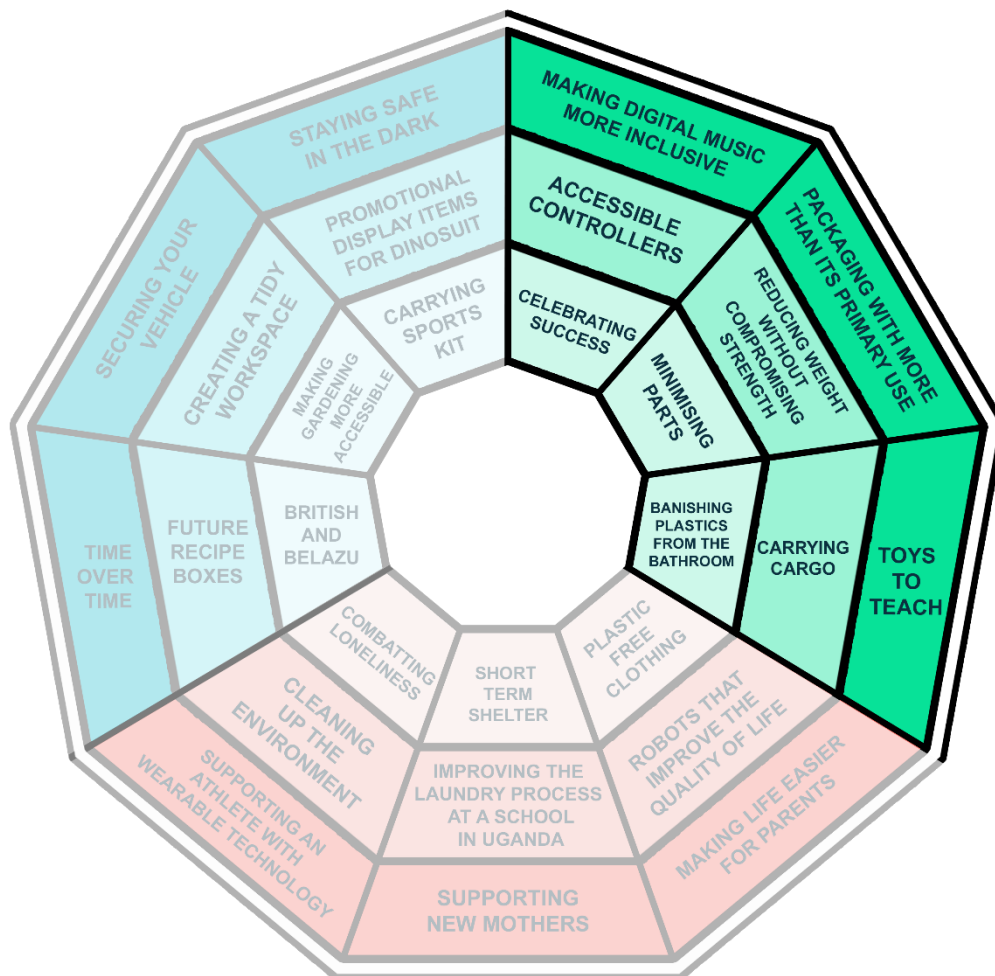


INSPIRED BY INDUSTRY

Toys to teach

#InspiredbyYoto



Introduction

This context has been put together to allow for a range of opportunities for students to explore the design and creation of toys to help children learn. While the company specialise in screen free audio players, the context is adaptable to other types or learning toy.

Materials

This context provides opportunities to explore woods and polymers as well as prototyping materials such as card and expanded foam. This context could also encourage the exploration of simple electronics and/or mechanical systems. This may be through the use of Micro:bit or Crumble where they can allow for some prototyping of products that react to inputs. Alternatively, it could just make use of existing standard components found in other teaching toys or off-the-shelf components.

Potential outcomes

Some outcomes are likely to be conceptual and may not be fully working. For example, a toy may focus on accessibility or ergonomics which can often be tested without functioning as an electronic component. Alternatively, it might be that the toy works mechanically or is operated manually, but students could suggest how electronic elements might enhance the learning experience.

It is important that students are given some freedom within this context and so outcomes should vary between students / groups. You may decide to limit your class to a range of outcomes or applications or the components they need to incorporate.

