THE DESIGN PROCESS

Designing and making a TOY

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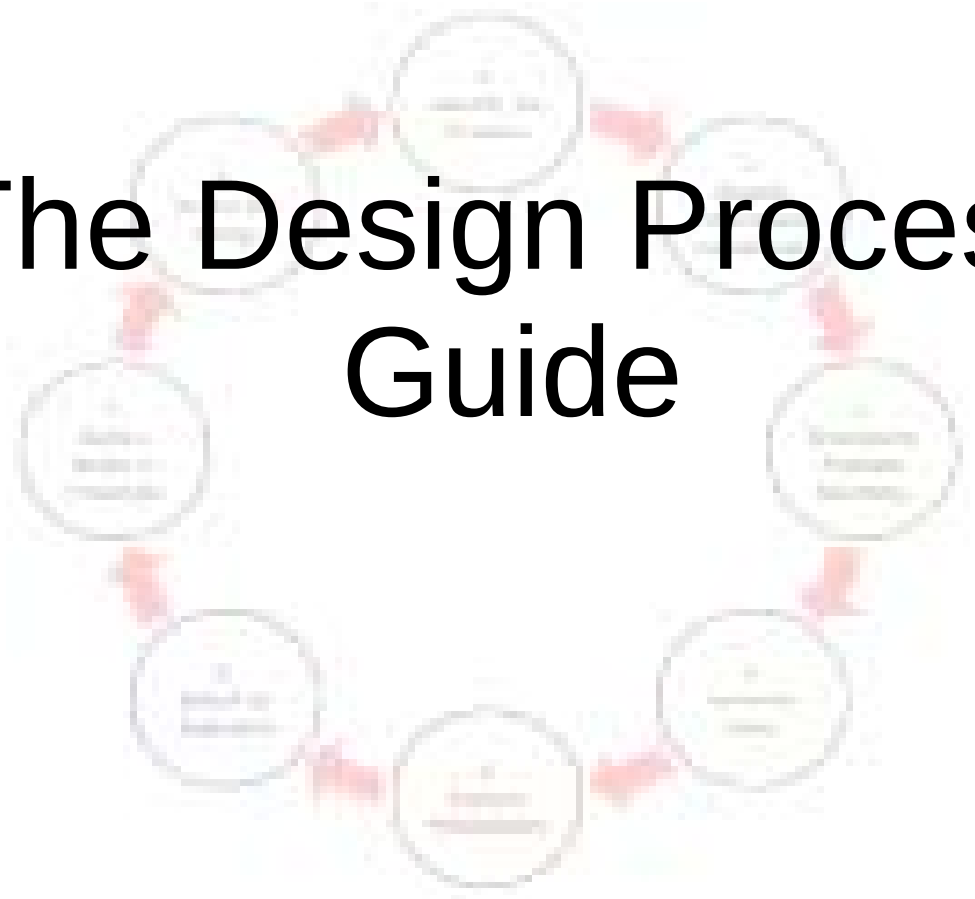
THE DESIGN PROCESS

Activity one

- Work in groups of three.
- Discuss and write down in the table below the stages involved in the Design Process.

	STAGES OF DESIGN PROCESS

- Exchange your decisions with the rest of the class.



