



PiXL Gateway: Progression – Design and Technology

Year 12-13 Design and Technology



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I. Design and Technology Vocabulary

Materials - Wood (hardwood/softwood/manufactured board), Metal (ferrous/non-ferrous/alloys), Polymers (thermoforming/ thermosetting/elastomers), Papers and Board.

Aesthetics – What a product looks like; the feature of a material or object that make it visually attractive

Anthropometrics – The study of human measurements, the data is used to improve a product's ergonomics

Ergonomics – The fitting of a product to a human body making a product easy, comfortable and safe to use for extended periods.

CNC – Computer Numerically Control; applies to machines that can follow instruction from CAD software. This may control the movement of a cutter such as in a CNC Router or and CNC lathe.

CAM – Computer Aided Manufacture; the use of CNC machine to improve the manufacturing process.

CAD – Computer Aided Manufacturer; the use of software to create designs and convert CAD drawing into information for CNC machines.

Copyright – The legal right to copy and publish work only with the owner's permission.

Patents – A licence confirming the sole right to make, sell or use an invention. They can often last up to 20 years.

Adhesives – A chemical used to bond materials (PVA, contact adhesive, solvent cement, Epoxy resin)

Jig – A device that aids in the manufacture of identical product – this could be by holding a piece of work or guiding a tool.

Scale of production – The amount of an object being made: examples, one off, batch, mass and continuous. A general rule: the fewer being made the more flexible the manufacturing process and less specialised equipment is needed.

Fabrication - The process of joining materials

Obsolescence - A product or process that is no longer required because of an improved version. Obsolesce can be planned into a product, meaning the product will need to be replaced.

Smart material – A material that reacts to its environment. The reaction can be caused by changes in light, temperature or forces

Nanotechnology – An arrangement of a material's atoms to make useful properties – e.g. hydrophobic materials, increased lightness, electrical conductivity

Composite Materials – A combination of two or more materials to make a material with improved properties

Materials Properties – The characteristics of a material, a way for describing a material

Hardness – The resistance to being scratched or bent. The harder the material is, the more brittle (likeness to snap or shatter) the material is (unless the material's structure has been changed).

Durability – A material's resistance to repeated use

Elasticity – The ability to be bent and misshaped and return to its original form

Toughness – The resistance to sudden impacts without breaking or cracking

Plasticity – The ability for a material to be reshaped with pressure without fracturing

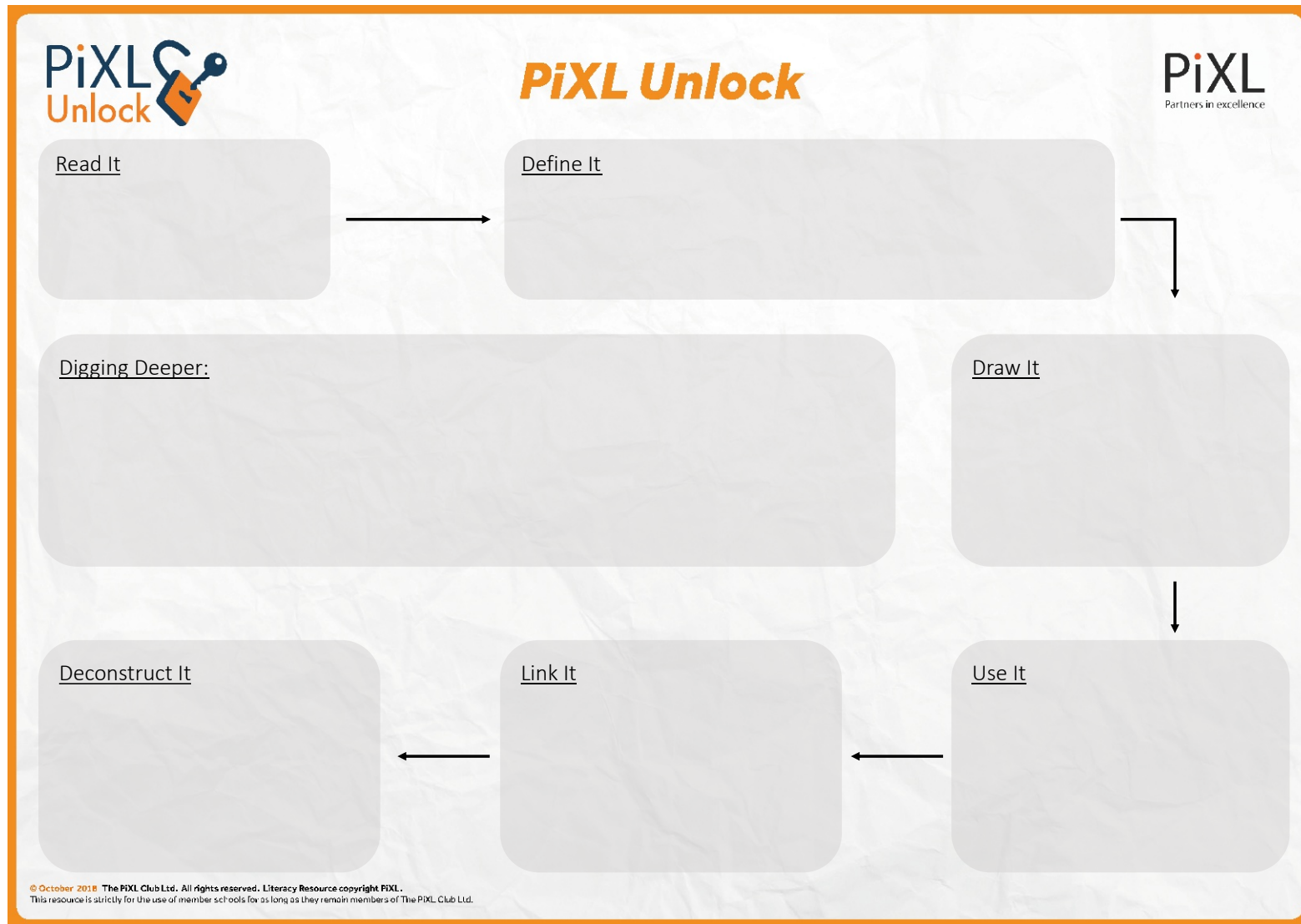
Malleability - The ability to be deformed using compression

