. This will not only ensure that you finish the project on time but also make your team more likely to succeed!

WHAT A RELIEF!: PROJECT OVERVIEW

There are two approaches to tackling climate change; Mitigation and Adaptation. *Mitigation* refers to actions that we take to reduce or prevent emissions of greenhouse glasses (one of the leading causes of climate change). *Adaptation* is when we come up with innovate ways to help lower risks caused by climate change. Both approaches are vital if we want to make a difference however, this project focuses on *Adaptation* .One risk that we are often faced with (especially in this country) is flooding. Glasgow in particular has issues with flooding every year caused by heavy rain and the the three main rivers (Clyde, Kelvin and the Cart) that flow right through the centre of the city. This project focuses on one way that we could tackle this problem.

In 2011, the £53m Glasgow Flood Prevention Scheme was inaugurated to prevent flooding of the White Cart River and protect the 1750 homes and businesses that line the river, protecting the south of Glasgow and creating marshy natural habitats. Read more at: http://www.scotsman.com/heritage/more-heritage/remembering-glasgow-s-floods-of-2002-1-3997763

There are other rivers which threaten Glasgow, one in particular is a small watercourse in the East end of the city called the Tollcross Burn which is predicted to flood areas of the cities East End.

Your challenge is to design a new flood prevention system that will be built either in the east end or upstream in the catchments that can prevent flooding from this small watercourse.

It should control the amount of water allowed to flow through the watercourse during heavy rain fall and fit seamlessly in with the surrounding environment. You should also consider other secondary features your flood prevention system could have. Could it provide help power to the city, be used as a new park, provide new habitats or even have an education centre.

However, the most important feature of your flood prevention system should be its ability to reduce flooding and prevent properties and streets from flooding.

Getting Started

Types of Flooding

You should begin by researching the different types of flooding that Glasgow has to deal with. There are 3 main types; costal, river and surface flooding. What one will you primarily be dealing with? How have people tried to tackle this issue in the past?

Surrounding area

Your dam is to be built at the Glasgow harbour site where buildings such as the Science Centre, SEE Hydro and the Riverside Museum are situated. Your dam should not look out of place and should be designed to fit in with the surrounding area. Think carefully about this as it may influence some of your decisions on materials and aesthetics. Your team may even want to arrange a trip to the harbour to have a look at site your dam will be built.

Rainfall

Look into the amount of rainfall that the city normally has to deal with each year. You may even want to conduct a few of your own experiments and measure the rainfall over the course of this project.

Materials

What materials are available to construct your dam and what ones are you going to choose. Is your focus going be on the strongest materials available, the most cost efficient or a balance of the two?

Costing

How much will it cost to build a dam at the Glasgow Harbour. Have you factored in construction costs and materials?

WHAT A RELIEF!

The best approach is to write the report as you go!

WRITE A REPORT

Your team will need to submit a written report *one week before* the final celebration day at the end of May. This will allow our panel of judges to read it though beforehand and prepare questions for after your presentation. You are asked to bring *3 hard copies* of the report with you on the day to allow other schools and teams a chance to see what your team has done.

Your Report should include the following:

- A front cover with your team name, school and our Industry partner (Jacobs Engineering)
- A contents page
- Team member profiles: Tell us a bit about each members role and some of their interests in and out of school.
- An introduction: Why did you choose the '***I'll be Dammed***' project and what were your initial ideas.
- How you planned out your project: Did you use a timeline or Gantt Chart, give out team roles, have weekly meetings?
- Research and Experiments: What kinds of research did you do and what did you find? Look into materials and costing. Could your Dam do more than just control water flow, perhaps have a visitor centre or observation deck?
- Results and Analysis: What kind of data did you collect from your experiments? How did this influence your next steps?
- Recommendations: What solution has your team come up with and why do you think this will work?
- Conclusion: What did you learn from this project and will it help you as you move through school?
- Appendices: Make sure you include your timeline/Gantt Chart, minutes from team meetings, graphs and calculations at the back of your report.

Don't forget to include any advice or guidance that you get from your industry partner throughout the project. They are there to support your team and help you if you get stuck so make sure you take advantage of all the knowledge they have to offer!

If your team are going to conduct some of your own experiments then asking Jacobs for some advice may be a good place to start.

CREATE AN ENGAGING DISPLAY

At the end of your project your group will need to create an engaging and informative display board as well as a model that will be shown at the celebration event. Displays are a great way of visually communicating everything that you did in your project to both assessors and other teams.

The best approach is to make sure the information on your display is clear and easy to read. It should tell a story of everything your team did and who was involved. You want to attract as many people as possible to look at your display so try not to make it too busy or cluttered.

