KEY STAGE 3 DESIGN & TECHNOLOGY

Book 2 Teacher's Resources

Smart Materials and Conductive products

Be smart and be seen….. keeping you safe at night…. A Light Stitches Project for KS3

Light Stitches
www.lightstitches.co.uk

Teacher Resources
Book 2 Smart Materials and Conductive products

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Introduction

This project Light Stitches Book 2 Smart Materials and Conductive Products has been designed and aimed specifically at year 9's as an introduction to product design to encourage the mixing of different D&T elements. It could however also be used quite successfully in primary schools with suitable resources or for older students as well. The contents of this book are intended for teacher's planning for e-textiles. The information and resources are designed for you to choose some or the entire scheme and projects. There is a separate e-textiles project book for the students or as another reference for the teacher.

This project would be ideal as a starter project going into GCSE work. In these days of tight budgets these items could also be made by a class as group work. By dividing the class into 3 groups and each one working on each design and its development as a group with a presentation to the rest of the class at the end, this way only 3 items are made instead of over 20 thus reducing costs.

The "Be Safe and Be Seen Projects" are ideal for producing a realistic design and making these suitable for a retail market. They become unique smart projects by their inclusion of LEDs and the use of conductive thread and switches. There are 3 basic designs included in this book for a Road Safety Strap but if you wish to increase the level of design input then the components can be used in other things in just the same way. This booklet has been written giving the students very little designing to do as it is aimed to learn certain basic skills but, the designs could be surface decorated for example to tempt a particular market.

Please see our website for the latest projects. We hope you find all the information and resources useful and that the students find this to be an enjoyable scheme of work. There is also a Power Point Presentation available videos are found on our YouTube channel Light Stitches.

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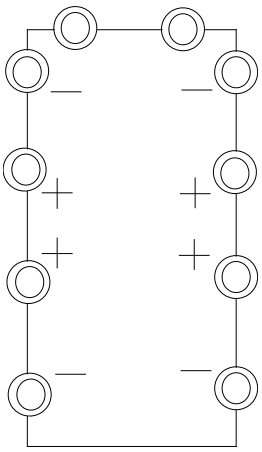
The circuit board and how to complete a circuit using conductive thread



Picture A

A circuit and power board enables you to operate up to 5 inputs and outputs at a time taking up no more than 6v in battery power picture A. It is designed to use with conductive thread for sewing into textiles projects but can also be used in the conventional way with solder and wire.

The important thing to remember here is that you wish to have future access to the batteries but also that the contact between the thread and the board is actually on the reverse from the batteries. You need to sew the board into your access pocket or flap so that the batteries are on show when the flap is open and your sewing to your LEDs and the LEDs are actually on the other side of your material.

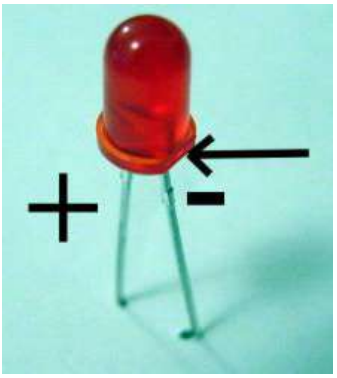
There is also an important choice of materials to use to take into consideration. Conductive thread circuits do not work well on a material that has any form of stretch. So its important the fabrics are chosen appropriately, something which is quite stable, i.e. felt, cotton, polyester. Fleece or jersy for example would not be good choices.

Each group of two holes belong together, one is a positive and the other a negative. Each set can operate 1, 2 or 3 LEDs. The maximum number of LEDs the board will cope with is 12 and they would all need to be the same type. Different LEDs use different levels of voltage therefore it could cause you problems if you start to mix and match too much.

Tack down the board using ordinary tacking thread. Just a couple of tacking stitches each hole just to keep the board where you want it to be. LED's also have a positive and a negative leg. The longest leg is the positive. Picture B.

When placing your LEDs it is important to remember that you are building a circuit, i.e. a circle and that the threads must not cross each other or you will end up with a short circuit.

Using long nose pliers curl the legs around on themselves which will allow you to have a curl of wire which you can then tack down in the places you want them to be. Don't forget to place them the correct way around positive and negative.



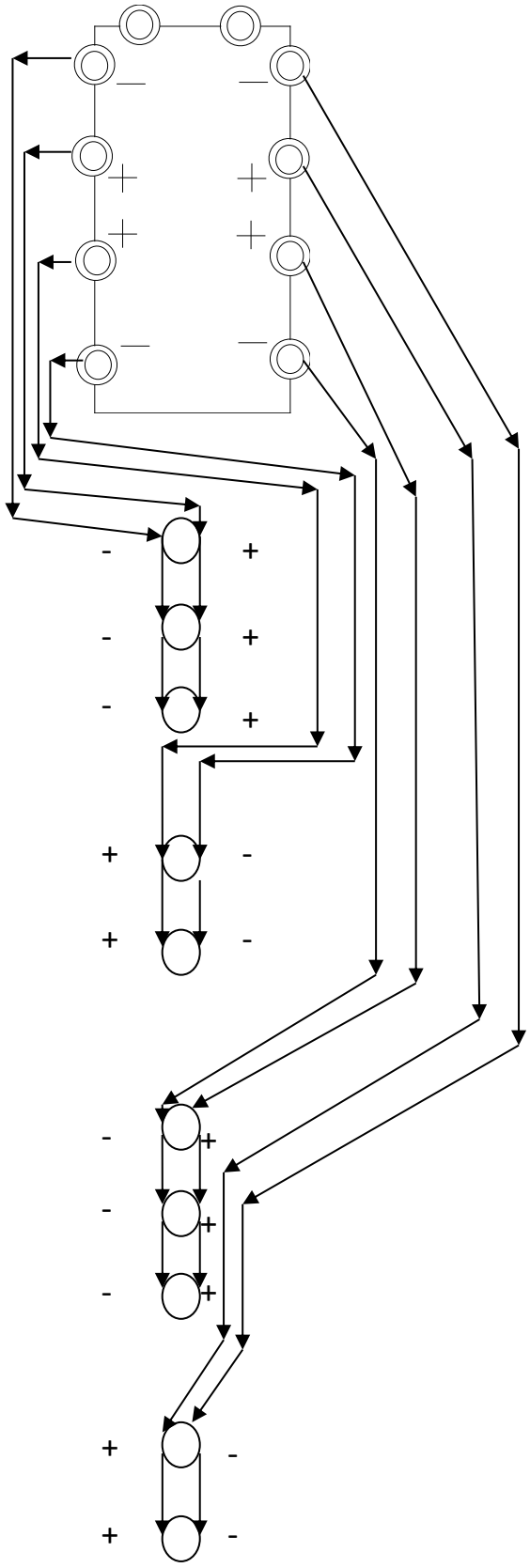
Picture B

If you follow the arrows downwards you can see you are connecting the negative metal hole down to the negative leg of an LED and then down to the next LED.

You do the same with the positive metal holes and the positive legs of the LEDs.

Once you switch on you then have a circuit down from each metal hole pair, going down to the positives and back up through the negatives.

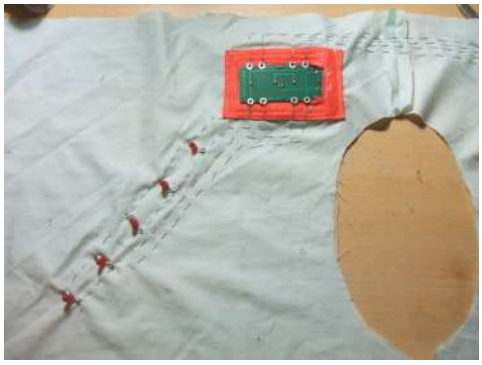
The first time you follow this diagram, keep to the straight line before you start to move the LEDs around.



Tack down the LEDs in a similar way to the circuit board. It just helps to keep everything in place and allows you to double check the circuit before you start to use the conductive thread. Thread your needle with conductive thread add knot on the end to prevent it coming through the fabric.

Complete the lines as per the diagram and attach each component up to the circuit board. At each component make a stitch through the material and then pass the needle through the loop and pull tightly. This ensures that you have a firm contact with the metal of the component, the metal of the circuit board and the metal content of the conductive thread. The electricity will not flow without a complete circuit.

Below is a picture of the stitching for the tabard version of the road safety garment.
As you can see the one side of the circuit board has been used to power one set of 3 and one set of 2 LEDs at the front of the tabard picture C and the other side to power the same at the back picture D. The wrong side of the board is on the wrong side of the material, as are the LEDs. The batteries are accessible through the hook and loop tape flap on the right side of the material. This process of connecting up the components is the same for any garment just the direction you want to go with the stitches to go with your design changes.

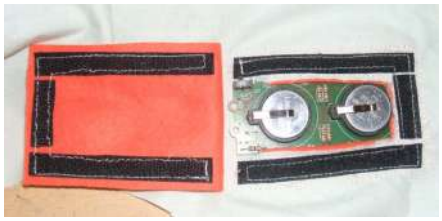


Picture C

Picture D

Troubleshooting
Are the LEDs the correct way?
Do you have a good connection at the circuit board and each LED?
Do the batteries need changing?
Have you a complete circuit for each LED without crossing any other threads?
Do you have any threads touching one another?

Extension work – Adding a Mp 3 player

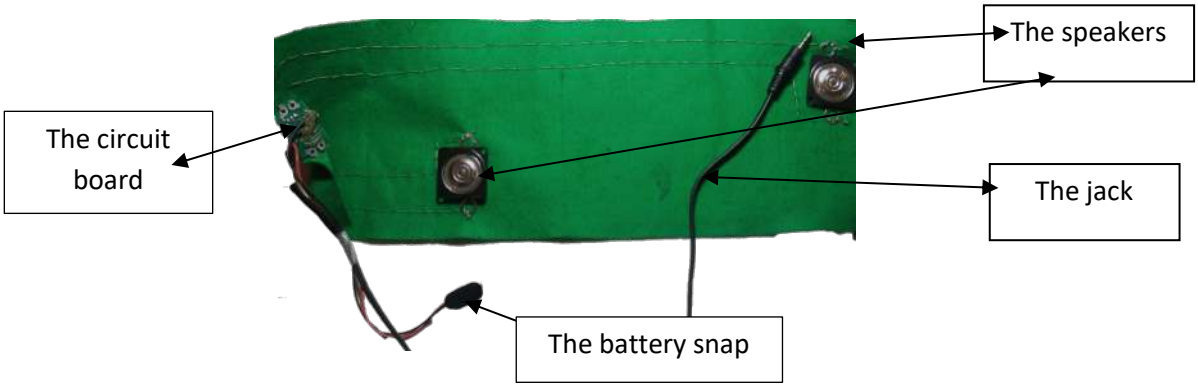


Picture E

An Mp player kit usually comes with a ready populated board, with a battery snap (for a 9v battery) already attached, an earphone jack socket (suitable for most Mp3 players and iPods) and 2 x 25mm speakers which are suitable to be sewn into textiles through the metal holes in the circuit boards and also through the holes in the plastic surround so that the speaker can be held firm against the material being used to cover the speaker itself. Picture E.

To sew these onto a piece of fabric is very easy. The connectors on the speakers do not have a positive and a negative. The populated circuit board has two lots of metal connectors, again neither with a positive nor a negative, but they do work in pairs as per the circuit board for the LEDs. Knot the thread onto one of the connectors from one pair on the circuit board, thread your needle and stitch down to one of the connectors on the speaker. Do the same with the other connector of the same pair on the circuit board and stitch down to the other connector on the speaker. Do the same for the other speaker. Make sure you do not to cross your lines of sewing otherwise you will end up with a short circuit.