The Design Process Guide

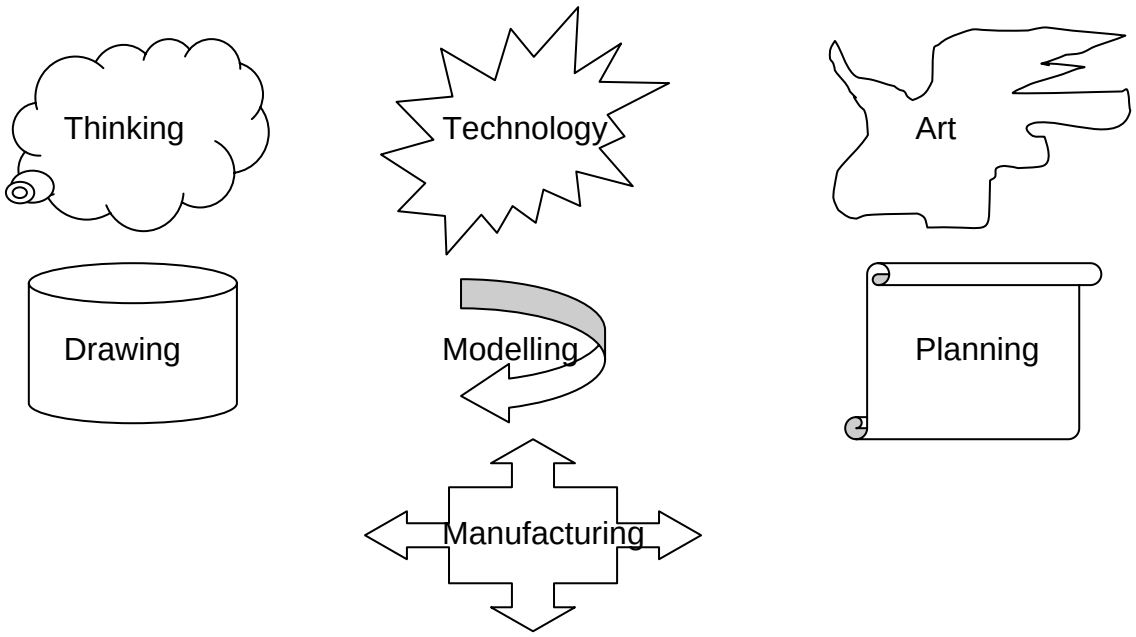
Project Title: Names: Class: Date:

CONTENTS

INTRODUCTION

Design is a non-stop process!!!

Design and manufacture demands a great variety of skills. Some of the skills you will practise/use are:



Product Design is involved in practically everything that we do in the home, at play, in the school, in the street…

The best products are those that satisfy a REAL NEED.

You have been chosen to do a humanitarian project. It consist of designing and making different **toys for children from Katine (Uganda)** http://www.guardian.co.uk/katine. We will send them all.
These children have no access to a conventional market toys and obviously, their families can't afford either buying any kind of toys. Famine is their main concern.

Are you ready to help them?

AIMS AND DEMANDS:

You are expected to:

- **Design and make a TOY for children aged between 3 and 8.**
- Work in groups of two. Teamwork.
- Restrictions to bear in mind:
    - The availability of materials (metal, timber and plastics…) and mechanisms (gears, pulleys…) in the workshop.
    - You will use the tools and machinery of the workshop.
    - You can bring other materials that you want to use.
- Follow the instructions of the teacher and the guide.
- Learn and follow, with common sense, the workshop rules, specially with respect to machinery and tools (Optional activity)
- Wherever you do your writing and drawing you need to bring the necessary items (pencils, ruler, pencil sharpener, rubber, colouring pencils, compass…).
- It is highly recommended to **take pictures** of the work done during the different stages.

At the end of the term, each group has to deliver:

- The **TOY**
- Complete piece of work/**portfolio** (including all the sketches and research you will have done and all the unexpected events.
- **Oral Presentation** (PowerPoint) **of your work.**

Do your best and work at a steady pace!

ASSESSMENT

This is the assessment table that the teacher will use to award the marks.

	1	2	3
Design Brief	- The Design Brief is neither clear nor concise	- The Design Brief is clear and concise. - Little previous group work before the Brief.	- The Design Brief is clear and concise. - Good group work before the Brief has been done.
Analysing	- Some questions are not answered. and/or - The Mind map is incomplete.	- The Wh-questions have been answered. - The Mind map is quite good.	- Many good questions and answers concerning the toy. - Very good Mind map.
Research	- Less than two pieces of research have been done or two or more researches have been wrongly done or presented. and/or - Badly stated conclusions/no conclusions.	- Two or more pieces of research have been done in a correct way. - The conclusions are correct.	- Two or more pieces of research have been done in a very good way. - The conclusions are clear and consistent.
Specification	- Lack of some Primary or secondary functions and/or - Some specification points are neither decided nor justified and/or - Radar chart and design is badly done.	- Some Primary or secondary functions not clear. - Specification points decided not all justified - Radar chart and design done.	- Primary and secondary functions clear. - Specification points decided and justified - Radar chart and design tidy and well done.
Alternative proposals	- Your proposals are less than three. or/and - they don't have	- You have three solutions made using at least two different	- You have three appropriate solutions made using different

