The Smallpeice Trust
ENGINEERING
@HOME

The Keyhole Surgery Simulator

#EngineeringAtHome

Curriculum links: Maths – shapes, measurement; Science – materials, experimentation; D&T – design, make, evaluate

Skills learnt: Design, building, testing, evaluation, dexterity
Since our Smallpeice team can’t visit schools, we’ve decided to challenge each other to make a keyhole surgery simulator which you can test at home.

Objectives

- Build a keyhole surgery simulator and the instruments to use with it
- Select from a wide range of materials and use tools to perform practical challenges
- Design testing criteria and then use them to test your designs
- Evaluate your ideas

Topics Covered

- PRODUCT TESTING
  https://tinyurl.com/prdct-tst
- THE ENGINEERING PROCESS
  https://tinyurl.com/ENG-process
- BIOMEDICAL ENGINEERING
  https://tinyurl.com/BIOMED-CC
WHAT MATERIALS TO USE

You can use cardboard, plastic, wood, or anything else that works well and you can get at home.

Try looking in your recycling box.

HERE’S WHAT WE USED:

1. CAMERA-ENABLE DEVICE (e.g. SMARTPHONE)
2. CARDBOARD BOXES
3. CARDBOARD TUBES
4. STRING/RIBBON
5. SELLOTAPE
6. SCISSORS
7. STRAWS
8. BAMBOO SKEWERS
9. COCKTAIL STICKS
10. BLUE TAC
11. PIPE CLEANERS
12. PAPERCLIPS
CREATING THE SIMULATOR

1. Source a large cardboard box.

2. Cut three holes into the top:
   a. One for the camera and flash
   b. Two for the keyhole surgery tools

3. Create some obstacles inside the simulator. For example, you could line the inside with balloons, tissue paper, packing peanuts, bubble wrap – whatever you can get your hands on!

4. Design your challenges. There are three examples on page 6, but be creative!
DIFFERENT TYPES OF INSTRUMENTS YOU CAN BUILD

- **HOOK**
- **TRIDENT**
- **LOOP**
- **SNARE**

CRAFTING A SNARE

1. Fix ribbon to skewer
2. Feed skewer through straw
3. Fix ribbon to outside of straw
CHALLENGE EXAMPLES

#1 AGAINST THE CLOCK
Remove the marbles as quickly as possible

#2 FIGURE OF EIGHT
Loop the rubber band around the sticks in a figure of eight

#3 THROUGH THE LOOP
Loop the shoelace through the different tubes
NEED A CHALLENGE?

To extend the activity and challenge yourself further:

1. Turn it into a competition by challenging others in your household. Who is the quickest/best at completing the challenges?

2. Can you improve the tools? In medicine, engineers are always trying to make instruments smaller, lighter and stronger.

3. Devise your own challenges to test your dexterity.

4. Film a video and send it to us!

Once you’ve got your simulator up and running, film it in action and share your video on:

- www.facebook.com/TheSmallpeiceTrust
- www.twitter.com/SmallpeiceTrust
  Use the hashtag #EngineeringAtHome
- www.instagram.com/TheSmallpeiceTrust
# STEM Day Risk Assessment

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity/area being assessed</th>
<th>Associated risk</th>
<th>Who is at risk?</th>
<th>Existing control measures in place?</th>
<th>Level of risk (low, medium, high)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Activity and Workspace</td>
<td>Slips, trips and falls: Injury due to tripping over items</td>
<td>Students and adults</td>
<td>Activity supervised by adult supervisor. Deliverer reminds students about safety in video introduction.</td>
<td>M</td>
<td>Students and adults</td>
</tr>
<tr>
<td>2</td>
<td>Use of Materials: paper/card, plastic containers</td>
<td>Injuries: Injury due to paper cuts, cuts from sharp edges Injuries: Injury due to misuse</td>
<td>Students and adults</td>
<td>Activity supervised by adult supervisor.</td>
<td>L</td>
<td>Students and adults</td>
</tr>
<tr>
<td>3</td>
<td>Use of materials: elastic bands, sellotape, glue stick, blu-tack, small toys, paper fasteners, LEGO pieces, nuts &amp; bolts or equivalent.</td>
<td>Injuries: Injury due to use as a missile Slips, trips and falls: Injury due to slipping on dropped items Injuries: Ingestion risk of choking.</td>
<td>Students and adults</td>
<td>Activity supervised by adult supervisor. Activity supervised by adult supervisor. Activity supervised by adult supervisor.</td>
<td>L</td>
<td>Students and adults</td>
</tr>
<tr>
<td>4</td>
<td>Use of materials: plastic, corrugated cardboard</td>
<td>Injuries: Cuts from sharp edges</td>
<td>Students and adults</td>
<td>Activity supervised by adult supervisor.</td>
<td>L</td>
<td>Students and adults</td>
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<tr>
<td>5</td>
<td>Use of sharp tools: Scissors, craft knives</td>
<td><strong>Injuries:</strong> Cut to self</td>
<td>Students</td>
<td>Activity supervised by adult supervisor.</td>
<td>M</td>
<td>Students and adults</td>
</tr>
<tr>
<td></td>
<td><strong>Behaviour:</strong> Cut to others</td>
<td></td>
<td>Students and adults</td>
<td>Activity supervised by adult supervisor.</td>
<td>L</td>
<td>Students and adults</td>
</tr>
<tr>
<td></td>
<td><strong>Behaviour:</strong> Vandalism of property</td>
<td></td>
<td>School or home</td>
<td>Activity supervised by adult supervisor.</td>
<td>L</td>
<td>Students and adults</td>
</tr>
<tr>
<td>6</td>
<td>Testing of projects: bathtub, drop from height, items on floor</td>
<td><strong>Spillage of water on floor:</strong> damage and injury due to slip</td>
<td>Students and adults</td>
<td>Activity supervised by adult supervisor.</td>
<td>L</td>
<td>Students and adults</td>
</tr>
<tr>
<td></td>
<td><strong>Slip, trip or fall:</strong> Injury due to falling from testing area, tripping over items in testing space</td>
<td></td>
<td>Students and adults</td>
<td>Activity supervised by adult supervisor.</td>
<td>L</td>
<td>Students and adults</td>
</tr>
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