The same guidelines apply when sewing this circuit as when sewing the LEDs. Use a firm, stable fabric to stitch your flexible circuit and ensure that the thread is firmly knotted to the circuit board connectors and the connectors on the speakers thus ensuring a clean, strong connection to the metal of each. You should now be able to hear the audio on your mp3 player once you insert the jack into it.



Using the LED circuit board and the mp3 player together

The battery snap can be removed if you are adding this to the LED circuit board and attach one thread to the positive connector on the mp3 circuit board and one to the negative connector.

These threads need to be attached to the LED circuit board into one of the paired connectors just like you attach the LEDs, the positive to the positive; the negative to the negative. Keep the lines of sewing separated from each other just like before. The LED circuit board should have enough voltage to work your mp3 player and 8 ordinary LEDs. You may need to reduce the number if you decide to use multi-coloured or flashing LEDs.

The three models we have designed

We have not included patterns in this booklet as the students should be aiming to design their own patterns based on the size of the model they are making the product to fit. If they are using themselves as the client, they can measure each other. If they are using a child, say a younger brother or sister they obviously should measure the client. We have however, given instructions as to where to measure in order that the product should fit their client. Therefore, this scheme of work moves them up a level to making a pattern to fit a person as opposed to making a pattern to fit a product, say a mobile phone holder, pens or a book thus building up their skills in readiness for their GCSEs.

Model one – the orange tabard/vest

This is a straightforward tabard/vest.

1. The students need to measure across the chest and the length required. Measure across the neck from the tip of one collar bone to the tip of the other and from the top of the shoulder down to the depth you want the neckline to be. Then curve round to create a neckline.

2. The front and the back are the same. Don't forget to add on any seam allowances or hemming. The regularly used seam and hem allowance is 1cm. The one shown is made from acrylic felt. The advantage being that there is no need for hemming due its non-fraying properties and the eyelets are placed into this layer. Picture 1.

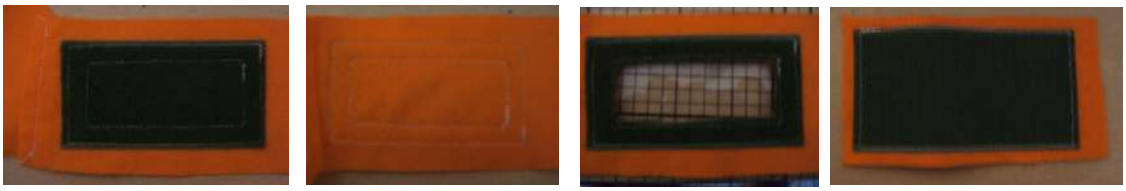
Picture 1

3. The flexible circuit underneath is also acrylic felt and is made from three separate pieces, one for across the chest eyelets, one for over the shoulder and one for the back eyelets. Picture 2. There is no need to use a whole piece of felt to make the circuit from, just stitch the three together into the correct shape and angle for across the chest and over the shoulder. Picture 3. The conductive thread has been sewn purely through the top layer of the felt rather than through from one side to the other. This alleviates the need for a lining material to cover up the circuit as little sewing is actually on show on the inside.

Picture 2

Picture 3

4. The hook and loop tape method has been used to provide a cover for the circuit board for access to the batteries. Picture 4.

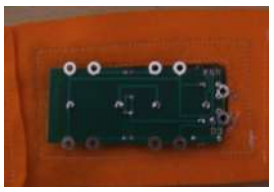


Picture 4

5. Measure and cut a piece of hook and loop tape slightly larger than the circuit board. Using the brushed side of the hook and loop tape, stitch a rectangle slightly smaller than the board and then stitch around the edge of the tape. Then using a scalpel and cutting mat cut out the inner rectangle. Using the nylon hook side of the tape, stitch to a rectangle of felt large enough to act as a circuit board cover. This can then be stitched at one end to make secure if preferred. Picture 5.

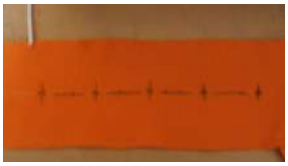
Picture 5

6. As you can see the circuit board now fits quite neatly through the hole, with the 'wrong' side of the circuit board on the wrong side of the fabric. Next tack the circuit board in place at the 2 end connectors, which for this design we won't be using. Picture 6.



Picture 6

7. Then mark your design on the felt you have sewn together, the back and the front. In this case the gap between the LEDs worked out to be 10cm, with 5 LEDs down the front and 5 down the back and the place for each LED was marked on the felt with pencil. Pencil is fine for marking the fabric here as it is not going to be on show and won't disappear before the LEDs are sewn into place. Picture 7.

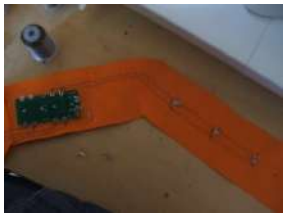


Picture 7

8. Twist the legs of the LEDs into coils using long nosed pliers. Start to stitch your LEDs in place. Remember to keep your negatives on the same side as each other for each group of LEDs. In this photo, we have started from a negative connector, so sew down from there to each negative leg on each LED of the group. Picture 8.

Picture 8

9. Then stitch from the positive connector down to the positive legs of each LED in the group. You can then do the same for the next group of LEDs but remember that the next connector up the side of the circuit board is another positive so set your LEDs up so that you can sew to their positive legs without crossing any of your previous stitching and enabling a clear path to the negative legs. Picture 9.



Picture 9

10. Look at the diagram on the previous pages to help you but once you master how to connect up the circuit board it really is very simple to adapt to other designs. Now complete for the remaining side. Stitch the shoulders of your 2 tabard pieces together. Lay your flexible circuit on a flat surface and place the tabard over the top so that the circuit cover lies just over the shoulder onto the back of the tabard. You will be able to feel the LEDs through the material, mark the place for the LEDs with a small amount of fabric chalk. Picture 10.

Picture 10

11. Next place your eyelets. These help to support the LEDs and help to keep them in place in the final product. Once you have popped each LED through its eyelet, hand stitch through the flexible circuit and out onto the main fabric close to each eyelet, one small stitch at one side, one small stitch at the opposite side. This helps keep the flexible circuit in place and the LEDs. Picture 11.

Picture 11

12. Catch stitch the rest of the flexible circuit in place at the back of the eyelets to ensure it doesn't move around. This is particularly important around the circuit board due to it being slightly heavier. Picture 12.

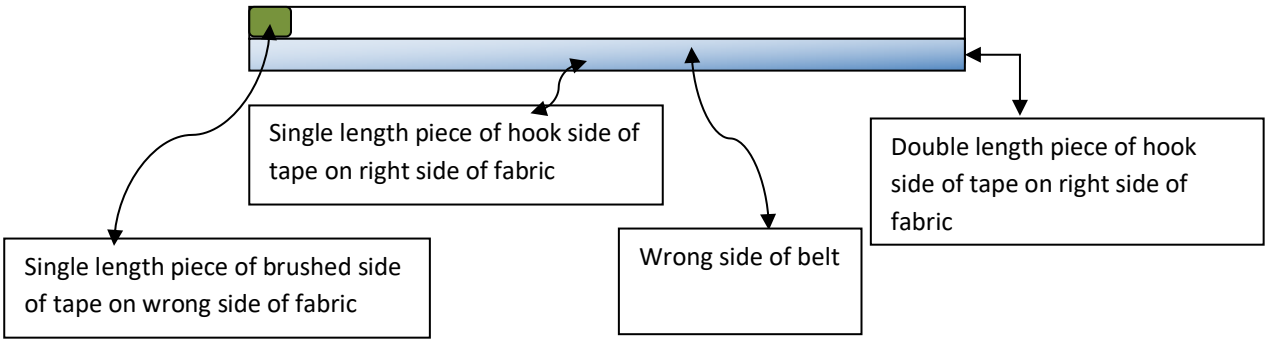
Picture 12

13. Next cut 2 pieces of elastic to attach to the sides, back and front approximately 10cm up from the bottom edge. You should now have a working tabard/vest.

Model two – the yellow diagonal

1. To make this design measure the waist, add on approximately 5 -10 cm to overlap onto the hook and loop tape to fasten. The depth of the waistband is entirely up to you, but you would normally double the depth and place interfacing in between to strengthen the band. The band is folded over and stitched down either by hand or using the machine.

2. Before finally sewing down stitch the raw edges, stitch a piece of hook and loop tape to one end and the matching piece on the opposite side of the other end. Sew the hook end on the left and make it twice as long as the brushed end and the brushed part on the right (underneath) so that when they are fastened together you will leave half of the hook tape free for one end of the diagonal strap to be attached to it. So, they will fasten over each other when around your waist. Stitch a piece to the back of the waistband too, the hook end. Its corresponding 'brushed' end will be on the end of the diagonal strap.



3. The circuitry for the diagonal strap is exactly as per the diagram up above. Sew your circuit into one piece of material with the battery cover at one end. Remember to attach the extra pieces of the brushed side of the hook and loop tape to enable you to fasten the diagonal strap to your waistband.

4. Mark up and place your eyelets as per the instructions for the orange tabard. Once you have popped each LED through its eyelet, hand stitch through the flexible circuit and out onto the main fabric close to each eyelet, one small stitch at one side, one small stitch at the opposite side. This helps keep the flexible circuit in place and the LEDs.

5. Attach strap to waistband with the hook and loop tape and you should now have a working diagonal strap.

Model 3 – the reflective and fluorescent 'Y' shaped jerkin

1. First measure your model from the waist up to the chest; this identifies the length of open ended zip you require for your jerkin. In this example it was 30cm.

2. Open up the zip, cut 2 pieces of reflective tape 2 cm longer and then stitch each piece to each side of the zip. Zip up again. Picture 1.

Picture 1

3. Place the closed zip up against your model again and this time measure from the top of the reflective tape to the top of the shoulder. Add on 1cm and then cut 4 pieces this length. Fold the corners up on two of the pieces and then trim the corner off. Picture 2.

Picture 2

4. Lay one of each shape next to each other and flat stitch each piece to other stitch to zipped piece. This provides the wider shape leading up to the shoulders in order to ensure the fabric is wide enough cover up your circuitry later. Stitch the straight bottom edge to the top of the zipped part sewn previously, at the correct angle to lie correctly. Picture 3.

Picture 3

5. Do similar steps for the back, from shoulder down to centre back between shoulder blades. Then stitch the two pieces on top of each other into a 'V' as per the picture. TIP: Rather than use pins and tacking to temporarily secure your fabric, use masking tape. Picture 4.

Picture 4

6. Place shoulder pieces, right sides together, and straight stitch across. Fold back the seam allowance to lie flat, then using the same flat stitch you used before stitch across the seam again to hold the shoulder seam down flat permanently. The right side of the shoulder seam will now look like this.

Picture 5

7. Complete the opposite side to match.

8. Now measure from the bottom of the 'V' down to the waist and create a double pieced strip of reflective tape which will join the shoulder pieces down to the waistband to create the jerkin shape. Picture 6.

Picture 6

9. Next place the sewn items onto the model and measure a single piece of reflective tape around the waist from the right hand side of the zip, around the back, to the left side of the zip. Then sew in place at each zip end and then attach the centre back strip to the waistband. Trim off any excess from the centre back strip if you have any. You should now have a complete jerkin shape. Approximately 4m of reflective tape was used. Picture 7.

