The Smallpeice Trust

ENGINEERING @HOME

07

The Keyhole Surgery Simulator

#EngineeringAtHome

Suitable for ages:	Time needed:
11+	1.5hrs+

smallpeice
Dare to imagine

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

Skills learnt: Design, building, testing, evaluation , dexterity

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Dare to imagine

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.

07

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

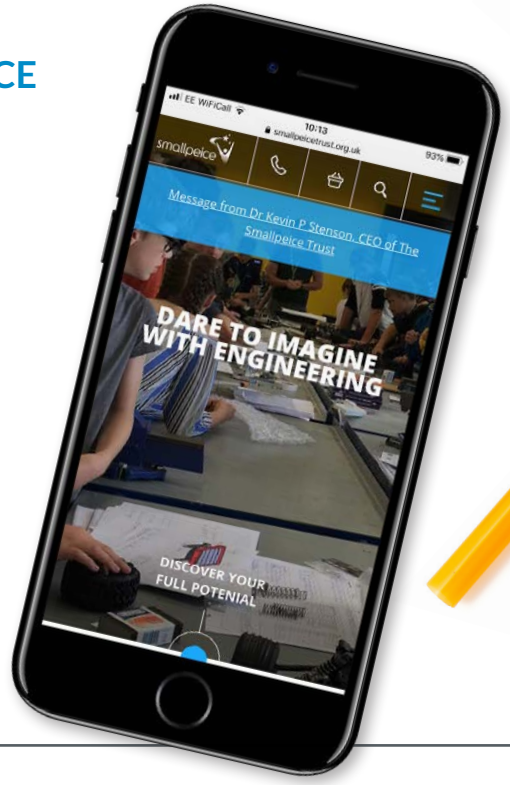
WHAT MATERIALS TO USE

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

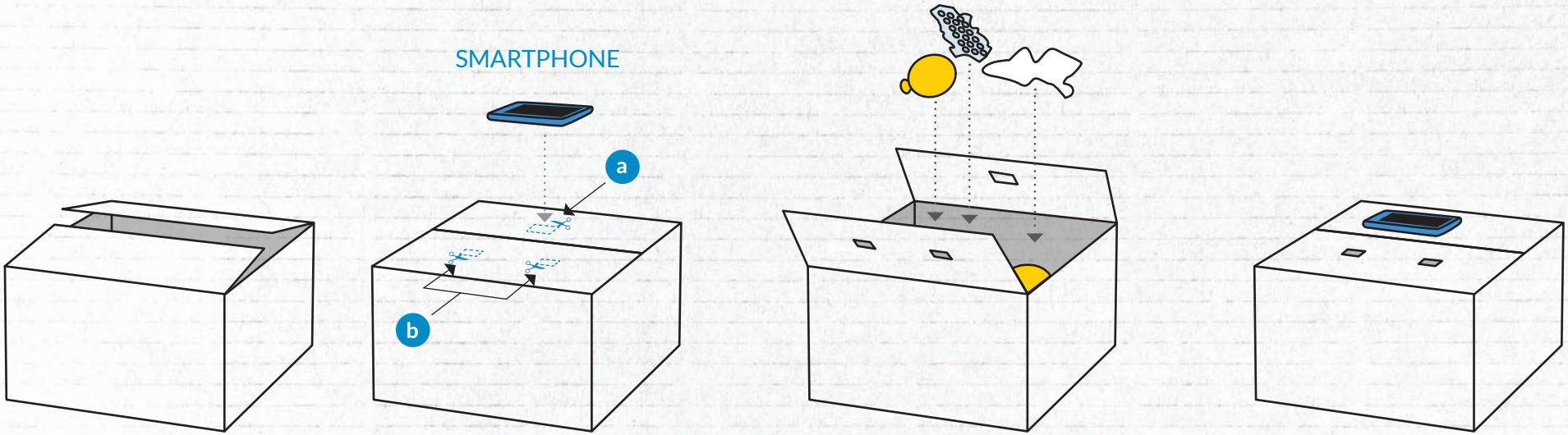
Try looking in your recycling box.

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.

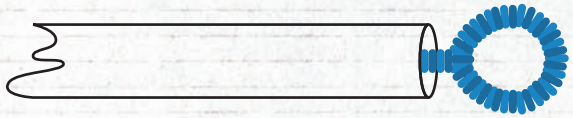
Design your challenges. There are three examples on page 6, but be creative!

