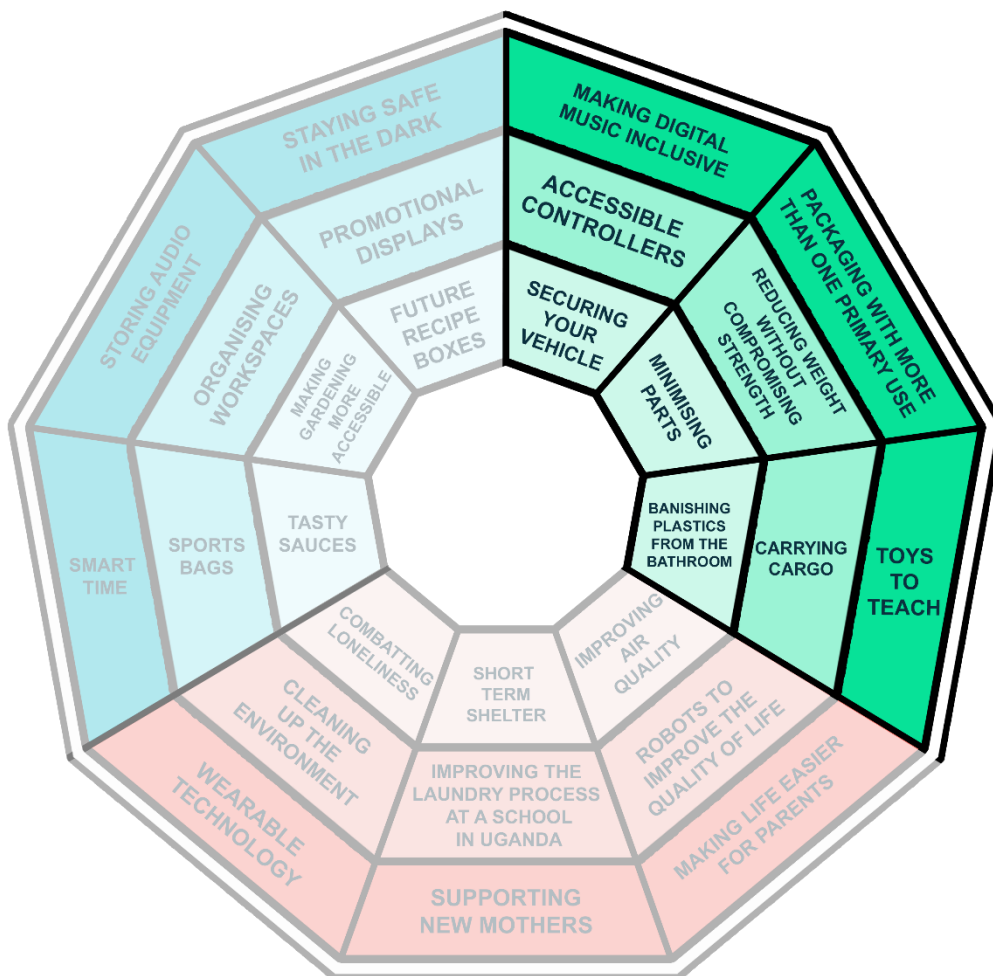


INSPIRED BY INDUSTRY

Making digital music more inclusive

#InspiredbySalsus



SALSUS design 

Introduction

This context has been put together to allow for a range of opportunities for students to explore the design of inclusive products. Whilst this context focuses on the creation of digital music, it could be adapted for a range of applications where an inclusive approach to design will benefit the user.

Materials

There is the obvious opportunity to explore electronics and digital sound outputs, however, the element of 'inclusive' lends itself to a manner of different materials. The opportunity to create bespoke 'switches', 'joysticks', 'handles' and more can be through polymers, fabrics (think e-textiles) and more. There is the opportunity to explore mechanisms and mechanical systems to activate microswitches, complete circuits and more. Depending on how confident the group are, you may wish to add in constraints such as the elements to make 'music' (for example, *we are all using a micro:bit, and it's pre-programmed with some sounds*) and have the students explore the users and accessibility aspects. However, push them, and see how far they can take it! It is suited to both individual and group work.

