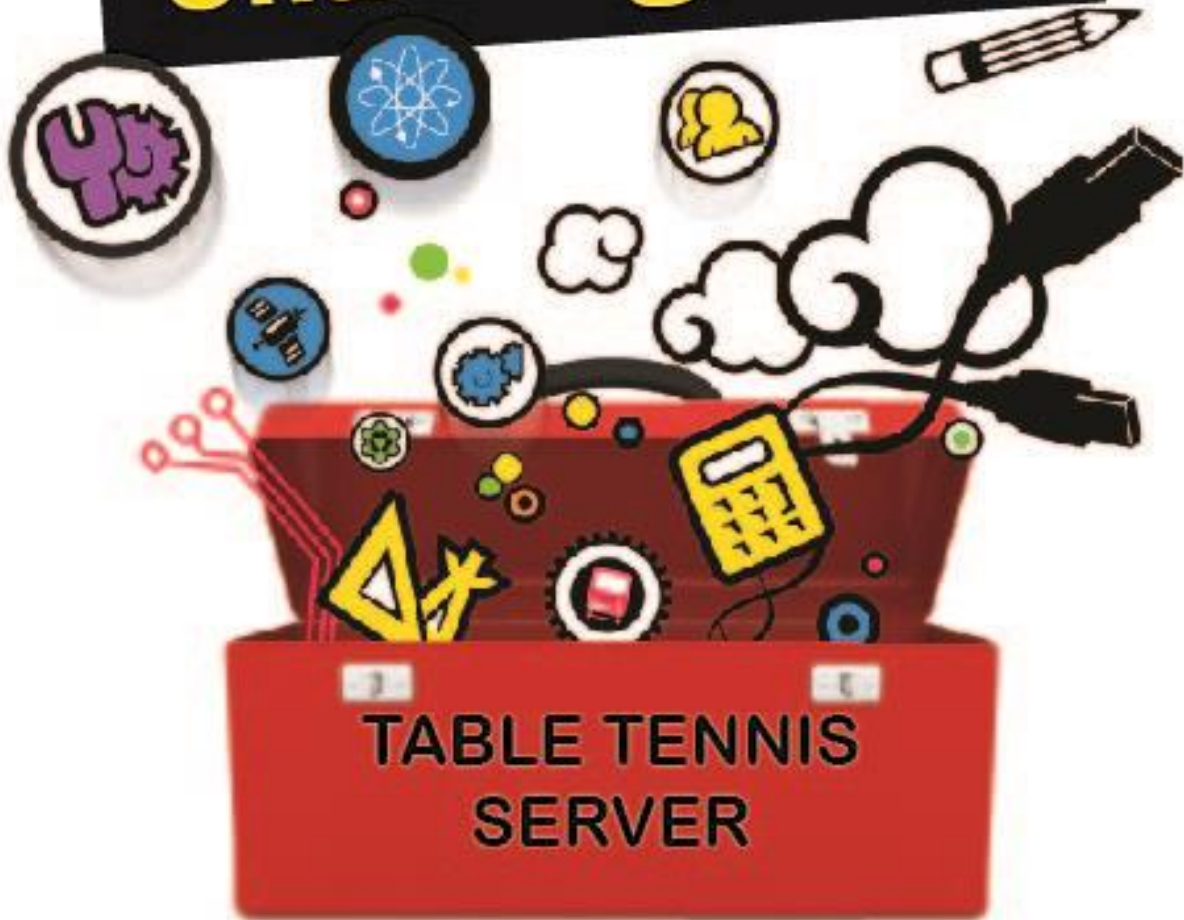




DIY Faraday Challenge Day



Student booklet

'Practice makes perfect'



Faraday STEM Challenge Day

'Table tennis server'

CONTEXT

Table tennis is a growing sport in the UK.

Practice, as with most things, is the key to improving at the sport. The problem is, it is hard to practice table tennis on your own.

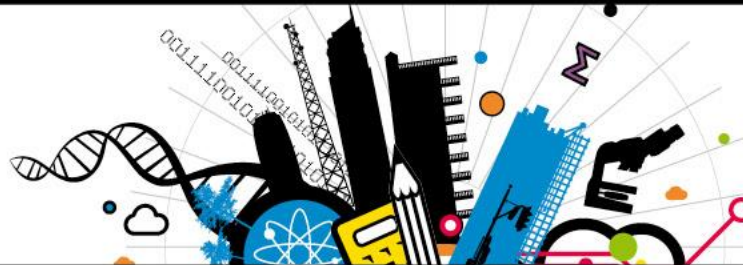
In this sport, being able to return service is often what provides the edge in terms of winning and losing.

BRIEF

Design and make a prototype table tennis server.

The server must:

- Be operated remotely
- Have adjustability in both horizontal and vertical directions/axis
- Must be able to serve 4 balls consistently



Assessment Information and criteria

| Key Area | Marks |
|--|------------|
| Initial ideas sheets (x3) | 30 |
| Developed ideas - sketches and notes | 30 |
| Accountant's balance sheet | 20 |
| Quality of final product | 50 |
| Function of device – consistent delivery | 50 |
| Team work | 50 |
| Learning Log Poster | 20 |
| Total | 250 |

1. INITIAL DESIGN SHEETS - (session one)

These are the first sheets you need to hand in. It involves every member of your team (in your subject pairs) drawing their initial thoughts and ideas after being given the context and brief. Three sheets need to be handed in. They need to include sketches, notes, diagrams and annotations. It is really important that you let the judges know what you are talking about in your discussions otherwise they will not understand these sheets and you will not get high marks.