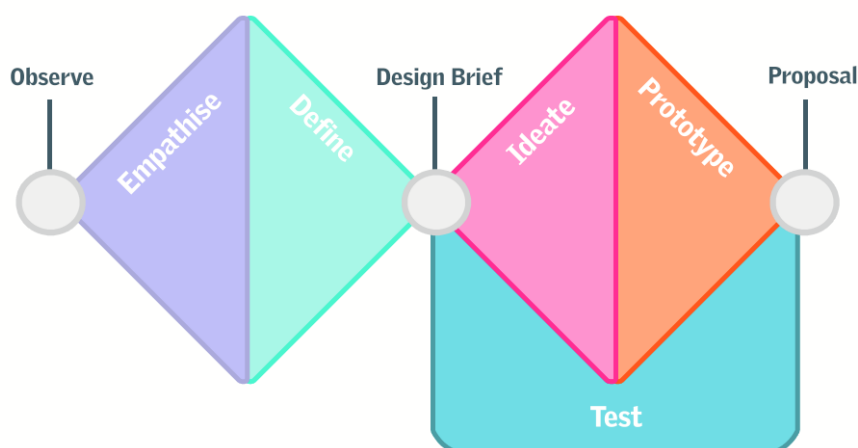
As well as traditional methods of working with materials, there is also an opportunity to look at rapid prototyping here. Smaller toys or elements could be realised relatively quickly especially in shell or case form. While incorporating electronics is an option, again, this should be viewed as a prototype to test a concept. You may wish to explore making a 'what it looks like' prototype with students – or this may be an opportunity for introducing or developing 3D CAD work for visualisation.

Shape-sorting with electronics, modern take on classic toys, teaching aspects like tying laces or self-care...

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Design cycle

The design cycle shown can be worked through in a range of orders. It's advised that the areas are revisited throughout the process depending on your time. We advise that a graphical representation of thinking convergently and then divergently may be shown to your students, such as this example:



The following are some tips as to the type of activities you could do with your students.

Empathize stage

- Students should be introduced to this term if not already familiar. It encompasses aspects of research and investigation that they may be familiar with.
- Students should consider user centred design throughout the design process
- At the start of the context, students should be thinking wide with their thoughts, exploring the problem and not deciding too soon what they 'want to make', but observing what is happening.
- Observations (may be a video, producing a journal for someone to fill in, a phone call interview, email etc) should allow them to 'spot common problems' or identify opportunities for improvements over existing solutions.
- The following videos from Ford are good examples of empathetic design in industry [VIDEO 1](#) [VIDEO 2](#)
- The Big Life Fix [HERE](#) is fantastic for showing empathetic designing. Throughout the process the designers try to immerse themselves in the problem and regularly get feedback from the clients. Observing others is really important rather than just asking people what they want as they may not know!
- If gaining access to research is hard, you may want to contact specialist who work with children such as nursery and primary teachers. Note down all the potential issues you discover – don't think at all about solutions yet, or even if they are able to be solved using technology – this is just a stage to highlight issues and concerns. It may be things like shape, form, key areas of learning, interactivity etc.
- Students should get as much information to help them later on in the challenge, but also be aware the research can be done at any relevant point in the design process. They may present their findings in any way they feel appropriate or effective.
- They could explore some of the things on the curriculum in EYFS or what we learn to do as we grow up. This could be done as a group activity.

Define stage

- This is where students try to get the real root of the problem and decide what they are going to do. What aspect of designing or improvement will be their focus?
- There may be a whole range of 'learning situations' that could benefit from a toy. Are there products from other areas that could be inspirational?
- The '5 why's' may be a good resource to run through with students. You could even pair them up to do this with each other at the define / empathy stage [VIDEO HERE](#)
- For older students, this case study from [DESIGN COUNCIL](#) is great to show how to define the problem and come up with innovative solutions.
- This is a good opportunity to introduce contextual challenges to students and get them to consider all aspects of the problem. It will undoubtedly need some support from you as a teacher. Please get students to share their thinking as clearly as they are able.
- Get students to create a specification. Whilst templates / writing frames are fine at KS3, you will want to avoid this at KS4. Consider using columns such as 'Essential', 'Desirable' and 'Definitely not'.

Ideate stage

- Ideas for the teaching toy may initially be through words and simple diagrams.
- Encourage students to think wide initially. No ideas are too silly, or too big.
- Ideas can also be produced through making or modelling. Get students experimenting with modelling materials or rapid prototyping early in the design development phase.
- The outcome could also be modelled using 3D CAD to help visualise form, colours and materials in a more realistic way.
- There are a range of videos on YouTube to help students with sketching techniques. [HERE](#)
- Sketching is a great way of communicating ideas quickly. Product design sketching tutorials can be found [HERE](#)
- The Design Museum have some nice, short, case-study videos [HERE](#)
- Students should be encouraged to sketch on anything to hand – envelopes, packaging etc. This may be a good method to stop students potentially being daunted by blank paper.
- Encourage zoomed-in parts of the product to focus on details and annotation.
- Annotation may be things they like, things they are not happy with and explanation of parts that are not clear from the picture.
- A range of techniques such as 2D, 3D, exploded and cross sections are good for considering details as the design develops towards the final prototype.
- Further research may be needed at this stage. Consider a handling collection of toys and learning aids. Can they think of other products that perform a similar function?
- Ideas don't have to be revolutionary and completely new. They can be a development of an existing product, but you may well see an opportunity for something totally new!
- Maybe they can start with an existing product and improve it. This [VIDEO](#) is a good introduction to this for older students / teachers.

