Creating Engineering Activities for Children Aged 3-7 and their families.

A guide for engineers on the Let's Do Engineering project.

Introduction

Helping young children to explore STEM activities at an early age is a good way to support them develop their knowledge of engineering and understand the enjoyment and creativity involved in working in and around STEM.

Working with children from ages 3-7, and their families, is incredibly rewarding, but this group is often viewed as challenging for the design of high-quality interventions. When designing outreach activities, it can be challenging to correctly 'pitch' activities both in terms of scientific content and the practical skills of the participants. This guide offers support for anyone thinking about developing STEM activities for this audience.

Creating activities for young children

- Think about what excites and interests you about your field of STEM, then use this to start your activity development.
- There is no substitute for actually testing out an activity on of the right age as part of your development. This could be done by the activity designer with a class of children, or the activity can be facilitated by a classroom teacher who is willing to provide critical feedback.
- Think about the language and role models you might use in an activity. It can be easy to lean on common stereotypes, so provide counter-stereotypical examples.
- If you are designing an activity for someone else to deliver (perhaps a teacher or parent) you need to provide clear instructions about how to deliver the activity, guidance on setup and background information on the topic to enable confidence delivery of what might be new content.
- Curriculum documents are useful for providing guidance on age related ability and expectations; however, many STEM topics won't feature within these documents. Don't let that put you off.

Ages 3-5

- Large group activities will tend to favour vocal and confident individuals. Plan small group activities so more children can participate and contribute.
- Keep activities short but open ended – 10 minutes is a good rule of thumb. Some children may want to work for longer so think about how an activity might be extended.
- Children will need adult help with basic tasks like cutting, sticking, building and colouring. Make sure to build this into your activity or teacher guidance.

- Provide links or base activities on things that children will already be familiar with.
- Linking to stories is a good way of providing context for an activity.
- Instructions should be in the form of explanation from teachers or simple picture diagrams as this age group will be unable to read.

Ages 5-7

- Scientific understanding will vary greatly, so think about creating 'low floor, high ceiling' activities – straightforward for all children to access, but with scope for expansion and increased complexity for those who want it.
- Children's ideas and ambition will rapidly outpace their understanding of the complexity of an idea – choose the activity and provide clear boundaries and expectations of what can be achieved, building opportunity for children to talk about and refine their ideas with their peers, teachers or STEM experts.
- Provide opportunity for individual and group work.
- If your activity requires children to follow a set of instructions, make sure these are clear and use simple text and clear images.

Creating family activities

- Adults can feel uncomfortable in new situations and may and may bring baggage from their own STEM experiences – think about setting up the space and activity to provide non-confrontational fun and a social environment.
- Avoid creating activities that promote competition between families – although this may motivate some, it can have a detrimental effect on how family groups engage with an activity.
- Create activities in which the children and parents feel as though they are contributing together. Children's attitudes to engineering are strongly influenced by their parents, so shared experiences are particularly valuable.
- No-one read instructions sheets properly. Think about other ways to explain instructions clearly – this could be through whole group or individual demonstration, videos, written step-by-step instructions or pictures.
- Families may bring other siblings of different ages with them to an activity – think about how your activity can be accessed by them.
- You can make activities more technically difficult when families are supporting their children, but remember they may not be (for example) confident crafters either. Provide clear guidance about how you suggest they work with and support their child.
- Test and refine your activity with families.
- Think about how the activity could extend beyond the workshop – activities could promote further exploration back at home.