Picture 7

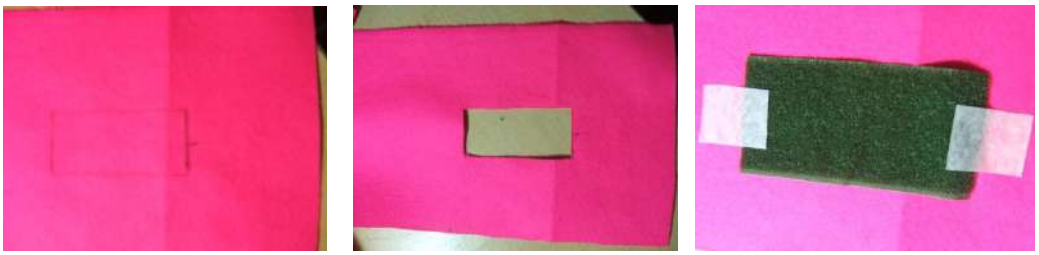
10. This now gives you a pattern to work from to cut out your felt shapes to enable you to stitch your flexible circuit. Picture 8.

Picture 8

11. Using the jerkin as a pattern lay it on top of your felt and cut pieces to sew together for under the shoulders and the centre back. They should be at least 2 cm wider than the reflective tape width when it has been sewn together into a double strip. Stitch the pieces together at the right angle so that at least 1cm of felt will show under the shoulder straps and the centre back. Picture 9.

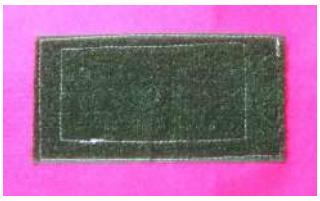
Picture 9

12. Next, work on the battery cover and cut out a rectangle slightly smaller than the circuit board. Place a piece of wide hook and loop tape, holding it in place with low tack tape as the hook and loop tape is very stiff to get pins through. Picture 10.



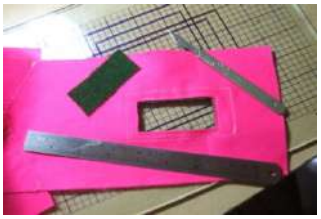
Picture 10

13. Stitch around the hole and then stitch around the outside edge of the hook and loop tape. Picture 11.



Picture 11

14. Using a scalpel and cutting mat, cut out the hook and loop tape which won't be needed as that is where the circuit board will sit.
Then tack the two top connectors down to the hook and loop tape.
Make sure your switch is easily accessible. Picture 12.



Picture 12

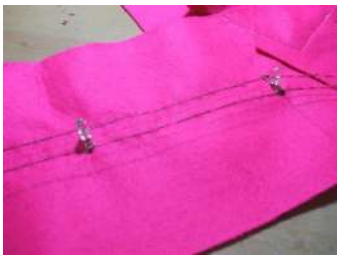
15. You can now start to build your flexible circuit in a very similar way to the tabard/vest and yellow strap. Place your felt underneath your reflective tape jerkin. Decide where you want your LEDs to start and end from. In our case, it was just above the sewing of the centre back piece to the shoulders and to end at the sloped edge of the front of the shoulder straps. Picture 13.

Picture 13

16. Now mark these positions on your felt. The space between our start and end markers was 40 cm. This meant that we could divide the space up quite neatly into 10cm gaps to place our LEDs. Five over one shoulder and five over the other, it works out to approximately 2 on each shoulder strap on the back and 3 on each shoulder strap on the front. Picture 14.

Picture 14

17. We chose to draw our flexible circuit sewing lines onto the felt prior to the sewing, this meant there could be no mistakes as we stitched the circuit in. This part of the fabric will not be seen in the final product so you could even mark the lines prior to sewing that they are negative and positive, whatever you find easiest to make sure few mistakes are made. Picture 15.



Picture 15

18. As you can see from this photograph, the stitching for the circuit has only been sewn through the top layer of the felt rather than completely through to the other side. This means you do not need to put more fabric behind the flexible circuit to cover up your sewing to improve the quality of finish. Picture 16.

Picture 16

19. Next mark up your reflective tape where the LEDs should go. This should be easily measurable based on your measurements on the felt. Insert your LEDs through and then use some low tack tape in order to keep everything in place whilst you stitch through by hand. Use small stitches up through the seam to one side of the led, back through to the wrong side and back up through the stitching again on the opposite side of the LED. Picture 17.

Picture 17

20. The back should look like this, you won't be able to see your stitches from the front but, they will help to hold the LEDs in place. Picture 18.

Picture 18

21. Now using the machine and a straight stitch, stitch around the reflective tape shape, stitching it to the flexible circuit. Trim away any unwanted felt, ensuring you do not snip through your circuit anywhere and leaving a trim of approximately 1cm of fluorescent felt showing underneath the reflective tape. If your circuit should fail at this stage the likelihood is that you have snipped through your circuit and this will need to be re-sewn before you will be able to get it to work again. Picture 19.

Picture 19

22. Now affix the hooked side of the hook and loop tape to a piece of felt large enough to cover the circuit board. Picture 20.

Picture 20

23. Cover up your circuit board with this. Picture 21.

Picture 21

You should now have a working reflective safety jacket.

Conductive Thread

Until recently the mixed properties of electronics and textiles was unheard of. With technology moving as fast as it has in recent years , the possibilities of clothing and accessories with visual and audio effects by the use of flashing lights, sensors and piezo-electronics has now been made much easier in a domestic situation with the availability of conductive thread.

Conductive thread is similar in properties to ordinary sewing thread but, it also has the ability to conduct a small amount of voltage through it. It can do this as it has metal incorporated into it (usually silver, nickel, tin or copper) with a core of normally cotton or polyester. The thread is not insulated and therefore attaching it to a metal component within a circuit in place of the usual wires means the circuit is much more flexible allowing you to maintain many of the original properties of the material such as drape and feel. As it is a thread it also allows you to sew by hand or machine and even embroider designs into textiles. Its resistance properties are 4Ω per 100mm. When using by machine it is not necessary for the second thread to be conductive thread to just the spool for the side of the design you wish to have the circuit on.

The conductive thread used by Light Stitches is a medium weight and comes on a bobbin of approximately 6M or 150M reel. The thread is much stronger than domestic poly/cotton thread, and somewhat thicker. If using on a machine you may wish to try a larger needle to help with threading up and less chance of fraying by being caught on the point of the needle.

Conductive thread has medical uses (silver has antiseptic qualities) and is used to create 'soft' circuits. An example of one of its uses is a fencing jacket. The jacket is made with conductive material scoring areas which can become extremely worn with time. The jackets are expensive, and fencers usually try to get them repaired by darning the worn areas. Conductive thread can be used for this quite successfully and also sewn into the fabric of a jacket where the conductivity of the material has been lost over time.

Conductive Hook & Loop

Hook and loop has been around for decades today it is used in various applications and designs which are always evolving. It is often described as “Velcro” but this is a trade name so we will call it conductive hook and loop.

Today, there are hook and loop fasteners that will conduct electricity. The hook and loop is spray coating with liquid silver. Silver is used because it possesses the highest electrical conductivity of any element. It also has the highest thermal conductivity of any metal. Electrical conductivity measures an object’s ability to accommodate the transport of an electric charge.

Electrically conductive hook and loop is used in all sorts of projects regarding radio frequency or electromagnetic interference. Essentially, it can protect equipment or people from high-intensity electromagnetic fields (used in grounding straps). It can also prevent the escape of signals from secure facilities. This makes it especially useful in the military, government buildings, hospitals, and private or classified organizations.

The resistivity of electrically conductive hook and loop has a maximum of 1.8 ohms per square inch on the hook, and 1.4 ohms per square inch on the loop. The closure combines for 0.8 ohms through resistance and has a cycle life of around 5,000 closures.

For E- Textile project usually a 10cm long strip of conductive hook & loop is used. This conductive strip is used where you need to make a complete circuit by simply forming a connection between the hook and loop pieces.

You can use this hoop and loop to light LEDs with a simple on/off switch. Hook & Loop strips are extremely versatile touch fasteners.

Hook and Loop fasteners are Ideal for making many projects including light up dog collar or other wearable projects including a reflective jacket. It is used in the same way you would use conductive thread.

Reflective v Fluorescent

Nearly all surfaces are reflective by bouncing light off its surface so it can be seen but there are different levels of reflectivity: diffuse, mirror and retro reflection. Diffuse reflection is common as it occurs when light strikes a rough surface and causes the light to scatter in all directions. Scatter light can be seen by our eyes normally. Mirror reflection occurs when light strikes a smooth or glossy surface. This light reflects off the surface at an equal but opposite angle to the source. Mirror reflection may or may not be seen by our eyes. Retro reflection happens when light bounces from a surface which has been designed to return the light in the direction of its source. If you are looking at the retroflective material and you are near the light source, this light may be seen by our eyes. A driver sitting in a vehicle near the light source provided by the vehicle can see the light being reflected from the retroreflective material on a person's garment who is standing at a distance in the beams of the headlights. Retroreflective material can retroreflect light in daylight but there is little contrast between the light retroreflected from the material and the background environment. Therefore, this makes them ineffective for enhancing visibility during the daytime. Retroreflective materials are most effective under low-light level conditions. During the day, reflective material is often grey and dull.

Fluorescent materials absorb energy in the near ultraviolet and visible regions of the electromagnetic spectrum from the sun, then re-emit the energy as longer wavelengths of visible light. This is light energy which is from the sun and then converted into light energy that we can see offering daytime visibility enhancement which is not present in other colours. Therefore, fluorescent materials are most effective for improving visibility in daylight conditions. The most commonly used fluorescent colours are yellow, orange and lime green. Yellow is the most effective for improving visibility but at nigh time these colours are no better than any other colours.

Fluorescent

Reflective

Fluorescent & reflective

Scheme of work

DESIGN AND TECHNOLOGY SCHEME OF WORK KS 3			**DESIGN AND MAKE**		
PROJECT TITLE: LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD			**10 x 1 HOUR SESSIONS**		
WEEK	**LEARNING OBJECTIVES**	**TEACHING ACTIVITIES**	**LEARNING OUTCOMES** Students should:	**ASSESSMENT**	**HOMEWORK**
1	To understand the design brief. To gain an understanding of conductive thread. To understand the assessment booklet and their interactive role in it.	Start introduction with demonstration of the light stitches 2 models. Distribute and talk through Design brief sheet. Use Power Point (PPP) to discuss thread and how it differs from sewing thread. Students to complete Thread worksheet. Distribute and explain the assessment booklets.	Understand the goal of the design brief. Understand the different properties in conductive thread compared to sewing thread. Understand the benefits of assessment.	Completion of – What am I being asked to make? Threads worksheet	Homework – research – collect pictures of textiles which are designed with road safety in mind.

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should:	ASSESSMENT	HOMEWORK
2	To understand how to write a basic specification using ACCESS FM A = aesthetics C = cost C = client E = environment S = safety S = size F = function M = materials To recognize the usefulness of research.	Link to previous lesson with use of demonstration model and outline of the lesson contents. Explain ACCESS FM and how it relates to the design of a product. It is important to get this across to the students. This task could be done in groups with analysis of findings at end of session. The students could be split according to ability or with peer teaching in each group. Using the research provided plus the pupils' own research set for homework analyse the appropriate choices, why and why not.	Be able to apply ACCESS FM to the writing of a design specification. Understand how to select appropriate research.	Completion of – My Design Specification Complete the research sheets with the homework from last week.	Using the design sheet – prepare at least 4 design ideas, coloured and with annotation to explain your idea – remember to keep in mind the demonstration models as to how your design will work and keep your designs within your specification criteria.