DIFFERENT TYPES OF INSTRUMENTS YOU CAN BUILD

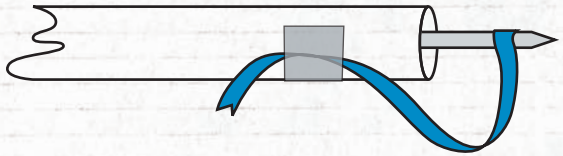
HOOK

TRIDENT

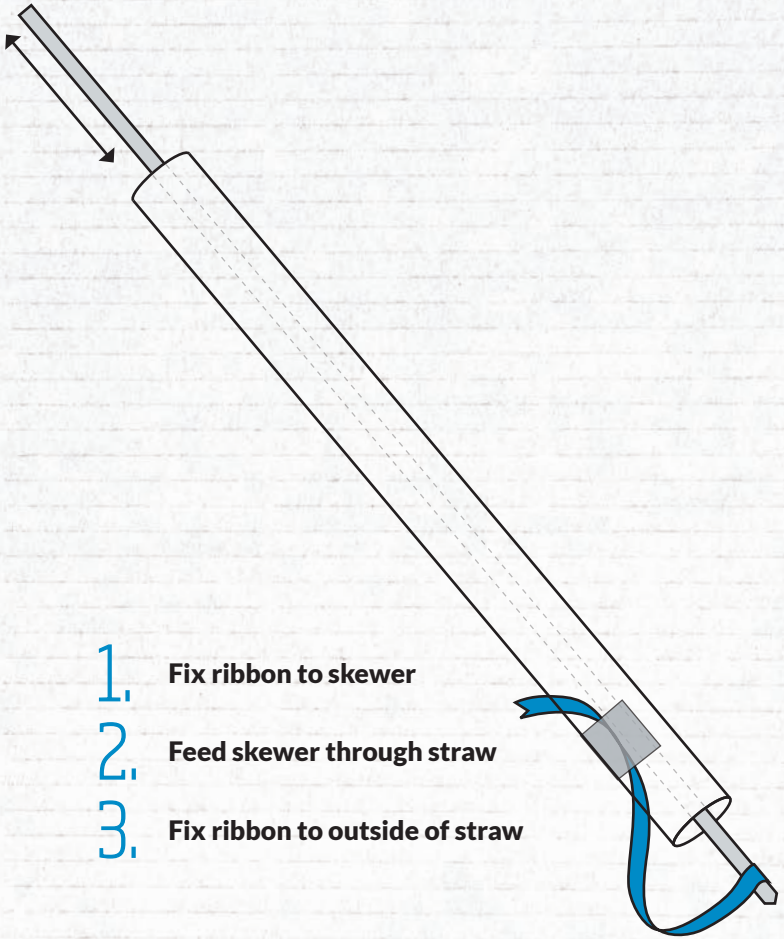
LOOP



SNARE

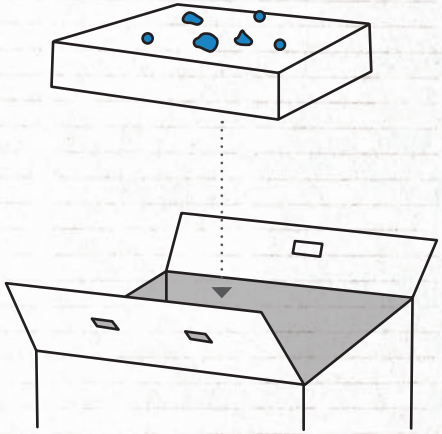


CRAFTING A SNARE



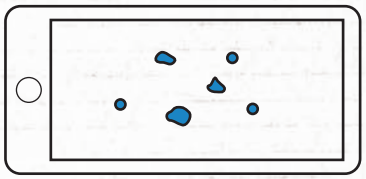
1. **Fix ribbon to skewer**
2. **Feed skewer through straw**
3. **Fix ribbon to outside of straw**