	many notes or/and - You haven't used different techniques to draw them.	techniques. -Few notes	techniques and all of them include many good and clear notes
Realistic solution	- You haven't explained the choice. - Not all the essential points are included	- You have explained the choice. - All the essential points included, though it is possible to improve some of them.	- You have explained the choice. - All the points to be included are well done: orthographic projections, scales, materials…
Planning	- The work chart is not clear or/and - many processes don't appear or/and - some part of the chart is not finished at all	- The work chart is clear. - Some (1 or 2) of the processes are not included	-The work chart includes all the steps and they are really well thought and explained
Making	- The group work is not balanced. - Your work is neither constant nor well done enough. - You haven't taken notes of the problems or the length of each stage	- You have worked in group. - Your work is consistent and quite well done - You take some notes of the real length, of the problems and of the solutions chosen	- The group work is made in a good harmony - Your work is well done - You take accurate notes of the real length, of the problems and of the solutions chosen
Testing	- You have not included all the necessary testing points or/and - Your tests aren't planned or done in an accurate way.	- Your testing is clear but one of the items (your test, somebody else test and simulation) could be better.	- You have used, asked some people to use and simulate some aspects of your toy. - You have reached objective assessment of your toy and you explain it clearly.
Evaluation	- The evaluation is poor. Few people have been asked	- You have your own evaluation. - You have some	- You have your thorough evaluation.

	or your information is unclear.	more opinions.	- You include a huge variety of opinions, suggestions. - The information is clear.

DESIGN BRIEF

Without the initial thinking it would be difficult to conceive and build a new product

Now, you have to concentrate basically on the problem you're trying to solve.

- WHY is a/the new product/toy needed?

  Some possible reasons:

  - A gap in the market
  - Problems with an existing product
  - To improve the performance of an existing product

Task 1: Describe briefly (after thinking and discussing) what you are aiming to do. It should say just enough to state the problem, but it should not attempt to solve it.

A short description of what you intend to do to overcome the problem

"Design and make a stool for an adult aged 35"

Be simple and concise!!!

What is the English word for_____?
How can we say_____?

Vocabulary
Toys

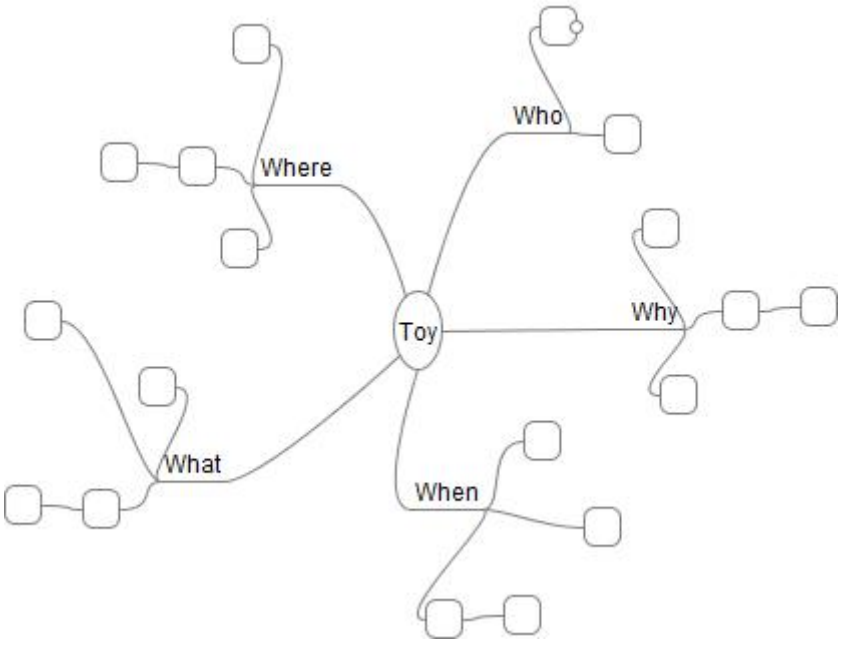
Jigsaw	Cups	Puzzle	Bag
books	Play buttons or reels	Shopping game	Teaching clock
bingo	Reward chart	Magnetic calendar/world	Tie my shoe
Doll	Tunnel	Table football	Lift-out puzzle
Card game	Bounce animal	Doll's house	Bath toys (rollers, bar…)
Drum	Xylophone	Chess	Pushchair
Toolbox	Walker	Juggling	Rocking cradle
Game of chance	Shape sorter	Jewell case	Baby wardrobe
Billiards	Stacker	Black board	Stroller
Skill toy	Lamp	Domino	Beauty case
rattle	Vehicles (train…)	Soft cubes	Tea set
Pin ball	Ramp	Doll	Drying rack
Ball	Happy places	Labyrinth	Kitchen accessories set
Holders	Projector desk	Stencils	stampers
Sew and lace cards	Wind chime	Puppets	Theatre
Bookmarks	Counter caterpillar/lion	Alphabet frame	Cards
Catapult	City garage	Castanet	Maracas
Bell stick	Shelves	Memo board	Height chart
Apron	Paint palette	Mats	Art easel
Yo yo	Pull toy	Parking	Shopping bag