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should:	ASSESSMENT	HOMEWORK
3	To appreciate other people's designs and be able to analyse their appropriateness.	Links to previous lessons by demonstrating the original model again. Using the product analysis photographs and the worksheet pupils (working in groups) analyse the products	Understand designers' thoughts when designing and how to analyse their function and appropriateness in design	Completion of – product analysis sheets Presentation of results	Road safety products mood board – Produce a mood board of any suitable road safety products for pets. Try to add 3D objects which are appropriate too, for example items that glow. Use a range of resources – internet, papers, magazines, catalogues and leaflets. Extension task – to design a poster showing the group work rules for display in the classroom

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should:	ASSESSMENT	HOMEWORK
4	To understand a basic circuit. To appreciate the difference between reflective and fluorescent	Link to previous lessons by the demonstration model again but this time concentrating on the design of the light pattern and how the circuit works. Use the PPP to help demonstrate how the circuit works Using the PPP Reflective v Fluorescent, students complete the worksheets Using their previous homework pupils will analyse their 4 initial ideas in their groups using the star diagram to help them choose the best design	Students will create a small circuit using the circuit board to light one LED. They will understand the difference between reflective and fluorescent material and which is most appropriate to use and when. To analyse their designs and choose the best one based on results	To complete the tasks on the worksheets with experiments and tasks – differentiation can be shown by success of ideas and experiments, also the diversity of their design work Alternatively, with group work a small analysis of the learning achieved as a plenary.	To choose the best of their design ideas and develop it using the knowledge learnt today about circuits and properties of reflective v fluorescent. Produce an A4 drawing with colour and annotation in readiness for next lesson. Use the exemplar work provided to show what. is expected. Electronics; Reflective; Fluorescent word search available. Extension work word search available – Reflective v Fluorescent

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should:	ASSESSMENT	HOMEWORK
5	To interpret their design and suggest a process plan for making their design, changing where necessary.	Teacher to demonstrate a process plan and link to industry, one off; batch; mass & continuous. Students to continue with making a process plan and finalise their design whilst assessment takes place.	Will understand the importance of considering the making process Will understand where they are with their understanding of the project and what they need to do to achieve more.	Assessment lesson where each student discusses their design with the teacher and receives feedback on their progress within this project Assessment sheet completed up to the design stage with explanations given as to what is required from the student in order to achieve more. Grade achieved on success of circuit	To write 5 rules of safety in the textiles workshop based on their previous knowledge. This will form part of their contract to be able to work safely in a workshop environment and will be signed by the student after checking by teacher next week prior to starting any practical. Extension task – What could be done to improve on the designs here i.e. quality, finishing, etc.

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should:	ASSESSMENT	HOMEWORK
6	To show their understanding of the H&S in a textiles workshop To build and consolidate on their previous knowledge of pattern making	Link to previous lesson's homework with the H&S contract Teacher to demonstrate how to create one basic pattern and students to create their pattern from this information Students to cut out their patterns from paper and move on to using fabric if ready Students to practice their sewing technique on sewing machines	Will understand the need for H&S in a textile's workroom Will build and consolidate their previous knowledge of pattern making Will understand how multiple products can be made of the same product Will improve their skills in using a sewing machine and in pattern laying out	Feedback on pattern task and on their sewing skills on a machine	Make a paper drawing of your circuit required for your design

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should:	ASSESSMENT	HOMEWORK
7	To create the pattern pieces To consolidate their previous knowledge and accurately cut out the pattern pieces To understand how multiple copies can be made of the same product	Students to practice their sewing machine technique on the practice sheets. Students to cut out their patterns and then their fabric.	Students will learn how to sew with more accuracy on a machine. Students will learn how to use a pattern and how multiple items can be made	Individualised attention around the classroom, providing one-to-one feedback formatively.	To write a record of what they have done up to now. Where did their design come from, what influenced them, what process did they use to get where they are up to now, how difficult did they find using the tools, was their process plan correct or has it been changed? etc. This information can help later in their evaluation.

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should	ASSESSMENT	HOMEWORK
8	To understand how to stitch their road safety product To understand how to assemble the product	Teacher to demonstrate how to stitch the pocket or flap to cover the circuit board. Lesson is broken down into small demo pieces to explain how to assemble. The PPP can help with the circuit sewing again.	Students will stitch their battery cover and sew their circuit.	Individualised attention around the workroom providing one-to-one feedback formatively.	Design a name for your product. Draw in full colour a 'flyer' which could be given to potential customers to explain the functions of your product. Worksheet – advertising my product

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should	ASSESSMENT	HOMEWORK
9	To appreciate the quality finish of a product To accomplish completion of project including any missed paperwork	Teacher to demonstrate the final product and how to combine the components along with the last minute jobs. Emphasise the quality of the finished product and expectations using the demonstration models again	Students will appreciate the quality of a finished piece and take on responsibility for their own learning	Assessment based on the quality and success of the final outcome.	Record of completed worksheets obtaining any missed sheets and completing for homework – What I've done up to now worksheet Extension task – How could I improve the original design i.e. quality, finishing, etc

WEEK	LEARNING OBJECTIVES	TEACHING ACTIVITIES	LEARNING OUTCOMES Students should	ASSESSMENT	HOMEWORK
10	To understand the purpose of evaluating and the benefits of same To comprehend how well they achieved throughout the project and how they could achieve more next time by assessment tutorial	Teacher to explain the purpose of evaluation and the lessons to be learnt for future tasks. All students to complete the evaluation sheets in full sentences Working in small groups they can evaluate their peers work and relate it back to the design specification, how well it meets the specification.	Understand the importance of evaluating their own product and each other's work.	Assessment marking sheet to be completed based on final product, completed paperwork, evaluation and discussion with student.	None

Lesson plans – week one

SUBJECT/CLASS CODE	**DATE**	**PERIOD**	**MALES**	**FEMALES**	**TOTAL**

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply)** To understand the design brief. To gain an understanding of Conductive thread. To understand the assessment booklet and their interactive role within it.
LESSON TITLE 1. Understanding the design brief	

RESOURCES:
Demonstration models, The Design Brief – Worksheet, Threads worksheet, Assessment booklets. Samples of wire and threads are also useful. Small pieces of thread and needles.

CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues

LESSON SEQUENCE	**For coursework/project lessons individual assessment sheets should be used to monitor progress regularly**	**TIME**
INTRODUCTION (link to previous lesson or new unit of work): Introduce the design brief with a demonstration of the models of the road safety products. Explain their functions and the unusual method of obtaining the lighting function within the textiles.		
MAIN ACTIVITIES (include timings, starter activity, differentiation, activities, group/pair work etc): Explain and discuss design brief. Using the power point to help, explain the difference between normal sewing thread; wire and conductive thread. (Use of samples are useful, maybe with a piece of wire sewn onto a piece of fabric by over sewing it down. Show how it affects the properties of the fabric i.e. drape.) Take feedback Students complete individual work sheets. The worksheet needs small pieces of thread and a needle to allow the students to untwist the thread and see how it is made up. Discussion and explanation of assessment for learning booklet and role the student plays in self-assessment along with the advantages for them.		
PLENARY (include assessment of learning outcomes) : Completion of What am I being asked to make worksheet and setting of homework		

HOMEWORK: Homework – research – collect pictures of textiles which are designed with road safety in mind.

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Understand the goal of the design brief and understand the basics of the difference between, thread, wire and conductive thread.
Some students will be able to:
Explain how thread is made, how wire is made and the advantages of conductive thread
Some students will have progressed even further and will be able to :
Be able to see other applications for the use of conductive thread

Link to next lesson:
Writing a product specification

Role of Classroom Assistant (if applicable)

Notes (if appropriate)

Lesson plans – week two

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULELIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply) :** To understand how to write a basic specification using ACCESS FM To recognise the usefulness of research
LESSON TITLE 2. Writing a product specification	

RESOURCES:
Demonstration models, My Design specification worksheets, research sheets, Design sheets.

CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
INTRODUCTION (link to previous lesson or new unit of work): Link to previous lesson with use of demonstration model and précis of lesson contents		
MAIN ACTIVITIES (include timings, starter activity, differentiation, activities, group/pair work etc): Explain ACCESS FM and how it relates to the design of a product. Students to complete – My Design Specification This task could be done in groups with analysis of findings at end of session as plenary. With G&T students the groups could be split according to ability of with peer teaching in each group. Using the research provided plus the pupils' own research set for homework last week, analyse the appropriate choices, why and why not.		
PLENARY (include assessment of learning outcomes) : Completion of What am I being asked to make worksheet, word searches and setting of homework		

HOMEWORK: Homework – using the design sheet – prepare at least 4 design ideas, coloured and with annotation to explain your idea – remember to keep in mind the demonstration models as to how your design will work and keep your designs within your specification criteria.

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Apply ACCESS FM to the writing of a design specification.
Some students will be able to:
Apply ACCESS FM to the writing of a design specification and how to select appropriate research
Some students will have progressed even further and will be able to :
Analyse others information and choose appropriate research, suggesting improvements

Link to next lesson:
Product analysis

Role of Classroom Assistant (if applicable)

Notes (if appropriate)

Lesson plans – week three

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply) :** Appreciate other people's designs and be able to analyse their appropriateness
LESSON TITLE 3. Product Analysis	

RESOURCES:
Demonstration models, Product Analysis worksheets

CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
	INTRODUCTION (link to previous lesson or new unit of work): Link to previous lesson with use of demonstration model, division of class into groups and reminder of group working rules. (If none available the class could be asked to set up 5 rules as a starter)	
	MAIN ACTIVITIES (include timings, starter activity, differentiation activities, group/pair work etc): Using the product analysis photographs and the worksheet, pupils (working in groups) analyse the products. (Set a time limit) Each group to present their findings to the rest of the class	
	PLENARY (include assessment of learning outcomes) : Discussion of purpose of a mood board.	

HOMEWORK: Homework – using previous discussion to help – produce a mood board of any suitable road safety products, try to include other items which 'set the mood' , perhaps 3D items which glow could be added.

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Understand a designer's thoughts when designing and how to analyse their function and appropriateness in design.
Some students will be able to:
Use another designer's thoughts to help in designing their product and apply improvements highlighted from the product analysis presentations
Some students will have progressed even further and will be able to :
Use the product analysis to create a totally unique product

Link to next lesson:
Understanding circuits, reflective and fluorescent material

Role of Classroom Assistant (if applicable)

Notes (if appropriate) Design a poster showing the group work rules for display in the classroom

Lesson plans – week four

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply) :** Will understand the difference between reflective and fluorescent material Will consolidate previous knowledge of materials Will understand how to complete a circuit
LESSON TITLE 4. Understanding circuits, reflective and fluorescent material	

RESOURCES:
Demonstration models, Reflective v Fluorescent worksheet, Power point, word search, conductive thread, circuit boards, one led per student, Exemplar examples of final designs

CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
INTRODUCTION (link to previous lesson or new unit of work): Link to previous lesson with use of demonstration model, concentrating on the design of the light pattern and how the circuit works. Use the power point to help		
MAIN ACTIVITIES (include timings, starter activity, differentiation, activities, group/pair work etc): Students to complete a one led circuit using the circuit board and the conductive thread. Needles can help to attach thread to board but not really necessary as to knot thread from positive terminal to positive leg on led is all they need to do and the same for the negative terminal and leg on led. Using the power point work through reflective and fluorescent. Students to complete worksheets.		
PLENARY (include assessment of learning outcomes) : Quick fire questions on learning for today. Setting of homework		

HOMEWORK: Homework – Choose the best of their design ideas and develop it using the knowledge learnt today. Produce an A4 drawing in colour and with annotation ready for next lesson. Show exemplar work

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Understand the difference between reflective and fluorescent and how to complete a circuit
Some students will be able to:
Design with confidence using reflective and fluorescent materials and be able to include an electronic circuit for lights within their design
Some students will have progressed even further and will be able to :
Design their own complete circuit pattern to achieve their unique design

Link to next lesson:
Process planning and assessment

Role of Classroom Assistant (if applicable)

Notes (if appropriate) Reflective v Fluorescent word search

Lesson plans – week five

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD **LESSON TITLE** 5. Process planning and assessment	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply)** Will understand the importance of considering the making process Will understand where they are with their understanding of the project and what they need to do to achieve more
RESOURCES: Demonstration models, process plans, assessment booklets	
CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues	

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
INTRODUCTION (link to previous lesson or new unit of work): Display of design artwork set as homework. Discuss each other's work		
MAIN ACTIVITIES (include timings, starter activity, differentiation, activities, group/pair work etc): Teacher to demonstrate a process plan and link to industry, one off; batch; mass & continuous. Students to continue with making a process plan and finalise their design whilst assessment takes place. Assessment lesson where each student discusses their design with the teacher and Receives feedback on their progress within this project Assessment sheet completed up to the design stage with explanations given as to what is required from the student in order to reach target level.		
PLENARY (include assessment of learning outcomes) : 5 minute quick fire questions on talk given at beginning of lesson based on process plans and the links to industry.		