You may want to think about what you want on your display at the beginning so you can collect things to put on it at each stage. Maybe one team member could be in charge of taking photographs of your team or even create a team logo and name? You may want to fill you display with artwork or comments from your research and testing.

You will need to ask your teacher to get some materials together to help you construct your display board e.g. Paper, scissors, Sellotape, Blu-tack. If you have ICT access you may even want to create parts of your display on the computer and print them out.

Sizes of the display board available for you to use on the celebration day will be emailed to your teacher.

There will also be a table available for you to showcase your model and any other pieces of evidence or work you want to display. The size of the table will be emailed to your teacher nearer the event.

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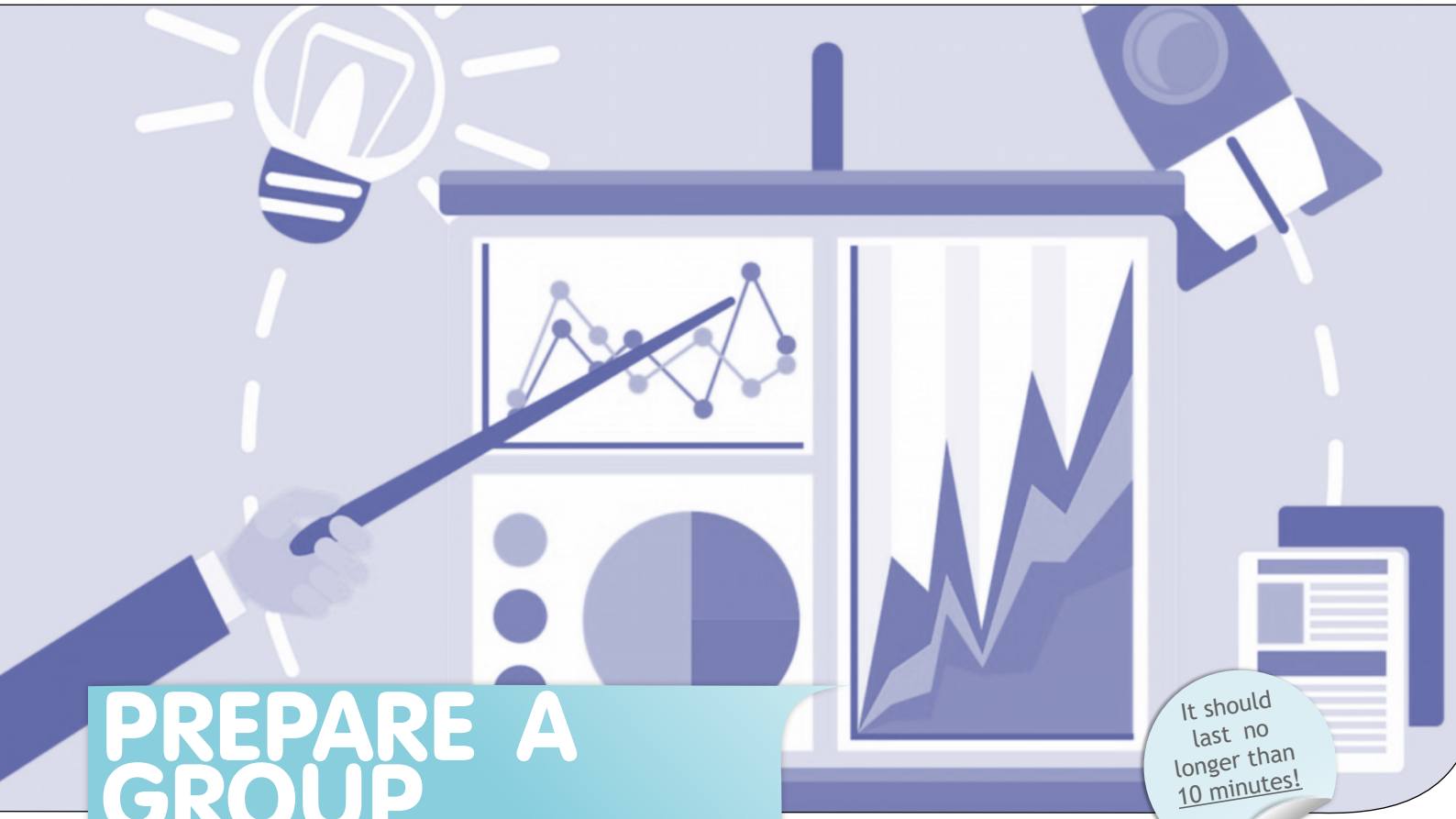

PREPARE A GROUP PRESENTATION

It should last no longer than 10 minutes!