2. DEVELOPMENT OF IDEAS - (session two)

This section is an important section and involves sketches and notes explaining the development of your ideas. You need to record your teams' agreed solution and then note down any changes or modifications you make, with reasons why you have changed the design. You need to think about materials, sizes, manufacture, including construction methods and ease of use (ergonomics).

You can use as many sheets as you want but it must be laid out so you can see the changes and why they were made.

3. ACCOUNTANTS BALANCE SHEET – (session three)

This is a record of all the costs the team has incurred. It should inform us how you have spent your money, giving us a total of how much you have left. You will gain more marks if you can spend less money. The materials you buy and the equipment you hire will be checked against the technician's record sheet.



4. LEARNING LOG – Poster

You will need to display all of your work from the initial ideas right through to the final design. Not only the contents, but also the quality of how your work is presented and produced will also be assessed.

5. TEAMWORK - (throughout the day)

One of the most important things!

This will be assessed throughout the day and marks will be awarded if you work effectively as a team.

Team working skills – does everyone have a clear role and are they working together effectively? Is your team communicating well? This is a really crucial area, as it is the team that works the best together that generally wins.

6. THE CHALLENGE - (final challenge)

This will be tested during the 'Final Engineering Challenge.' Can it perform the given task to a high standard – consistently and accurately? Is it well made, to a high standard? If it doesn't deliver the ball consistently, can you explain why?

You will still be given marks for understanding why your device hasn't worked and also for coming up with recommendations on how to improve it.



Materials resource sheet

AVAILABLE TO BUY:

| Material | Unit Cost |
|---|-------------|
| MDF 6.0mm 150mm x 150mm | 10 Faradays |
| Clear acrylic tube 150mm x 1 | 20 Faradays |
| 19mm paper fasteners x 5 | 2 Faradays |
| Styrofoam sheet 25mm 100 x 100mm | 20 Faradays |
| 6mm Dowelling 300mm | 10 Faradays |
| Elastic x 150mm | 15 Faradays |
| Pan head machine screws and wing nuts M3 x 20mm x 5 | 10 Faradays |
| Jubilee clips x 1 | 10 Faradays |
| Cardboard tube 150mm x 1 | 10 Faradays |
| Technician to cut materials | 10 Faradays |

AVAILABLE TO USE:

| Service | Unit Cost |
|-------------------|-------------|
| Low melt glue gun | 10 Faradays |
| Screwdriver | 5 Faradays |
| Styrofoam cutter | 15 Faradays |



Timings for the day

(Please note these timings are only approximate and may be changed to fit with your school day)

09.15 Teams arrive and take their seats

09.30 Session one

- Deliver introduction with film, and directions for the day
- Teams to embark on initial ideas stage (each subject pair to work on specific details)
- Teams continue with development of ideas stage (bring together the 3 pairs with their subject expertise)
- Team to decide on which idea to develop
- Video production manager briefing

10.40 Break (shop opens)

11.00 Session two

- Introduce use of shop and technician – money, resources, equipment
- Teams to develop chosen idea into viable solution (application of scientific research into creative engineering solution)
- Teams start manufacturing

12.30 Lunch

13.00 Session three

- Hand in all learning logs at the end of the session
- Produce final model
- Teams test their models!

13.30 Shop shuts

14.00 Faraday STEM Challenge commences

- Learning logs are presented
- Teams present their engineering solution

14.45 Results announced



Accounting balance sheet

You will have a sheet in your pack to keep an account of the NGHS Money that you spend throughout the day!

Marks will be awarded for accurate logs (they will also be checked against the technicians sheet) and bonus marks will be given if you still have money left!

STEM Challenge Day 2015

Accounting Log

Starting Balance: 150.00

| Material/Services Purchased | Amount per Unit | Quantity | Cost | Amount Spent | NGHS Money Left |
|-----------------------------|-----------------|----------|------|--------------|-----------------|
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Learning log help sheet

Your team will need to produce a learning log poster about what you have learnt throughout the day. Your team needs to demonstrate to the judges what you know about each of the three subject areas and how you have used this to help you design and manufacture your prototype device.

These prompts might help you:

GENERAL CONTENT

- Are you really learning (and not just *doing*?)
- Are the science, mathematics and design and technology specialists in your team talking clearly about the application of this knowledge and understanding?
- Is it interesting?
- Is it original in its content?

SCIENCE

There is a lot of science in this task, and you will need to identify the key areas and discuss them in relation to your device. Think about...

- What forces are being applied?
- How can you ensure consistency (height and length of delivery) every time you use the device?

MATHEMATICS

It is important that you and your team can identify the mathematical aspects of the problem you have been asked to solve. Sit down with your team and brainstorm all the different aspects of mathematics you can see that would ensure a lot of marks. Think about...

- Can you simplify your device and represent it mathematically? (i.e. a diagram)
- Can you explain which angle you need to project the ball to make it most efficient?

DESIGN AND TECHNOLOGY

The two key features you need to really think about and design effectively are the 'stand' and release mechanism. Both these features need a lot of thought in terms of ergonomics and function. Can you discuss the following...

- How you have designed the stand to achieve the movement you need?
- How are you going to ensure the degree of accuracy you need to be successful?
- Why have you used the materials chosen?
- What construction methods have you chosen and why?



Nottingham Girls' High School have presented this workshop with resources from the Institute of Engineering and Technology.



The IET DIY Faraday Challenge Day '**Table Tennis Server**' is based on the Faraday Challenge Day of the same name, a STEM activity day written and delivered by the Attainment Partnership on behalf of the Institution of Engineering and Technology (IET).

The IET Faraday website hosts a wide range of teaching resources for science, design and technology and maths. These include classroom activities with film clips, online games, posters, careers resources and STEM activity days.

www.ietfaraday.org

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