HOMEWORK: Homework – To write 5 rules of safety in the textiles workshop based on their previous knowledge. This will form part of their contract to be able to work safely in a workshop environment and will be signed by the student after checking by teacher next week prior to starting any DMA.

Learning Outcomes : By the end of the lesson:

Most students will be able to:

understand the importance of considering the making process and where they are with their understanding of the project

Some students will be able to:

Link their process to industry processes and identify how they can improve their performance to meet their target grade

Some students will have progressed even further and will be able to :

explain how it would be made in industry

Link to next lesson:

H&S and pattern making

Role of Classroom Assistant (if applicable)

Notes (if appropriate What could be done to improve on the design here; i.e. quality, finishing, etc.

Lesson plans – week six

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD **LESSON TITLE** 6. Health and Safety (H&S) and pattern making	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply) :** Will understand the need for H&S in a textile's workroom Will build and consolidate their previous knowledge of pattern making Will understand how multiple products can be made of the same product Will improve their skills in using a sewing machine and in pattern laying out

RESOURCES:
Demonstration models, 3 basic designs patterns, machine sewing practice sheets

CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
INTRODUCTION (link to previous lesson or new unit of work): Link to previous lesson's homework with the H&S contract.		
MAIN ACTIVITIES (include timings, starter activity, differentiation, activities, group/pair work etc): Teacher to demonstrate how to create one basic pattern and students to create their pattern from this information Students to cut out their patterns from paper and move on to using fabric if ready Students to practice their sewing technique on sewing machines		
PLENARY (include assessment of learning outcomes) : On the demonstration pattern – draw in the circuit. Set homework		

HOMEWORK: Homework – create a drawing of your circuit needed to fit into your pattern pieces

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Create their own pattern for their fabric and their circuit
Some students will be able to:
Suggest improvements to their design through modelling in paper
Some students will have progressed even further and will be able to :
To describe how multiple copies of their product could be made in detail

Link to next lesson:
Cutting out fabric and sewing

Role of Classroom Assistant (if applicable)

Notes (if appropriate What could be done to improve on the design here; i.e. quality, finishing, etc. Create a circuit drawing for decorative panel on a t-shirt.)

Lesson plans – week seven

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD **LESSON TITLE** 7. Cutting out fabric and sewing	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply, etc.) :** Will understand the need quality in sewing their product Will build and consolidate their previous knowledge of sewing Will understand to use eyelets and attach them to fabric
RESOURCES: Demonstration models, 3 basic designs patterns, machine sewing practice sheets	
CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues	

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
INTRODUCTION (link to previous lesson or new unit of work): Link to previous lesson's homework with demonstration of how their circuit will lie on the fabric and where the power circuit will need to go		
MAIN ACTIVITIES (include timings, starter activity, differentiation, VAK activities, group/pair work etc): Teacher to demonstrate pattern laying and how not to waste fabric Students to cut out their patterns from fabric if not already done so. Demonstration of marking on fabric, i.e. chalk, fabric pens, Students to mark on fabric where the eyelets go Teacher to demonstrate how to place eyelets in fabric Students to students to place eyelets		
PLENARY (include assessment of learning outcomes) : Using their homework from previous week, use chalk to mark on fabric where circuit will go. If possible, use 2 different colours of chalk to highlight positive and negative.		

HOMEWORK: Homework – write a record of what they have done up to now. Where did their design come from, what influenced them, what process did they use to get where they are up to now, how difficult did they find using the tools, was their process plan correct or has it been changed? Etc.

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Cut out their pattern pieces and place eyelets in correct places
Some students will be able to:
Confidently mark their fabric in the best way for the job they wish to do
Some students will have progressed even further and will be able to :
consider different methods for holding the LEDS

Link to next lesson:
Stitching circuits and assembling battery cover

Role of Classroom Assistant (if applicable)

Notes (if appropriate What could be done to improve on the design here; i.e. quality, finishing, etc.

Lesson plans – week eight

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2)
SMART MATERIALS AND CONDUCTIVE THREAD

LESSON TITLE
8. Stitching circuits and assembling battery cover

AIMS/OBJECTIVES (e.g. to know, to understand, to apply) :
Will understand how to assemble their product
Will build and consolidate their previous knowledge of sewing their circuit and complete and test

RESOURCES:
Demonstration models, conductive thread, power circuit boards, LEDs, long nose pliers, hook and loop tape, Power Point, advertising my product worksheet

CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
INTRODUCTION (link to previous lesson or new unit of work): Link to previous lesson's homework with demonstration where the power circuit will need to go and how to create an accessible battery cover.		
MAIN ACTIVITIES (include timings, starter activity, differentiation, activities, group/pair work etc): Some students to be using machines and assembling the battery covers whilst other students will hand stitch the circuit in place. The Power Point can help with the circuit sewing again This continues on a rolling programme until all have done both tasks. Students who manage both tasks in the lesson can then move on to assembly of the final product.		
PLENARY (include assessment of learning outcomes) : Gather circuits around a table for each to show how theirs works. If it doesn't work, some students will be able to suggest what is required to help the others.		

HOMEWORK: Homework – design a name for your product. Draw in full colour a 'flyer' which could be given to potential customers to explain the functions of your product. For those with access to IT, this could be done on a PC as opposed to hand drawn.

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Produce a successful circuit and battery cover
Some students will be able to:
Recognise how this flap design could be utilised in lots of different textile products
Some students will have progressed even further and will be able to :
Consider other ways to 'hide' the battery but still have accessibility and to help their peers troubleshoot

Link to next lesson:
Final stitching, assembly and testing

Role of Classroom Assistant (if applicable)

Notes (if appropriate What could be done to improve on the design here; i.e. quality, finishing, etc.

Lesson plans – week nine

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply) :** Will appreciate the quality of a finished piece and take on responsibility for their own learning
LESSON TITLE 9. Final stitching, assembly and testing	

RESOURCES:
Demonstration models, conductive thread, power circuit boards, LEDs, long nose pliers, hook and loop tape, Power Point, What I've done up to now worksheets

CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues

LESSON SEQUENCE	For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
INTRODUCTION (link to previous lesson or new unit of work): Brief discussion of coming towards end of project and how important this lesson is as they all aim for a finished product		
MAIN ACTIVITIES (include timings, starter activity, differentiation, VAK activities, group/pair work etc): Demonstrate the final product and how to combine the components along with the last minute jobs. Students to take into account the quality of their finished items as they finish off the final jobs to end up with a completed project		
PLENARY (include assessment of learning outcomes) : Group discussion on the project, preparing for next week's evaluation lesson. Discussion of each other's product names and display of advertising flyers		

HOMEWORK: Homework – From assessment booklet check out any worksheets not completed. Ensure these are done over the next week as non-completion will affect mark achieved over entire project

Learning Outcomes : By the end of the lesson:
Most students will be able to:
Produce a successful completed product
Some students will be able to:
Suggest ways to improve on the quality of theirs and others finished products
Some students will have progressed even further and will be able to :
Take on responsibility for their own learning and check out what they need to do in order to ensure themselves of the best mark

Link to next lesson:
Evaluation and assessment

Role of Classroom Assistant (if applicable)

Notes (if appropriate What could be done to improve on the design here; i.e. quality, finishing, etc.
How could I improve the original design i.e. quality, finishing, etc.

Lesson plans – week ten

SUBJECT/CLASS CODE	DATE	PERIOD	MALES	FEMALES	TOTAL

UNIT/MODULE LIGHT STITCHES (2) SMART MATERIALS AND CONDUCTIVE THREAD	**AIMS/OBJECTIVES (e.g. to know, to understand, to apply) :** Will understand the importance of evaluating their own product and each other's work
LESSON TITLE 10. Evaluation and assessment	
RESOURCES: Assessment books, evaluation sheets	
CROSS-CURRICULAR LINKS (e.g. Lit/Num/ICT/CEG/Citizenship) Environmental issues	

LESSON SEQUENCE		For coursework/project lessons individual assessment sheets should be used to monitor progress regularly	TIME
	INTRODUCTION (link to previous lesson or new unit of work): Explain the purpose of evaluation and the lessons to be learnt for future tasks		
	MAIN ACTIVITIES (include timings, starter activity, differentiation, activities, group/pair work etc): All students to complete the evaluation sheets in full sentences Working in small group they can evaluate their peers work and relate it back to the design specification, how well it meets the specifications, etc. Teacher to assess each student utilising the assessment marking sheet based on final product, completed paperwork, evaluation and discussion with student.		
	PLENARY (include assessment of learning outcomes) : Group discussion on the project, how did they feel about the project; what skills did they learn; etc		

HOMEWORK: None

Learning Outcomes : By the end of the lesson:

Most students will be able to:

Understand the importance of evaluating their own product and each other's work

Some students will be able to:

Critically evaluate their own and other's products

Some students will have progressed even further and will be able to :

Will be able to suggest what they can do in the future to improve their mark plus suggest how they can help others to improve

Link to next lesson:

Role of Classroom Assistant (if applicable)

Notes (if appropriate What could be done to improve on the design here; i.e. quality, finishing, etc.