ANALYSIS

Let's start with the WH-questions!

- Try to find as many answers as possible.
  - What could I do?
  - Who could use it?
  - Where could it be used?
  - When could it be used?
  - Why should it be used?

- Now, design a Mind map (ICT*)



- Probably you will find that there are a number of possibilities which you could design. All of them could satisfy your brief.

- If your original problem was very general, try **asking** one idea from the chart and conducting a further analysis before carrying on.

RESEARCH

….is important: it will give you lots of ideas and a good starting point for the rest of the design
To know the problem is half way towards finding the solution

You need to consider **the person** who is going to use the toy and find out what **their needs** are.

Task : Choose at least two of the research techniques from the table below

	Research Techniques
Measuring - Its length is 290 mm, its height is 490 mm and its thickness is 230 mm (tall, long, …) - The main sizes are: …… - It weighs 349 g - It has a soft/smooth/rough texture or It feels grainy/fine 	Gives you an idea of possible weights, shapes, sizes… Sensory analysis (feels, smells, touch…)are possible too
Experiments - Aim : to find the average height of five stools - Apparatus: tape measure - Method: to measure them and to calculate the mean/average - Result: the average height is 480mm 	Key pieces of information. Headings used for the scientific experiments: o Aim = why the experiment was done o Apparatus = equipment and materials used o Method = how the experiment was done o Result = What was discovered
Disassembling	How a product is made How it works

objects

Materials and processes used
How existing products meet potential user's needs

- Stool A is collapsible, made of wood and fabric. It is composed of nine pieces: four wooden legs, four cross bars and a Texan fabric.
- Dowels and glue are fitted to joint the legs
- Two cross bars are screwed to the legs
- The fabric is nailed on the wood
- Timber is finished with matt varnish

Books and media research (magazines, manufacturers, net, newspapers, leaflets,…)

Experts opinions
Ideas to rework and fit your specification

- (In a formal letter) …We are interested in stools and would like to have your furniture catalogue….
- Browsing through magazines we've seen many different designs and sizes.
- The anthropometric data for an adult knee height is 470 mm

Questionnaires	People's likes and dislikes Useful to identify your **target group** and find out your **market trends**

- What stools are becoming more popular?
- What material do you prefer in a stool?
- What do you use a stool for?
- If you could design your own stool how would it be?

and use them to elaborate the research to:

- Check that users actually **want** your product
- Find out
  - **what** makes an existing product good or bad: talk to people who use a similar toy and see what they like or dislike.
  - **what** materials, pre-manufactured components, techniques you can use and optionally how they could affect the manufacturing.

Task: Research analysis

- You need to come to some **<u>conclusions</u>** to decide how to use the information to help you write your design.
  - Pick out the useful information
  - Explain what impact the research will have on your design
  - Suggest ways forward from the research gathered.

Now you have some ideas about how to tackle your project!

SPECIFICATION

Good designers consider secondary functions as well as primary one

Task:

- Firstly, your analysis and research have to have made clear the product/toy's **main function**. Write it down.

We would like to make a stool that could be used in a living room.

- Probably you have asked too: what else must this product do?. Ask yourselves questions about storage, cleaning, maintenance, transport…. These are **secondary functions**. Specify them.