Ductility – The ability to be drawn into a wire

Quality Control – Is the detection and rejection for products or materials that do not meet defined quality standards

Quality Assurance – The management of process to prevent mistakes to meet quality control checks.

II. The PiXL Unlock Template



III. Summer Reading list/Project

- The Design of Everyday Things, by Donald A. Norman – takes a detailed look at user centred design and the value of design thinking
- Hooked: How to Build Habit-Forming Products, by Nir Eyal – a look at why products either succeed or flop and how to make a product that users can't put down
- Sketching: Drawing Techniques for Product Designers, by Koos Eissen and Roselien Steur – core practical sketching techniques for any designer
- Manufacturing Processes for Design Professionals, by Rob Thompson – a guide to established, contemporary and emerging industrial processes

Project

CAD is a skill that needs to be practised and is required in many design industries. CAD programmes are normally free to students and can be set up on a home laptop. Examples of free programmes include: google sketch up and fusion 360. Find out what your school uses or use the programme your school recommends.

The following is a list of starter projects that can be completed using a range of 3D CAD software packages. YouTube is an excellent source for instructions and learning the vocabulary of CAD.

Beginner

- Find step-by-steps online for simple products and follow them exactly – chairs, tables
- Design a tealight holder
- Design a cookie cutter

Intermediate

- Find a simple object and copy it with exact dimensions
- Draw a room in your house including furniture to scale
- Draw your home to scale
- Design a phone holder which includes an acoustic amplifier

Difficult

- Design a working mechanism, which could be 3D printed. This could include gears, levers and pulleys
- Design a phone holder that could clip in to a car vent
- Recreate design icons – examples include Bauhaus, Memphis, Ray and Charles Eames, Alessi.

IV. Links to TED Talks/Articles/Documentaries/Books/Journals

Ted Talks

- Philippe Starck: Design and Destiny <https://www.youtube.com/watch?v=Z4PwHD7XKj0>
- When we design for disability, we all benefit | Elise Roy
<https://www.youtube.com/watch?v=g2m97gPI70I>
- Design for all five senses | Jinsop lee | TED Talks
<https://www.youtube.com/watch?v=N6wjC0sxD2o>
- How product design can change the world | Christiaan Maats | TEDxUniveristyofGorningen
https://www.youtube.com/watch?v=ZqeA_psKn2E

Documentaries

- Inside the factory: BBC iPlayer – a tour of UK factories; episode focusing on non-food items has the most design technology related materials
- Abstract: Netflix – a look into designers in different industries such as graphic, automotive and interior design
- Design for life: YouTube – an apprentice's style show with Philippe Starck selecting and new designer to take under his wing. An excellent show for understanding one of the influential contemporary designers

Youtube channels

- How it's made – a look at how products are made on an industrial scale
www.youtube.com/channel/UCWBkudOTaVbvkCBc0pyZFMA

Articles/online magazines

- Yanco Design – an online magazine covering international product design
www.yankodesign.com
- Curve Live – Independent articles about industrial design www.curvelive.com