Potential outcomes

The outcomes are likely not to resemble shop-bought items, but should ideally allow the user to test the product and create some sounds! There may potentially be two outcomes, akin to a 'How it works' prototype and a 'How it looks' prototype'. The former may feature electronic components and some rudimentary switches and access points. There may be card, tape, glue-guns and the product may not be able to take the wear and tear expected of a completed product. The 'how it looks' prototype may be aesthetic only and a non-functioning model. This may even be a CAD render that showcases what a manufactured product may look like.

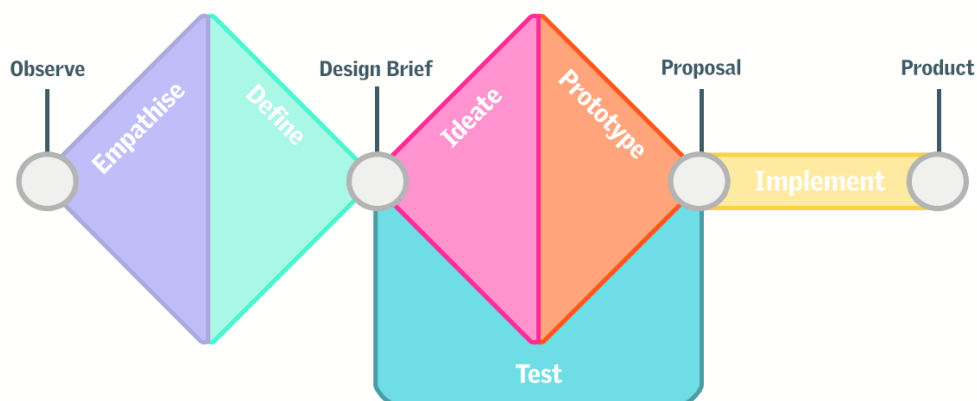
Examples may include (but not be limited to):

A music making device for a whole manner of disabilities (temporary or permanent), an elderly person, a very young user, someone deaf.

Consider sharing work on social media using the hashtag #InspiredbySalsus

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 convergent and then divergent may be shown to your students.



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.
- Ideally, students will have access to users who may be the ideal user-base for this context. This may be tricky to arrange and should be sensitively approached also. It may be preferable to consider elderly people who may have health conditions that may would restrict them from fully accessing standard methods of making digital music. For example, their manual dexterity, eye site, pincer-grips etc. Elderly users may be more straight-forward to access and speak with, rather than individuals with some of the conditions mentioned in the video.
- You may decide to have the class all focus on one user/tester for ease. Ideally this will be a real person, but for worse case scenario, this could be mocked-up using a potentially crude method. For example, taping fingers together can replicate limited digital use, plastic HIPs (High Impact Polystyrene) strips can be incorporated into gloves to create something [similar to these](#) to replicate arthritis, an offset motor on the hand can replicate elements of Parkinson's disease. All of these should be done sensitively and with a knowledge and appreciation it is a crude representation.
- 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 and identifying problems.
- Trying various aspects as a group can also be useful – making or editing digital music, observing performances or those working independently.
- 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!
- Collaboration software such as Miro, or Google/Microsoft collaboration can be good to use to collate ideas from all.
- Salsus have a website [here](#) that may help to show a range of their work, similarly Digit Music have a website [here](#) and videos [here](#).

Define stage

- This is where students try to get the real root of the problem and decide what they are going to do.
- There may be a whole range of problems identified. Identifying the user and their needs as well as constraints or barriers to making digital music will help.
- Remember that the focus is not on traditional instruments, it's about making digital music which can be done in many different ways. This may be focussing on the controller / input, but equally it can also be about feedback, knowing that what you have done, has worked (think of clicks, lights etc)
- Get students to create a design 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'. Get them to consider the features of a

product. Don't worry what it may look like at this stage, but what should it be able to do/be e.g., allow a deaf users to create digital sounds and know when and what various sounds have been created.

Ideate stage

- Getting ideas down quickly in the initial ideate stage is useful. There may be reluctance and apprehension. Drawing on existing ideas can be useful (e.g., improving an existing product) for many. This may mean diving straight into making, and playing with inputs. There is likely to be a need for further research here. Whilst not the same, check out some of the work of students at FH Salzburg [here, exploring emotion buttons!](#) They may generate ideas.
- Check out sites such as <https://teenage.engineering/> for different products and retro styling with a number of different interfaces that may be adapted.
- If students are reluctant to draw, consider other methods such as CAD, modelling and working in groups to help generate creative ideas.
- Get students to keep sketching. It may not be the whole item, it may be parts of it – they could concentrate on the shape of form of the controller, how it fits with other equipment, or they could look in more detail at the interface.
- 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.
- CAD programs will be of great use here if you are wanting students to explore the casing / enclosure.