Teacher Resources
Book 2 Smart Materials and Conductive products

LEVEL 4	TICK BOX	LEVEL 5	TICK BOX	LEVEL 6	TICK BOX
I collected ideas from more than one place i.e. the internet		I collected ideas from various sources, e.g. catalogues, the internet, the library, etc.		I explained how my research was useful in my design ideas	
I asked other people what they thought about me designs		I discussed my ideas with my teacher and other students		I made models to check my idea would work and also used CAD e.g. Pro Desktop where appropriate	
I produced a process plan before I started		I wrote about my ideas and used drawing and modelling to check they would work		I discussed designs and ideas with fellow pupils and teacher, critically analysing which would function	
I labelled my ideas explaining how they would work		I analysed other people's products and ideas which helped me with my design		I produced detailed planning, e.g. flowcharts, sequence drawings to ensure I understood my making process	
My project solved the original problem		I drew a detailed process plan for making and evaluated how accurate it was at the end		I compared my final design to my specification, ensuring I met the requirements of the design brief	
My project looks like I wanted it to		My project looks like I wanted it to after making improvements as I went along		I worked with a range of tools, equipment, materials, components and processes	
I paid attention to the quality/presentation of my finished product		I paid attention to the finish/quality/presentation of my finished project		I checked my process plan as my project developed and changed it as I went along	
I thought about improvements as I went along		I tested my final project myself and with others		I analysed my designs against the set criteria and selected the best design	
I used a range of tools/equipment correctly		I evaluated my project identifying improvements and explained how cost restraints may affect these		I explained any alterations, modifications and improvements and why I did these	
I evaluated my project identifying what was good and bad, how well it worked and how it could be improved		I described how my product could be made in multiple copies		I evaluated the way I have used sources of information and identified ways of improving the final product as it was being used	

HOMEWORK	DATE	TEACHER		DATE	TEACHER
RESEARCH			PAPER DRAWING OF CIRCUIT		
DESIGN IDEAS			WHAT HAVE I DONE UP TO NOW		
ROAD SAFETY MOOD BOARD			ADVERTISING MY PRODUCT		
FINAL IDEA DRAWING			RECORD OF PAPERWORK AND COMPLETE IF NECESSARY		
5 RULES OF H&S			NO HOMEWORK SET		

LEVEL 7	TICK BOX	LEVEL 8	TICK BOX	EXCEPTIONAL PERFORMANCE	TICK BOX
I used a wide range of sources of information to develop ideas and explained how they helped to develop my ideas		I used a range of strategies to fully develop and model appropriate ideas		I sought out information to help my design thinking	
I looked at different shapes and investigated the form and function before communicating ideas		I identified conflicting demands on my product		I recognised how products contribute to lifestyle and choices of a variety of client groups as my ideas developed	
I recognised the needs of different users and developed realistic designs		I responded creatively to the brief, suggesting ways forward and explaining how my ideas addressed the demands		I responded creatively to the design brief and was discriminating in my selection and use of information sources to support my work	
I produced detailed planning, e.g. with realistic timescales		I used my knowledge of materials to choose the best material based on its properties and characteristics for my design		I interpreted and applied my knowledge and understanding creatively in new design contexts and communicated my ideas in new or unexpected ways	
I adapted my methods of manufacture as changes developed		I used my understanding of others' designing by reinterpreting and applying learning in new contexts		I used my understanding of others' designing in innovative ways	
I worked with a range of tools, equipment, materials, components and processes taking full account of the material and tools characteristics		I organised my work, creating a Gantt chart with timescales which I stuck to and amended as necessary		I used a wide range of tools, equipment, materials, ingredients and components with a high degree of precision	
I explained any changes I made giving sound reasons		I used a wide range of tools, equipment, materials, ingredients and components with precision		My product is reliable and robust and fully meets the quality requirements given in the design proposal	
I used appropriate testing to evaluate my product		I used accurate testing to inform my developmental work to solve technical problems		Throughout the process I reflected critically and effectively	
I modified my product in the light of the evaluation to improve its performance		I evaluated my project and evaluated my project clearly identifying my findings and relating them to environmental, ethical and social and cultural dimensions		I produced a clear evaluation with sound, innovative testing, utilising my findings to produce ways forward which related to the environment, ethical and social and cultural dimensions	

ASSESSMENTS SHEETS	DATE	TEACHER		DATE	TEACHER
The Design Brief			Word search Reflective v Fluorescence		
Threads			Process plan		
My Design Specification			Sewing machine practice sheet		
Research			Advertising my product		
Product analysis			What I've done up to now		
Star Diagram			Learning pyramid		
My Design Sheet			Record of completed worksheets		
Reflective v Fluorescence					

INTERIM ASSESSMENT

Student's comments

Target grade

INTERIM ASSESSMENT

Teacher's comments including steps which will help to improve your learning

FINAL ASSESSMENT

Student's comments

WWW (what went well) –

EBI (even better if) -

NC LEVEL ACHIEVED	**EFFORT**	**SIGNATURE OF TEACHER**
	DATE	**SIGNATURE OF STUDENT**

Name:

Project:

Worksheet - Design Brief

Name _____

The Design Brief
As winter comes upon us, the amount of light when travelling to school makes it difficult for drivers to see some school children on their way to school. Design a garment which parents could easily take on and off and will allow children to be safely seen in the dark and daylight. Utilising modern and smart materials, your design should include LEDs for using in the dark and the correct fabric for being seen during the day.

1. What am I being asked to make and what are all the components involved? (battery holders etc.)

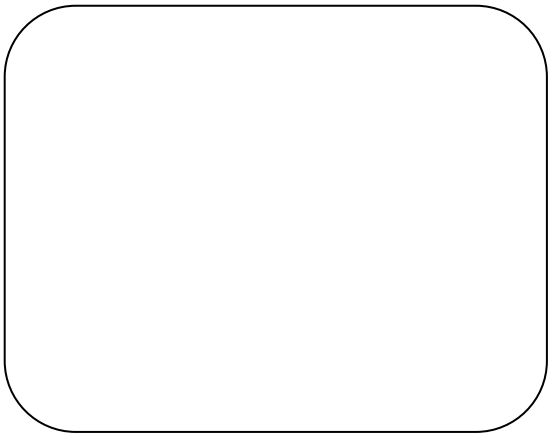
2. What materials will I be using and why are these suitable? (cotton, felt etc.)

Worksheet - Threads

Name _____

Using the sample piece of thread you have been given and the needle, lie the thread on top of the piece of paper on the desk. Hold one end so that it cannot move and using the needle fray out the edges.

1. Place your piece of thread into this box with a small piece of self-adhesive tape.



2. Describe what you have found.

Teacher Resources
Book 2 Smart Materials and Conductive products

Worksheet – My Design Specification

Name _____

Designers use a specification when designing. This helps to guide your thinking and also gives you a set of criteria to judge your design against.
Using ACCESS FM to help you start, fill in each box with the information you know about the criteria your design must meet.

	What to think about	**My design must……..**
Aesthetics	**Appearance. Use of colour, lettering, images, style.**	
Cost	**Value for money.** **Expensive or cheap to make?**	
Client	**The customer. How well does the product suit the client it is aimed at?**	
Environment	**Is the product environmentally friendly?** **Is it recyclable or refillable?**	
Safety	**Is the product safe to use?** **Are there any sharp edges or loose parts?**	
Size	**Is the product a good size?**	
Function	**Job. How well does the product do its job?**	
Materials	**Is the product made out of suitable materials?**	

Worksheet – Research – higher ability

Name _____

Read your design brief and then using different types of research, i.e. books; the internet; photographs; catalogues; visiting shops, etc. search for wearable safety garments.

Place your information in the box. Use extra sheets if necessary. You should use at least three different sources.

Using the information provided by your teacher, annotate (write at the side and around it, using arrows to point to where you mean) with information about how this product meets or does not meet your specification.

Worksheet – Research – Middle ability

Name_____

Read your design brief and then using different types of research, i.e. books; the internet; photographs; catalogues; visiting shops, etc.

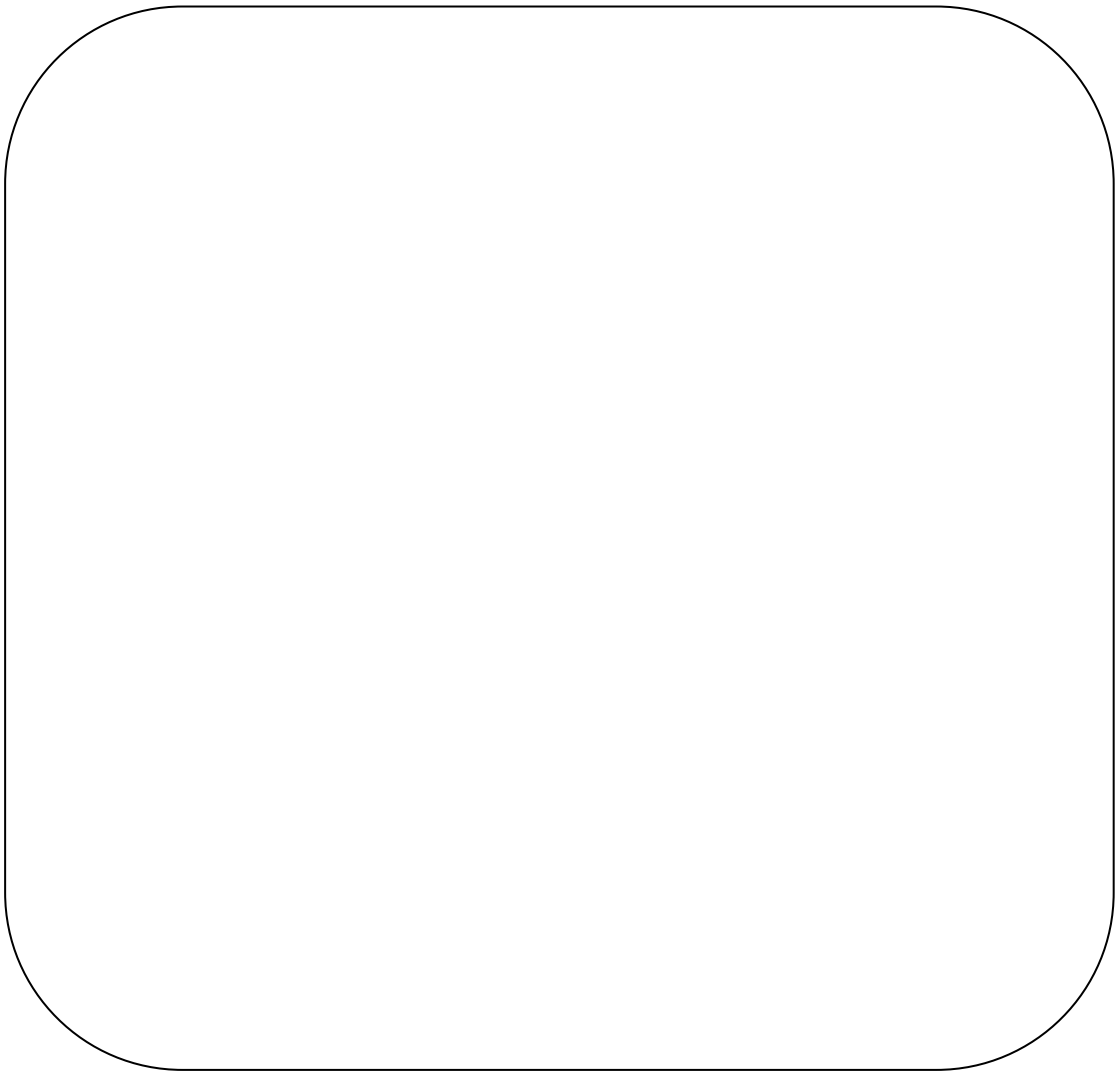
Place your information in the box. Use extra sheets if necessary. Use at least three different sources. You should answer these questions for each item you choose to go into your research.

Q1. Is this a suitable design?

Q2. Why is it a suitable design?

Q3. What is its function?

Q4. Is the product made out of suitable material?



Worksheet – Research – Lower ability

Name_____

Research

Read your design brief and then using different types of research, i.e. books; the internet; photographs; catalogues; visiting shops, etc. Place your information in the box below. Use extra sheets if necessary. Use at least three different sources. You should complete these statements for each item you choose to go into your research.

A. The design used is.....

B. This is good because.....

C. The function is the .....

Worksheet – My Design Sheet

Name _____

My Design Sheet

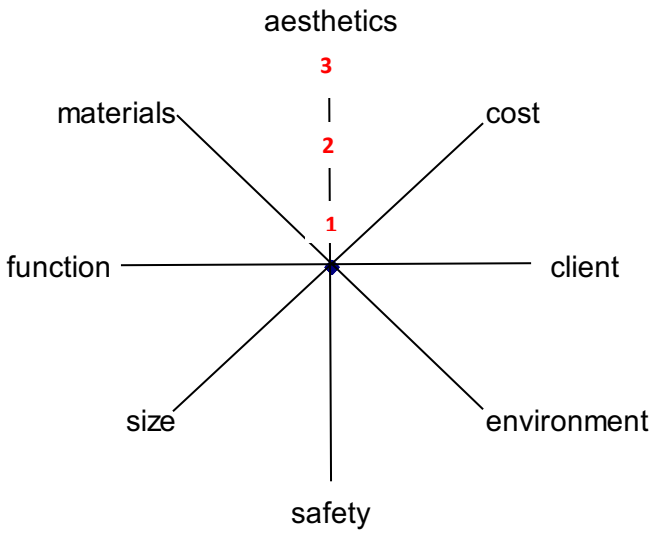
Draw 4 different designs which meet with your design specification. They should be coloured and annotated to explain your idea. Remember to keep in mind the demonstration models you have seen and how your designs will work. Remember to keep within your specification criteria. (Use more plain sheets of paper if necessary)

Worksheet - Product Analysis

Teacher notes

The score card can be used to help analyse either real products which you have brought in or use the following page to use as product analyse.