At the final celebration event at the end of May your team will need to give a presentation explaining your project to panel of assessors. Your presentation should last between 5 and 10 minutes and you should be able to answer a few questions about your project at the end. All members of your team need to contribute in some way but how to present is up to you!

You could use your display and model to help present your ideas or you may want to use PowerPoint or video. You will want to talk about costing, materials and how your team worked together to develop your final idea. The most important part is that you need to clearly tell the panel how your solution will aid flood prevention in Glasgow.

The best way to prepare is to practice, practice, practice! You may even want to arrange a practice presentation with your industry mentor, Headteacher or fellow pupils.

WHAT A RELIEF!

Summary of Project

Write a Report

As stated earlier in the handbook your team must write a report about your chosen project and submit this 1 week before the final celebration event. The easiest way to tackle the report is to write it as you go instead of leaving it to the last minute!

Create a Display

At the final celebration day you will be asked to showcase your project to a panel of assessors and other schools. Make sure you have time to create an engaging display of everything your team has done. Sizes of the display board will be given to your teacher.

Prepare a Presentation

Your team will also have to prepare a presentation about your project to give to the panel of assessors at the final celebration event. The presentation should last no longer than 10 minutes and teams should be prepared to answer questions at the end.

Hints and Tips

- MAYBE HAVE A REPORT WRITING SUB-TEAM
- HAVE A WELL STRUCTURED PLAN FROM THE BEGINNING OF THE PROJECT
- WRITE THE REPORT AS YOU GO
- GET YOUR MENTOR AND TEACHER TO CHECK YOUR REPORT BEFORE YOU SEND IN!

- USE PHOTOGRAPHS AND SKETCHES TO HELP TELL YOUR STORY
- BUILD A MODEL TO VISUALLY DEMONSTRATE HOW YOUR PROJECT WILL WORK
- YOU CAN EVEN USE POWERPOINT OR VIDEOS IF YOUR SCHOOL HAS A LAPTOP YOU CAN USE!

- YOU CAN USE POWERPOINT OR VIDEO IF THEY ARE AVAILABLE
- ALL TEAM MEMBERS MUST CONTRIBUTE
- IT SHOULDN'T LAST LONGER THAN 10 MINUTES
- BE PREPARED FOR QUESTIONS!

See you at the celebration event at the end of May!

WHAT A RELIEF!

SUGGESTED TIMELINE

Week 1

Decide team roles and a team name. Complete Gantt Chart as a team and begin to discuss initial ideas and start to conduct research.

From your initial research decide as a team areas which you are going to focus on. Why do our cities drains overflow? Where are the main problem areas. What possible ways can we get rid of water?

Week 2

What are the main objectives of your drain relief system? Will it be aesthetically pleasing, hidden from view or have a secondary purpose such as city centre seating?

Start to look further into materials and costing. This would be a good time to contract your Industry Mentor for some advice and information that you may not be able to find on the Internet!

Week 3

Begin to test some of your material choices. Look at aspects such as stress, strain, durability and water resistance. Start to write your report.

You now have enough information to begin work on your model. How will you and your team best represent your idea? What materials do you think you'll need?

Continue to work on model and report. Be sure to include any issues you have faced and how you overcame these as a team. Don't be afraid to alter your design as you go. This is all part of the learning process!

Week 4

Draw conclusions on what you have all learned. How did you work as a team and is there anything you would do differently next time?

Finish Report and ensure it is sent in by Friday the 19th of May. Get it checked by our Industry partner and your teacher.

Week 5

Start to think about your display. How are you going to tell your teams journey though this project. Do you want to use PowerPoint or video? Have you taken any photographs while your team has worked through the project?

Prepare your presentation and finalise your display and model!.

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Below is a suggested format for your team's Gantt Chart. It will help you plan out your week to week activities and give your project some structure. Whether you use this template or make your own you should include the final Gantt Chart in your written report.

Tasks	Week 1	Week 2	Week 3	Week 4	Week 5
Team Name and Team Roles					
Initial Ideas					
Research					
Company Visit					
Idea Generation					
Calculations and Experiments					
Analyse and Evaluate					
Draw Conclusions					
Report Writing					
Build Model					
Display					
Presentation					

WHAT A RELIEF!

School Name

Industry Mentor and Contact Details

Important Dates

Some Useful Websites

1. http://www.glasgowharbour.com/
2. http://www.sepa.org.uk/environment/water/
3. http://britishdams.org/about_dams/watersupply.htm
4. http://www.jacobs.com/
5. https://www.youtube.com/watch?v=nzlOo2mHTWM