It might also be used as a footstool and as a folding chair.

With reference to:

- **Storage:** it will have a holder device for the wire…
- **Maintenance**, you can buy refills…
- **Cleaning**, it will be able to be cleaned in the washing machine.
- **Transport**, it can be held in 2 different ways.
- **Packaging**, it will be packaged in a reusable paper bag…

- Complete your **design specification** giving reasons for your decisions.

Specification point		My decision	Reason/s
1	The **materials (**recycled,….) and/or all components we will use	Use at least two different materials (**one or more, recycled)** and five different components	
2	**Ergonomics**	Explain whether it is comfortable, fits well, the size and weight	
3	My **target market**	Specify it. Say exactly who is it aimed at	
4	The **techniques**	Use at least one mechanism, different joints and one structure	
5	**Appearance/Form** (aesthetics)	The style, shape, colours, look and decoration	
6	**Safety** aspects	Safety aspects to think about are: little components, toxic materials…	
7	**Sturdiness**	Sturdiness factors	
8	The **Purpose**	The role your toy is designed to play	

- Finally, put your specifications together, **in order of importance** in a **bullet form** as specific points. Include points to describe some or all of the following:

    - Details about what it has to do
    - A description of how it should look
    - Safety points to consider
    - Details of weight and size
    - Materials, components and joining methods. Bear in mind their availability, properties and prices.
    - Other important point to consider

- Use the **radar chart** below to evaluate your toy against your Design Specification.
- Afterwards, try to show in the **cell A** as clear and concrete as possible your first **design**. Be sure that you include as specification points as possible.

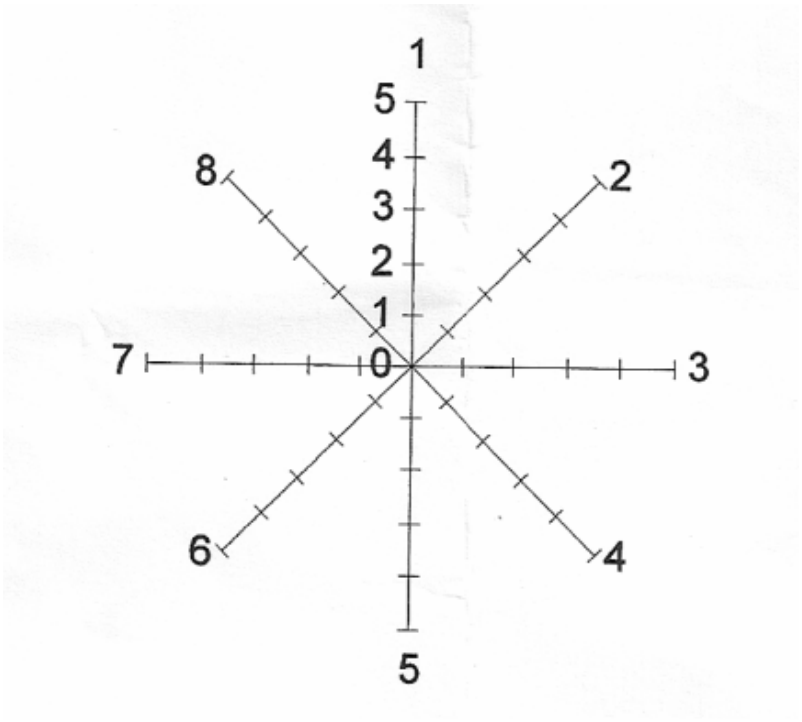
Specification points
1-Materials
2-Ergonomics
3-Target market
4-Techniques
5-Appearance
6-Safety
7-Sturdiness
8-Function

A _____

B _____

C _____

Radar chart



A This is the toy design we have chosen to develop

Checklist: Be sure that you have shown all the specification points:

- the materials
- the size in cm
- the target market
- the techniques
- the colours and appearance
- the safety rules
- the sturdiness
- the function/s