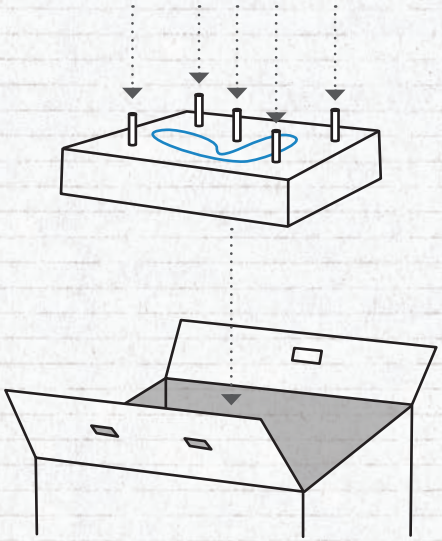
CHALLENGE EXAMPLES



#1 AGAINST THE CLOCK

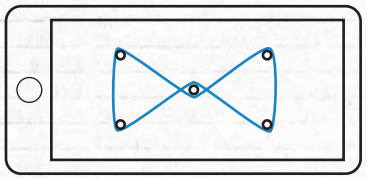
Remove the marbles as quickly as possible

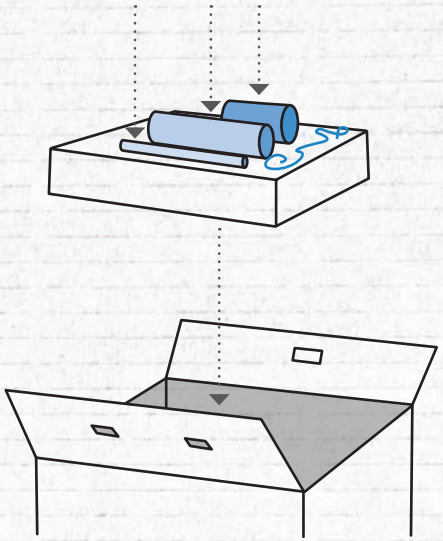




#2 FIGURE OF EIGHT

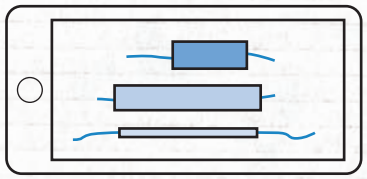
Loop the rubber band around the sticks in a figure of eight





#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!**

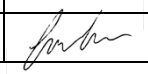
Once you've got your simulator up and running, film it in action and share your video on:

www.facebook.com/TheSmallpeiceTrust

www.twitter.com/SmallpeiceTrust
Use the hashtag **#EngineeringAtHome**

www.instagram.com/TheSmallpeiceTrust

STEM Day Risk Assessment

Risk Assessment for	Engineering at Home Projects
Assessment undertaken on	31/03/2020
Assessment undertaken by	Jessica Lee
Signed	

No.	Activity/area being assessed	Associated risk	Who is at risk?	Existing control measures in place?	Level of risk (low, medium, high)	Responsibility
1	General Activity and Workspace	**Slips, trips and falls:** Injury due to tripping over items	Students and adults	Activity supervised by adult supervisor. Deliverer reminds students about safety in video introduction.	M	Students and adults
2	Use of Materials: paper/card, plastic containers	**Injuries:** Injury due to paper cuts, cuts from sharp edges **Injuries:** Injury due to misuse	Students and adults	Activity supervised by adult supervisor.	L	Students and adults
3	Use of materials: elastic bands, sellotape, glue stick, blu-tack, small toys, paper fasteners, LEGO pieces, nuts & bolts or equivalent.	**Injuries:** Injury due to use as a missile **Slips, trips and falls:** Injury due to slipping on dropped items **Injuries:** Ingestion risk of choking.	Students and adults Students and adults Students and adults	Activity supervised by adult supervisor. Activity supervised by adult supervisor. Activity supervised by adult supervisor.	L	Students and adults
4	Use of materials: plastic, corrugated carboard	**Injuries:** Cuts from sharp edges	Students and adults	Activity supervised by adult supervisor.	L	Students and adults

No.	Activity/area being assessed	Associated risk	Who is at risk?	Existing control measures in place?	Level of risk (low, medium, high)	Responsibility
5	Use of sharp tools: Scissors, craft knives	**Injuries:** Cut to self	Students	Activity supervised by adult supervisor.	M	Students and adults
		Behaviour: Cut to others	Students and adults	Activity supervised by adult supervisor.	L	Students and adults
		Behaviour: Vandalism of property	School or home	Activity supervised by adult supervisor.	L	Students and adults
6	Testing of projects: bathtub, drop from height, items on floor	**Spillage of water on floor**: damage and injury due to slip	Students and adults	Activity supervised by adult supervisor.	L	Students and adults
		Slip, trip or fall: Injury due to falling from testing area, tripping over items in testing space	Students and adults	Activity supervised by adult supervisor.	L	Students and adults