Websites

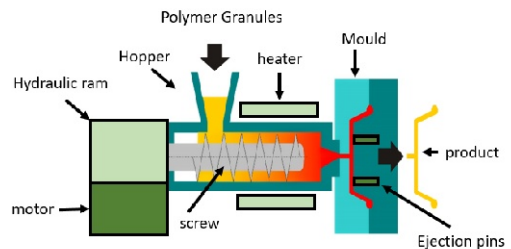
- <https://www.instructables.com/> - a website that hosts user generated and professional instruction guides that show how to make lots of products
- <https://www.thingiverse.com/> - a website that allows users to share 3d models and 2d models that can be either 3d printed or laser cut. Useful for getting started on a CAD project

V. Knowledge Organiser Template



Process/key word		
Sketch	Description	Analysis positive
		Analysis negative

Example

Injection moulding		
 The diagram illustrates the injection moulding process. It shows a motor driving a screw inside a barrel. Polymer granules are added from a hopper into the barrel. A heater warms the plastic. A hydraulic ram forces the molten plastic into a mould. The plastic cools and is then ejected by ejection pins to form a product.	Polymer granules are poured into the hopper and heated until molten. The screw pushes the plastic towards the mould building up the pressure and the hydraulic ram forces the plastic into the mould. The plastic cools and is ejected by the ejection pins.	1) Fast process suitable for mass production. 2) Can form complex shapes that other processes cannot. 3) The mould can make multiple small products at once.
		1) High start-up cost due to expensive machinery. 2) High cost for moulds.

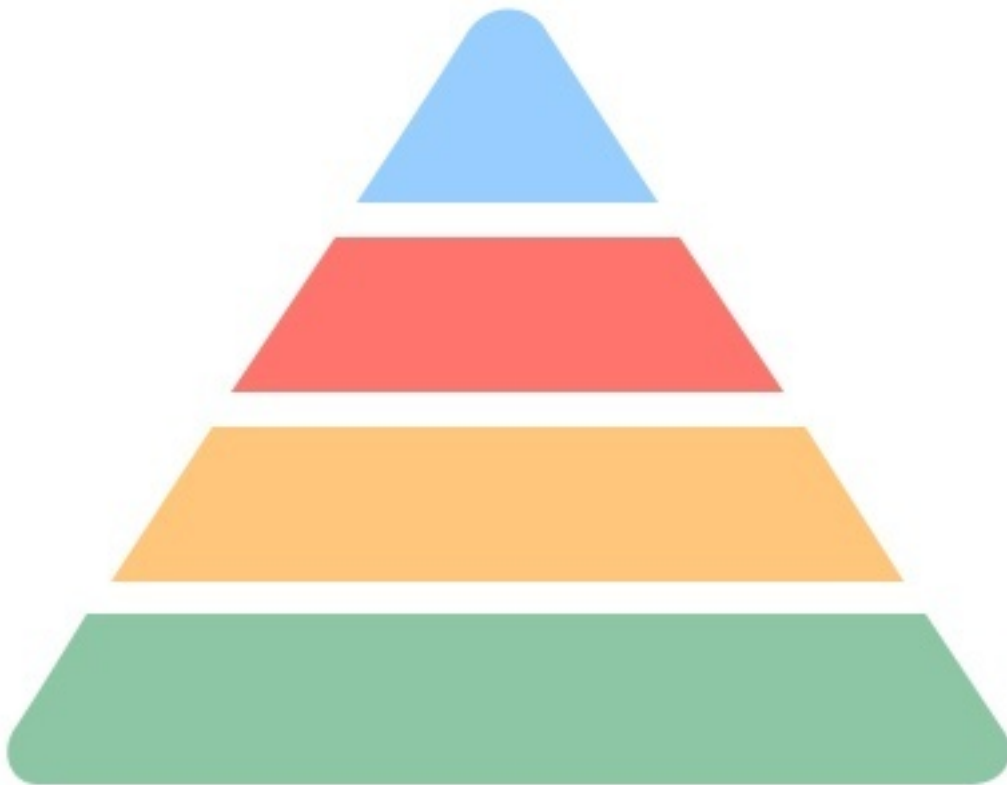
VI. Thinking Hard Revisit Template

Name of Topic: _____

Name: _____

Class: _____

The most important information goes at the top and then the least important at the bottom. Make sure you justify WHY you think it the most/least important.