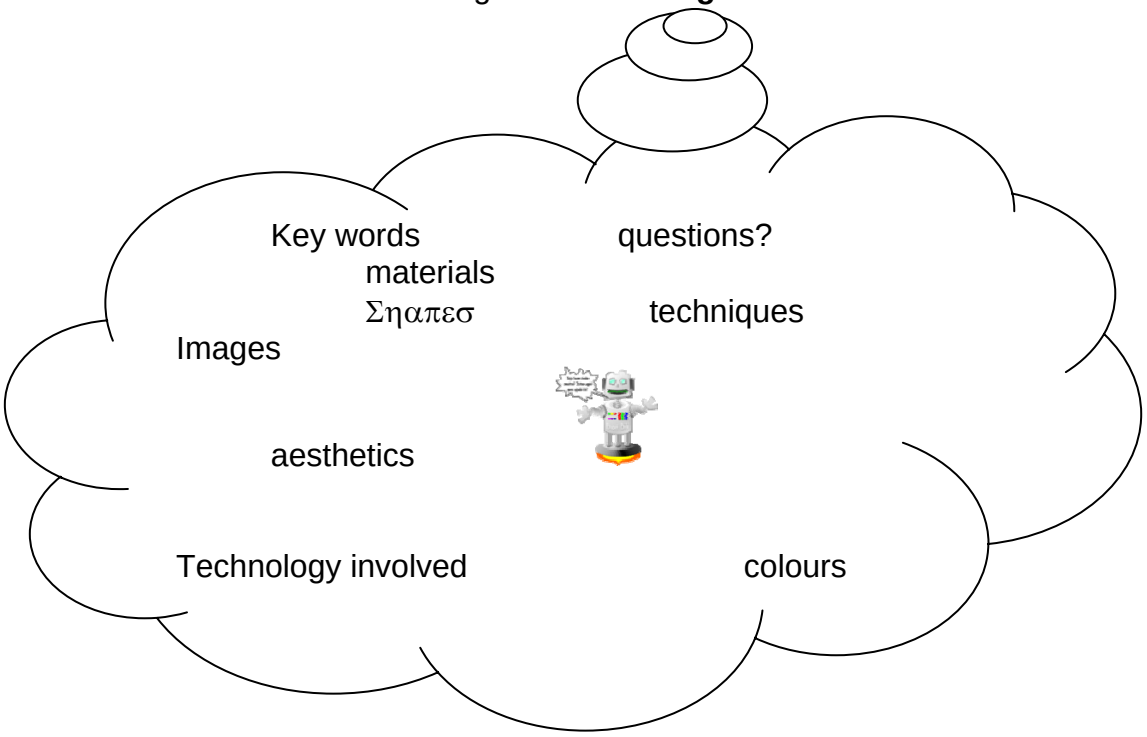
ALTERNATIVE SOLUTIONS

Let's go! It is the Creative and Practical stage
Think on paper!
Write whatever comes to mind!

- First of all, 'check' the **Design specification check** (next page)**.** Ask two peers (B and C) to improve your design and to reflect in your radar chart the improvements. They should mark the chart with a different colour each one so you'll see clearly what each colleague has improved.

- Secondly, having considered the checking, use the following tips to start designing with:

  - Create a **mood board** using **brainstorming**



  - You can break the task up into smaller parts i.e. **technology involved, aesthetics, texture and finish, patterns, shapes and form, energy sources, techniques, materials, styles** (traditional, classical, functional, technical)…

DESIGN SPECIFICATION CHECK

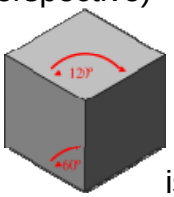
B I have improved your design by _____
C have improved your design by _____

You need to come up with a range of designs. Time and skills must be taken into account

- Produce a **range of appropriate solutions (3)** that you think could actually be made.
- Try to use a **range of techniques**

perspective drawing (one or two point perspective)

freehand sketching

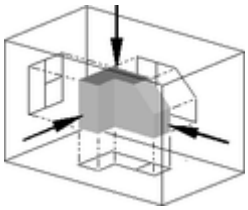


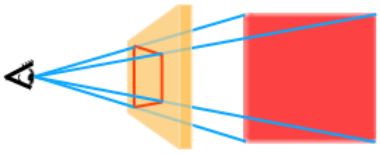
isometric drawing

digital photos

cross-sections

Computer Aided Design (CAD)





orthographic projection

- **Add notes** to your designs to fully explain:

user	shape	materials	production
advantages		size	disadvantages
functions		cost	colour