Prototype stage

- Getting students to realise when and why to make a prototype is key. What are they looking to prove / disprove? Linking the prototype method with the problem is a good task.
- Consider doing a 'hack' of an existing product. You are likely to find toys in charity shops or car boot sales similar to [this](#) and [this](#) that could be taken apart and the inside electronic aspects used to prototype.
- Prototypes may be mechanical or structural models, test rigs, mock ups, painted models, or CAD models and/or assemblies.
- 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](#)
- Consider looking at producing split moulds of their design. This is usually straightforward using most parametric CAD programs and gives a brief insight into

commercial manufacture. There are images in the presentation showing the inside of the Digit Music solution.

- Consider asking musicians to give some feedback on the prototypes, as they are being developed and at the testing stage. Also include those who may have barriers to making music.
- Throughout the process, ensure students follow procedures for health and safety and understand the process of risk assessment.

Test stage

- Although this is the final stage of the design cycle, encourage students to evaluate throughout and act on their feedback (and consider the feedback of others too). It is not a final thing, but a step to improve further.
- Test in as many different scenarios as possible to ensure you get realistic feedback. Observe how users are interacting with the product and use these observations to add more detail to your questions for feedback.
- Be sure to record the testing results, either in data form, written test or use digital audio and video to record (do get permission from those being recorded), or a responsible adult.

Implement stage

- The implement stage is when a prototype is put into production.
- This is an opportunity to reinforce that a prototype outcome is only one stage in the creation of a product.
- What processes are required to convert that prototype into a commercially available product?
- What manufacturing processes used to create the prototype would need to be re-evaluated for a larger scale of production?
- Would this involve reconsidering the materials and components used?
- This is a good opportunity to introduce industrial manufacturing processes that are not used in the classroom. It will undoubtedly need some support from you as a teacher.
- Reducing material is important to minimise environmental impact. Consider working in pairs / small groups to critique designs / prototypes and what could be done to make it lighter, smaller etc to potentially minimise environmental impact. You may want to look at a simple [Life Cycle Analysis](#) to assess the impact from material extraction to disposal.
- As a conclusion to the unit, you could get students to create an advertising campaign / promotional feature to sell their new product. Consider giving students free reign with regards to platform and media. They may surprise you with their ability to produce content!

Focused Tasks

<u>'Sketch modelling'</u>	<u>'CAD'</u>	<u>'CAM'</u>	<u>'Digital sketching'</u>
For this and many other contexts, you could encourage sketch modelling. Get scrap materials such as foam or card and introduce modelling while students are still generating ideas.	Use CAD to create early idea concepts as well as more detailed components for working assemblies and for rapid prototyping. Encourage the idea of 'sketch modelling' using CAD.	Investigate how CAD models can be converted to shapes that can be 3D printed or cut out using a laser or vinyl cutter. This will speed up the development process.	If you have tablets or digital software, encourage development of ideas by sketching over existing photos, models or sketches.
<u>'Micro:bit starter'</u>	<u>'Crumble starter'</u>	<u>'Creating bespoke switches'</u>	
Getting started with micro:bit.	Getting started with crumble microcontroller.	How to make your own type of switch to use with an existing microswitch.	

Investigative and Evaluative Activities

<u>'Reverse engineer'</u>	<u>'Success criteria'</u>	<u>'Inclusivity'</u>	<u>'Consider the person'</u>
Look at how existing controllers are designed and constructed. You could take this further by disassembling an existing controller to see how they have been engineered.	Investigate controllers or instruments that work well and have proven to be popular. What features do they have that make them successful?	Evaluate existing solutions and rate them in terms of how accessible or inclusive they are. Create a chart and rank them and use this information to create a list of desirable criteria to help your design be more inclusive.	Consider the person who might be using your controller. Create a mood board or mind map and evaluate their needs, wants and values. List key problems they might have and use these with the other evaluative activities.