This score sheet can also be used towards the end of the design and make to help evaluate the finished products.



Product Analysis

What are the strengths of this product?

_____

_____

_____

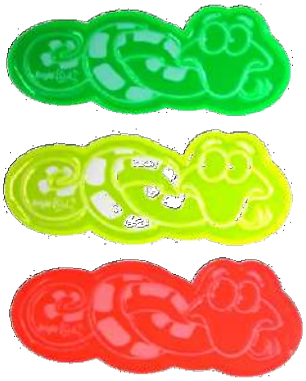
What are the weaknesses of the product?

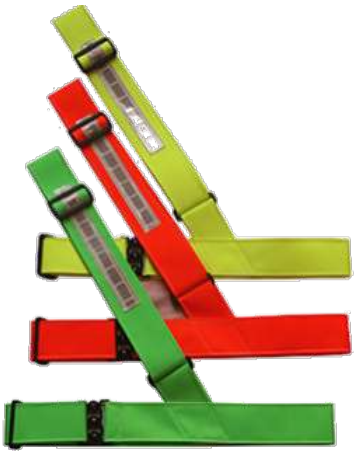
_____

_____

_____

Product analysis photographs





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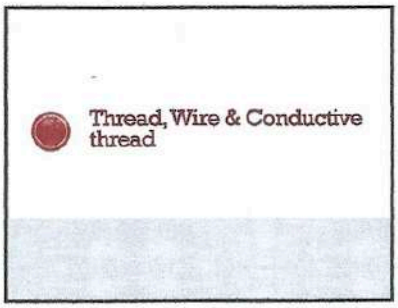

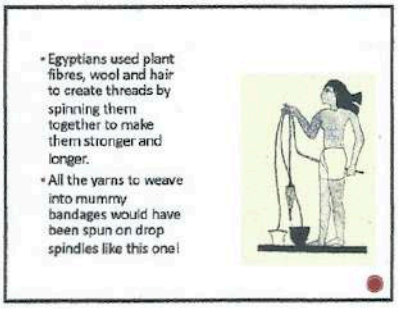

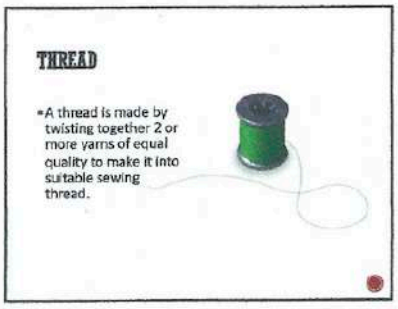

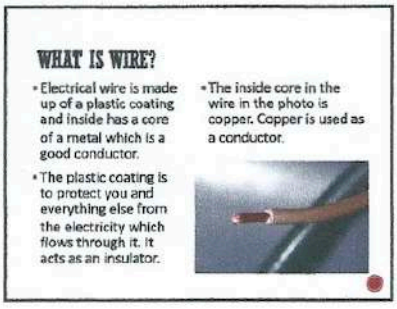

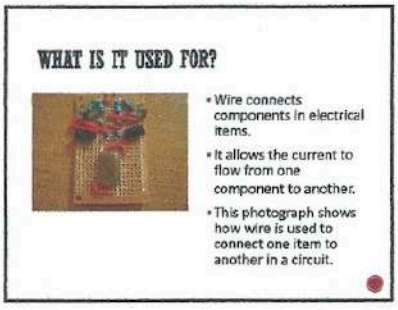

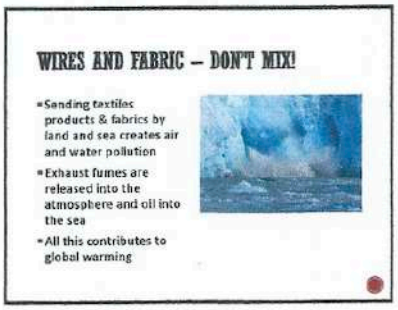

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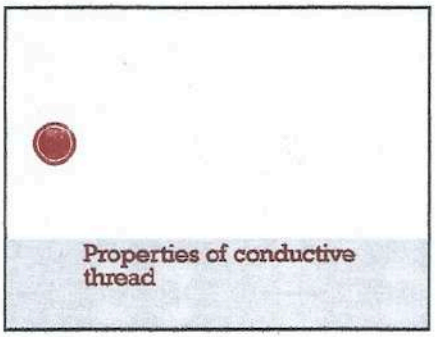

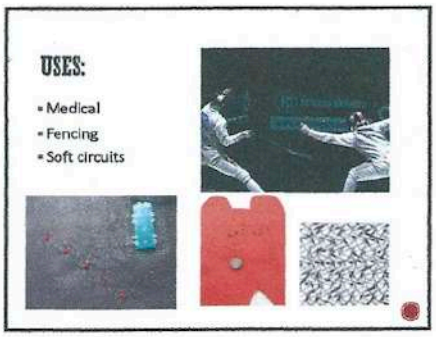

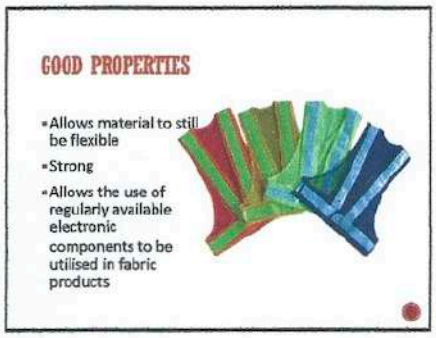

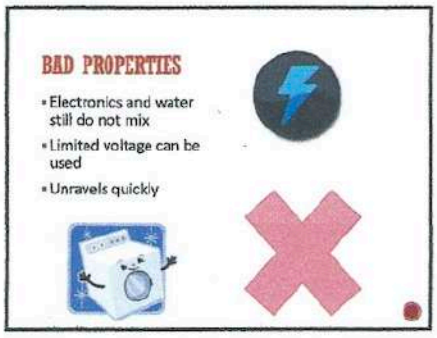

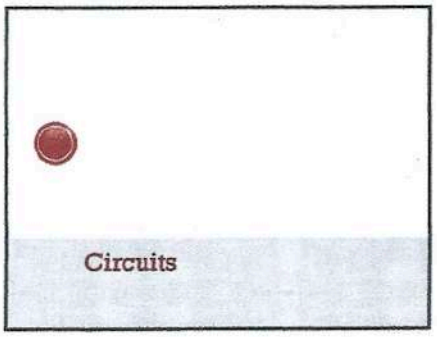

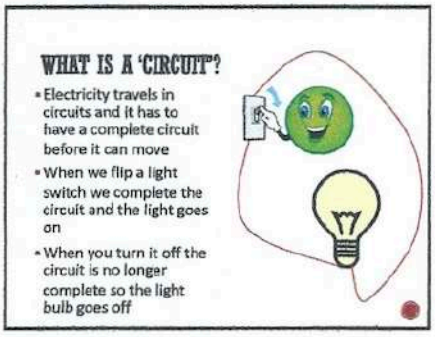

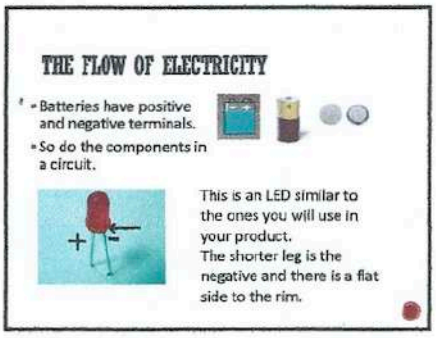

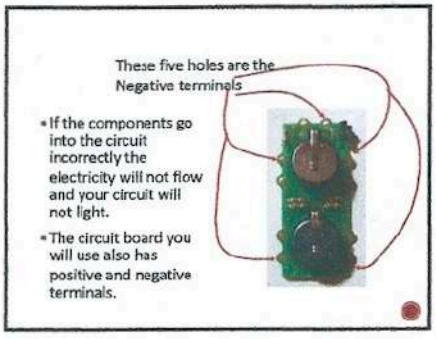

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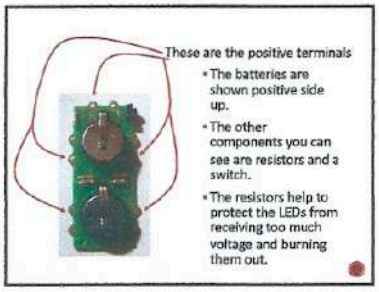

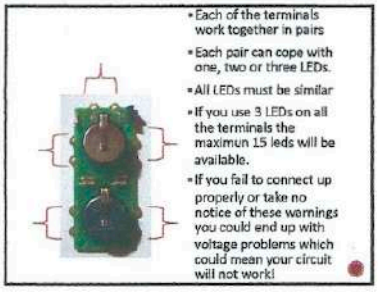

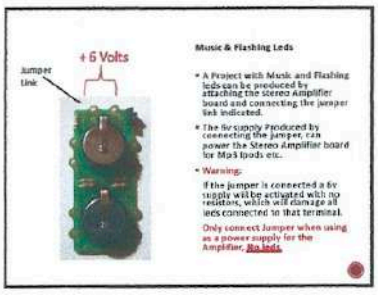

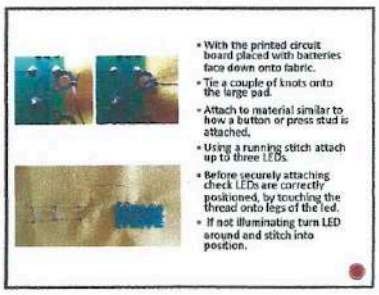

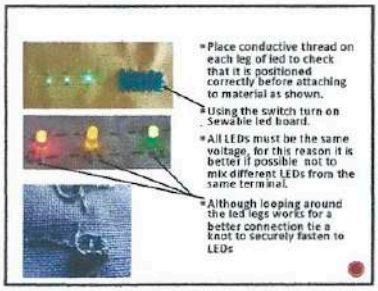

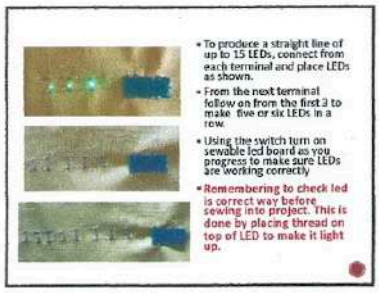

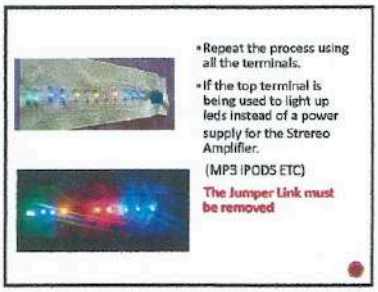

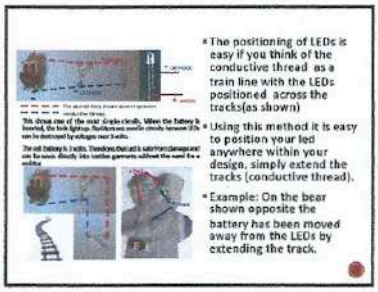

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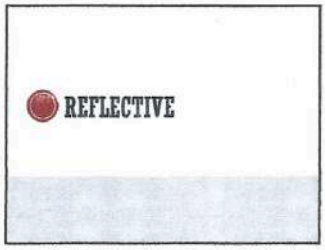
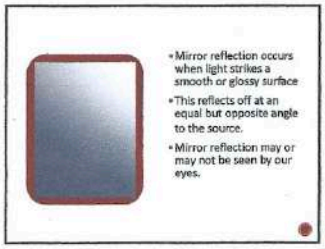
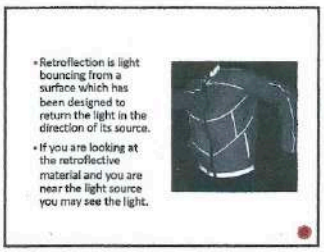
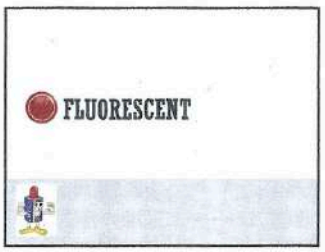
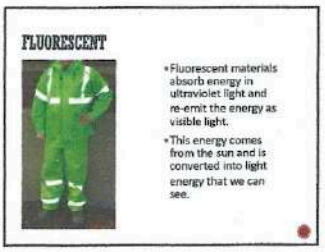
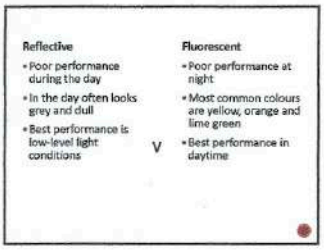