- Check that **each** design **matches** your specification

Do not waste ideas!; a poor idea today might suggest something better next time

REALISTIC SOLUTION

Neither of the designs is the right or wrong one

- Now, you as designers must **make the choice**. So, **make a decision,** saying **WHY you have chosen this one.**

We	have	chosen	this	proposal	because	it	is	more	fashionable difficult original
		selected						much more	
	haven't	preferred		alternative solution				less	

The reason	why	we	have	chosen	this	proposal	is	……
				selected		toy		

- This is the moment when your design/toy should start to really take shape. So:
  - Develop your design in different ways:
    - Draw the **orthographic projection** (plan, front elevation and side elevation) of each piece **to SCALE**
    - Work out exactly what sort of **materials** you will use, how many **pieces** are needed, their exact **dimensions**, fittings and components.
    - Include **methods of construction** and **assembly**.
    - **Test**, if necessary, different aspects of the design. E.g.….It will help you to **solve potential problems**. Use the results to make **modifications**

Now, you should know <u>EXACTLY</u> what you are going to make

PLANNING

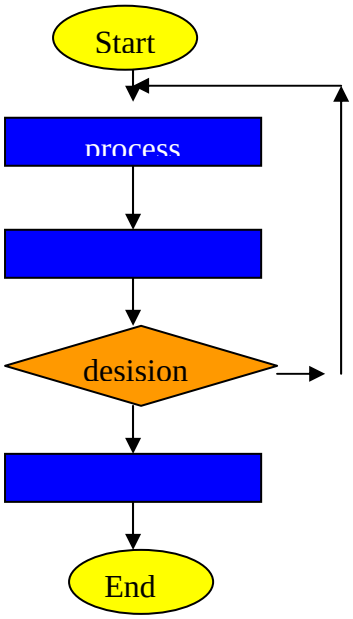
Time spent planning could save manufacturing effort!

Charts will help you to plan:

- Decide on the **best order** for the operations involved and on the materias, tools and machines you are going to need in each step.
- Try to **calculate the time** you will invest in each stage.
- Discuss your ideas with the teacher and try to complete the table below to plan your **work order**:

	process	material	tools	machines	planned lenght (min.)	real duration (min.)	difficulties, changes, comments
1							
2							
3							
4							
5							
6							
7							
8							
….							

- Produce a **flow chart** which shows clearly your prepared plan. Remember the different shape-meanings to specify whether you are in a **process**, in a **decision** or **starting** or **finishing** the making.



MAKING

Let's make it!

- Now, you only have to make your design using the drawing and following your flow chart and your work order table**.**

Warnings:

- Use a **log book**: Problems met can be noted and their solutions recorded.
- Bear in mind that each workshop operation has a **set of procedures** and needs a range of tools for different purposes.
- **Don't forget to allocate the tasks within the group: you'll win time**

Don't forget to take as many pictures as possible!!

TESTING

Live with it!

- **Use** the product to test that it meets all the requirements of the Design Brief and the Specification.

- **Ask** someone else (preferably a possible user) to use it under real conditions.

  - Would you mind using our toy in order to test it?
  - Could you please try to use this _____ and tell us whether it works properly?
  - May I ask you to use our toy just to test it?

- It is possible too to set up a **simulation**, putting the toy under similar conditions to the real situation.

  - We have simulated to _____ the _____ and it has _____
  - We have push/pull/… the _____ and it has _____

You will get **objective assessment.** Write it down as clearly as possible.

I	like	its	appearance shape size	
		how it works		
	would	have changed	its	appearance shape size
	might	change	the way it works	
	would	have preferred	another	appearance shape size
It	could	be	better	designed done finished painted
Materials	are		suitable	
			recycled	
	could be		different	
			less	heavy thick thin rough
			more	
The____	is/are		quite very	well badly	designed painted finished done