Prototype stage

- A nice video from BBC Bitesize is [HERE](#)
- This short video from The Design Museum looks at the journey a designer had to design and make a collapsible bottle. [HERE](#).
- There are a number of videos by Jude Pullen from Big Life Fix [HERE](#) on how to create shapes in card. However, many may not have access to materials / tools and so C.A.D. may be more suitable.
- The following are all suitable CAD programs:
 - [AUTODESK](#) free for schools/students. Mac & Windows
 - [CREO](#) free for schools/students (PC only)
 - [FREECAD](#) free for schools/students
 - [ONSHAPE](#) free for schools/students
 - [SKETCHUP](#) free for schools/students
 - [SOLIDEDGE](#) free for schools/students
 - [SOLIDWORKS](#) discounted for schools/students
- There are some good Autodesk Fusion tutorials [HERE](#) and TinkerCad [HERE](#)

- It is worth discussing with students why they create a model or prototype. What are you wanting to test or evaluate; function, comfort, aesthetics etc? Choosing the correct model or prototype for the correct test is important.
- Throughout the process, ensure students follow procedures for health and safety and understand the process of risk assessment.
- You may want to share this brief [video](#) from Reekon tools that show the variety and quantity of models that a company may produce.

Test stage

- Although this is the final stage of the design cycle, encourage students to test and evaluate throughout the process and act on their feedback (and consider the feedback of others too). Testing is not a final thing, but a step to improve your designs further.
- Consider **AR** (Augmented Reality). If you use windows, PAINT 3D allows you to open .obj (CAD) files and students can then view their design in context such as in a classroom or nursery.
- To help students that are **reluctant to improve their idea**, consider prompts such as “How can we make this more portable”, “What if we had to make more identical units?”, “how can we reduce materials”, “What if it had to be made cheaper?”, “What if it had to be made lighter?”. No idea is ever perfect or finished, this is just the nature of continuous improvement!
- This could be a good opportunity to explore mathematical content by getting students to calculate amount of material used, costs etc. Some programs such as Autodesk Fusion allow you to calculate the amount of material you have used [HERE](#).
- How can students get feedback from users? Could they use technology to get a wide range of feedback – e.g. a Google Form? A poll on twitter?
- Get students to think about the main problem they identified earlier – does it actually do that? How successful is the outcome compared to the intention?
- Prompts for younger students e.g. ACCESS FM are suitable approaches. For older students they need to consider a wider range of aspects such as scalability, manufacturing techniques and limitations, ergonomics etc.

Focused tasks

<u>‘Rock, paper, scissors game’</u>	<u>‘Shape sorters’</u>	<u>‘Makey Makey’</u>	<u>‘Ball bearing maze game’</u>
Coding a Micro:bit for rock, paper, scissors game using the tutorials and projects on their website. Alternatives could be coding for a digital dice. https://microbit.org/projects/make-it-code-it/	Using a scroll saw to create shape sorters or tangram style games. Focus on materials such as acrylic and how to finish the material in a safe manner considering quality assurance and quality control.	Students look at creating their own textile game controllers. See link here https://www.youtube.com/watch?v=15tJrOZZ_wQ	Students to make their own ball bearing maze game thinking carefully about the complexity level of the game to keep a child interested by it not being too easy and not switching off by it being too hard. For example click here.

<u>'3D printed fidget spinners'</u>	<u>'Tactile boards'</u>	<u>'Digital design'</u>	<u>'Mechanical Toys'</u>
Use of TinkerCAD, Fusion, Solidworks etc. to create a 3D printed fidget spinner so as to learn the software through a tutorial.	Tactile boards (Adding locks, switches, zips, buttons, toggles etc on a board) can be created as a skills based making task for fabrication methods but then can be used as part of your research and testing with your clients.	Look at and develop knowledge of CAD packages to help with prototyping ideas so as to gather feedback from clients. Possible use of TinkerCAD or Fusion.	Students consider the mechanisms within toys and look to make their own moving toy understanding how that particular mechanism works.

Investigative and Evaluative Activities

<u>'Toy Teardown'</u>	<u>'Hands-on research'</u>	<u>'Testing of finishes'</u>	<u>'User profiling'</u>
Take apart an old toy – think of Operation, Screwball scramble etc. This can be done in groups or pairs and donations could be sort through other school staff willing to donate or through charity and tip shops.	An in-person research task in a toy shop, relevant retailer or childcare setting would enable students to look at toys in person, interact with them and consider ways they have been made to make them easier for younger children to understand and interact with.	Students may wish to physically test a range of materials and finishes that would be the safest to use with children. This can be done with scraps of materials and alongside the BSI document to ensure they are considering safety standards.	Gathering a better understanding of the client (both child and parent) through observations, interviews, surveys etc and secondary research to get a thorough understanding of their priorities.