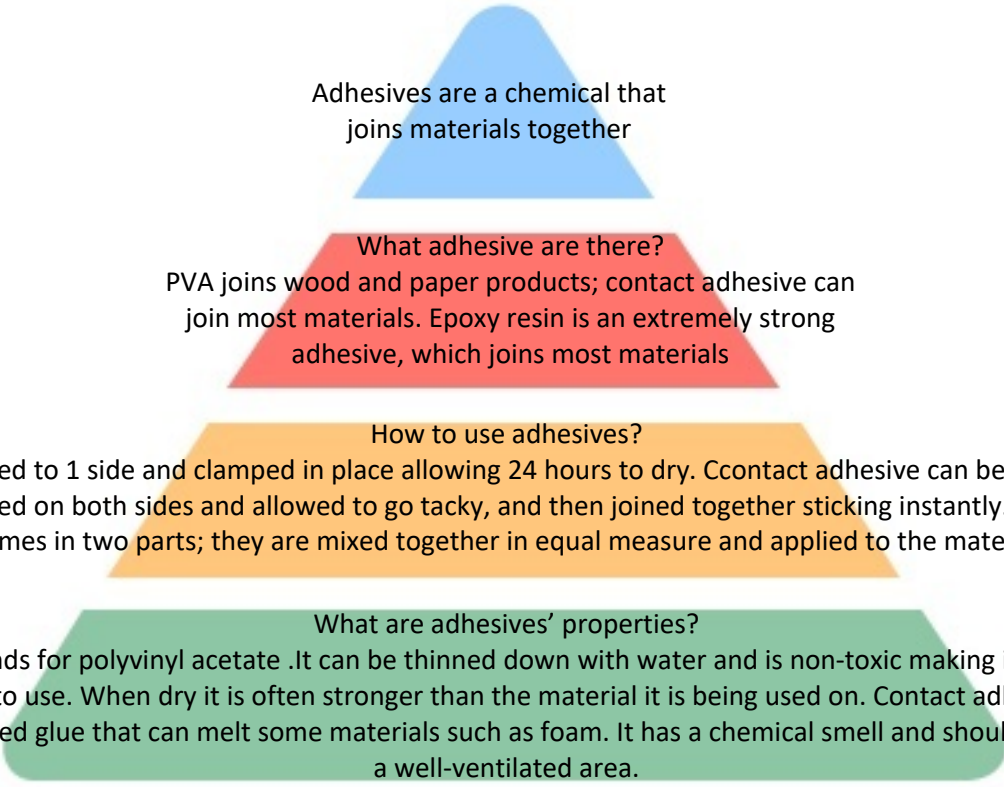
VII. A Model of the Thinking Hard Revisit document

Name of Topic: Adhesives

Name:

Class:

The most important information goes at the top and then the least important at the bottom. Make sure you justify WHY you think it the most/least important.



Adhesives are a chemical that joins materials together

What adhesive are there?
PVA joins wood and paper products; contact adhesive can join most materials. Epoxy resin is an extremely strong adhesive, which joins most materials

How to use adhesives?
PVA is applied to 1 side and clamped in place allowing 24 hours to dry. Contact adhesive can be the same as PVA or placed on both sides and allowed to go tacky, and then joined together sticking instantly. Epoxy resin comes in two parts; they are mixed together in equal measure and applied to the material

What are adhesives' properties?
PVA stands for polyvinyl acetate. It can be thinned down with water and is non-toxic making it safe for children to use. When dry it is often stronger than the material it is being used on. Contact adhesive is a solvent-based glue that can melt some materials such as foam. It has a chemical smell and should be used in a well-ventilated area.

It is most important to understand the term adhesive and what it means and what can be classified as an adhesive. Knowing commonly used adhesives allows the designer to make decisions earlier in the design and testing process. Using adhesive is important to plan in the manufacture but the information is easily attainable through small amounts of research and can be done later in the design process. Common properties of adhesives is important when manufacturing but this information is usually on packaging in the form of warning labels or instructions.

VIII. Cornell Notes Template

Name	Date
Topic	Subject

Main Ideas	Notes
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Summary

IX. A Model of the Cornell Notes document

Name: PIXL

Date xx/xx/xx

Topic: inclusive design

Subject Design Technology

Main Ideas

Inclusive design: to design a product or environment so it can be used by as many people as possible.

Notes

- Example - using an ATM. Everybody needs access to money. It uses colour to show what is cancel (red), go back (amber), and next (green), so language is not a barrier. There is a headphone slot for spoken commands; the numbers are tactile and always in the same place for the visually impaired
- The majority of people will be temporarily disabled at some point in their life with a broken bone, hearing or vision loss.
- Making a product easy to understand (push/pull doors needing a sign is bad design)
- Making a product easier to use makes it easier for everyone. Example - a can opener needing two hands to operate is harder to use than one that only uses one hand.
- When coming to a road crossing with headphones in and looking at your phone you are functionally hearing and visually impaired.
- Making something more visually appealing can be more inclusive and less intrusive – e.g. people with diabetes might need to inject themselves throughout the day, and this can lead to misconceptions as it could be interpreted as taking illegal substances. Make the syringe less conspicuous by disguising it as a pen and hiding the needle.

Summary

Inclusive design improves design for all users as it makes products and environments safer and more intuitive. Inclusive design covers all parts of a product or environment function and can be a simple change or development of a product.



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