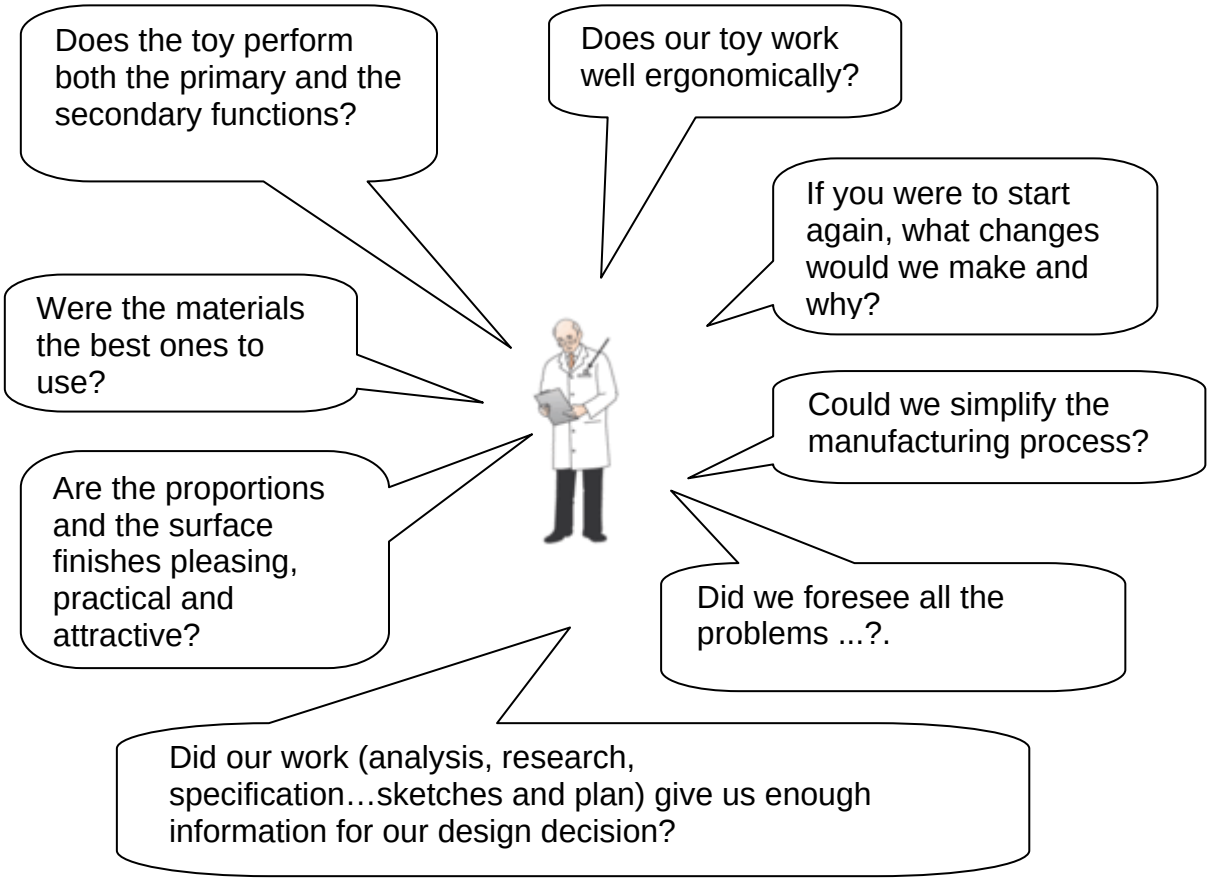
Make sure that it does the things you wanted it to do in the specifications

Don't forget to take pictures too!!

EVALUATION

You can be your teacher here!
You will be able to build on your strengths and learn from your weaknesses!
…it will help you to become a better designer

- Ask **yourselves and your peers** and answer honestly about your toy and write down all **the opinions, suggestions and possible improvements.**



ORAL PRESENTATION

- Put in **order** all your work.
- **Design a power point** with all the stages, pictures and information you have done to explain to the rest of the class. Use the pictures you have taken during the process.
- Prepare a suitable **oral explanation.**
- Bear in mind that the **items** your peers are going to use to assess your oral presentation are:

Content	Group	Power point	Speech
general content	participation	general aspects	communication
matching between speech and images	coordination	pictures, graphics and text	language

- **Introduction**. Presentation of the group: names, class, course…
- **Project aims**
- **Process summary**: stages, key words, images…
- Group's **conclusions**

Remember that often:
'A picture is better than one thousand words'