Worksheet – Reflective v Fluorescent (Higher ability)

Name _____

Reflective v Fluorescent

Write a description of reflective and fluorescent light in Include the different kinds of light reflective and fluorescent material are best used in.

Worksheet – Reflective v Fluorescent (Middle ability)

Name _____

Write a description of reflective and fluorescent light. Use the keywords provided in an appropriate way to help you.

Keywords – surface – smooth – rough – glossy – ultraviolet – light source – direction – low-level light

Worksheet – Reflective v Fluorescent (lower ability)

Name _____

Fill in the missing words in the paragraph below using the keywords provided.

R _ _ _ _ _ _ _ _ E light is not easy to see in the daylight. It's normally dull and _ _ _ Y in colour. It is easier to see in _ _ _ - L _ _ _ _ light conditions like dusk. Fluorescent material is charged with energy by U _ _ _ _ _ _ _ _ _ T light from the sun. It is best used in daylight for _ _ _ _ visibility.

The most common colours used are _ _ A _ _ _, _ E _ _ _ _ and _ _ E _ _.

Keywords – ultraviolet – orange - grey - high – yellow - low-level- green - reflective

Word search – Reflective v Fluorescent

High visibility, ultraviolet, fluorescent, light source, reflective, surface, mirror, glossy, orange, yellow, energy, angles, rough, green

Y R R O C S E X V G M T T S F

B T O E W D C E O R N H E U W

H V I U F W M M F E H Y L R O

I G R L G L L T C E I T O F L

Q F B J I H E S K N K M I A L

M N D D Y B E C T N Y B V C E

A F V W R R I F T U Y M A E Y

N Y S S O L G S T I I L R O L

H I R U E U A Y I R V V T W M

Q O L M N G D O R V B E L G Y

A F B R Q M N O A Q H Z U G P

A N G L E S R A I G A G R K L

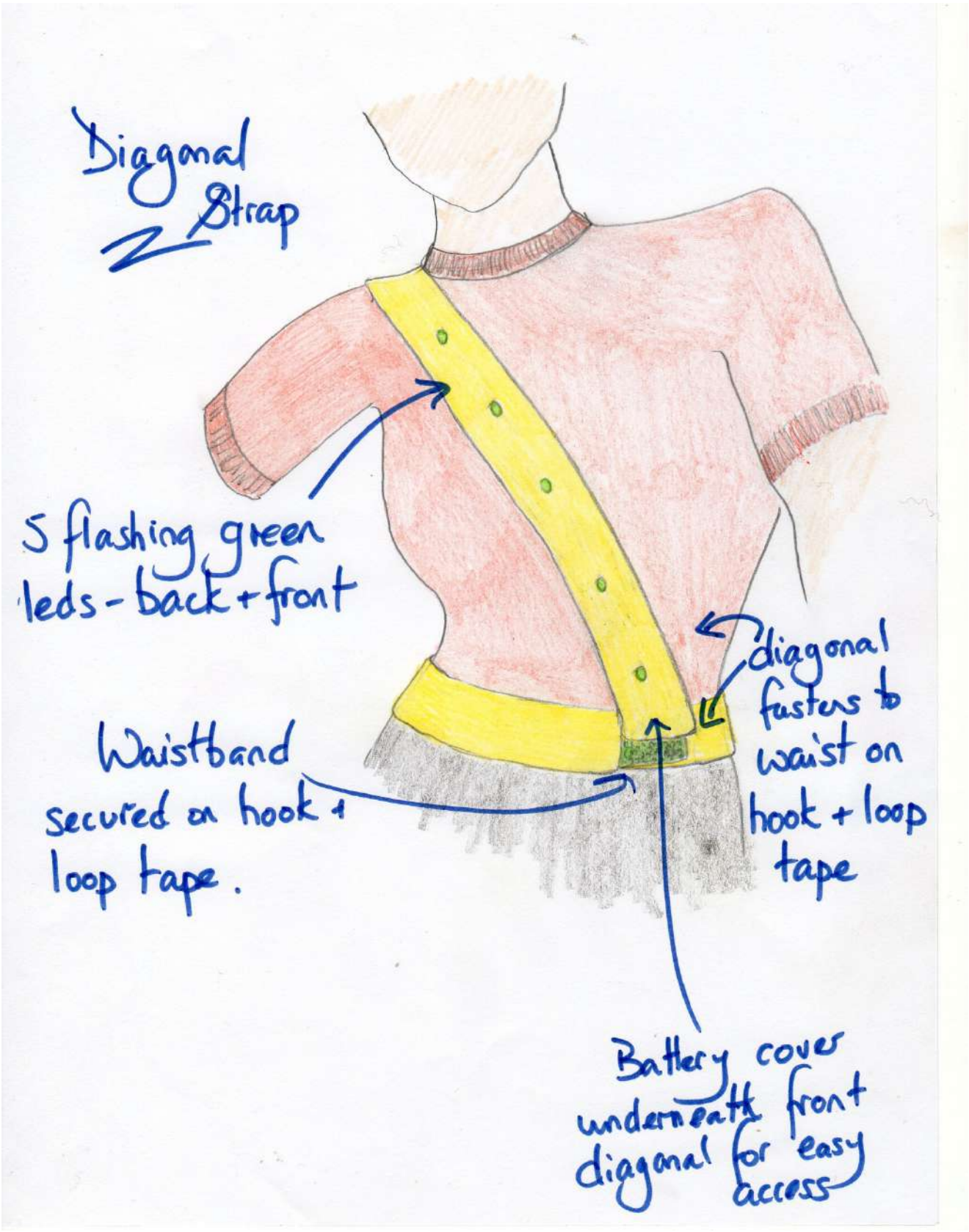
L I G H T S O U R C E E I M U

S V O G V M A T O O N P U H D

S T W P M Z Q I N E K G B S Y

Exemplar material Design one – Vest/Tabard

Design two – Diagonal Strap



Design three – Silver Reflective Jerkin

Model template

Worksheet – Process planning (higher ability)

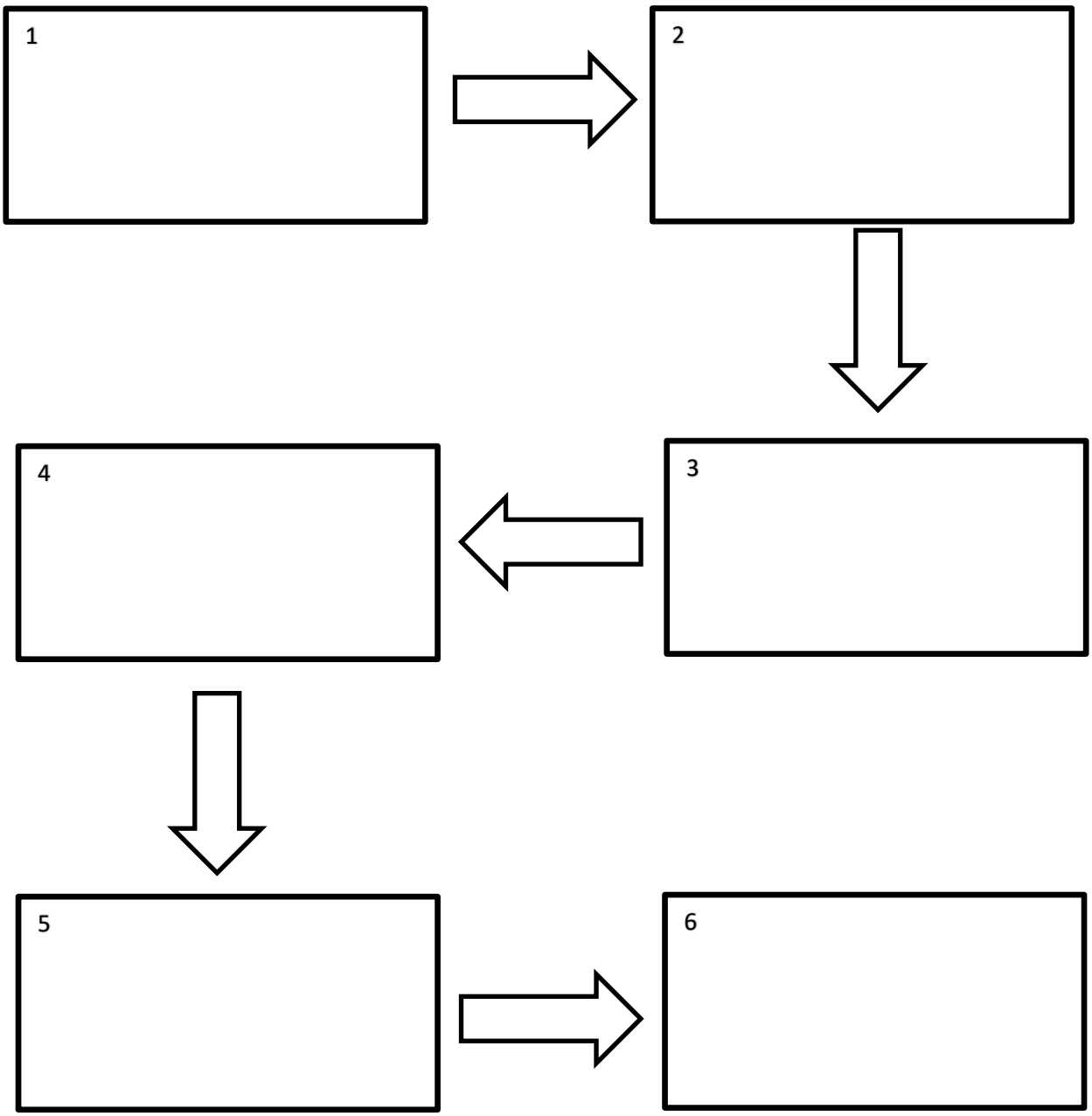
Name_____

Create a process plan of your design. For example: the first task you think might be first could be 'machine all pieces'?

Worksheet – Process planning (middle ability)

Name _____

Create a process plan of your design. For example: the first task you think might be first could be 'machine all the pieces'?



Worksheet – Process planning (lower ability)

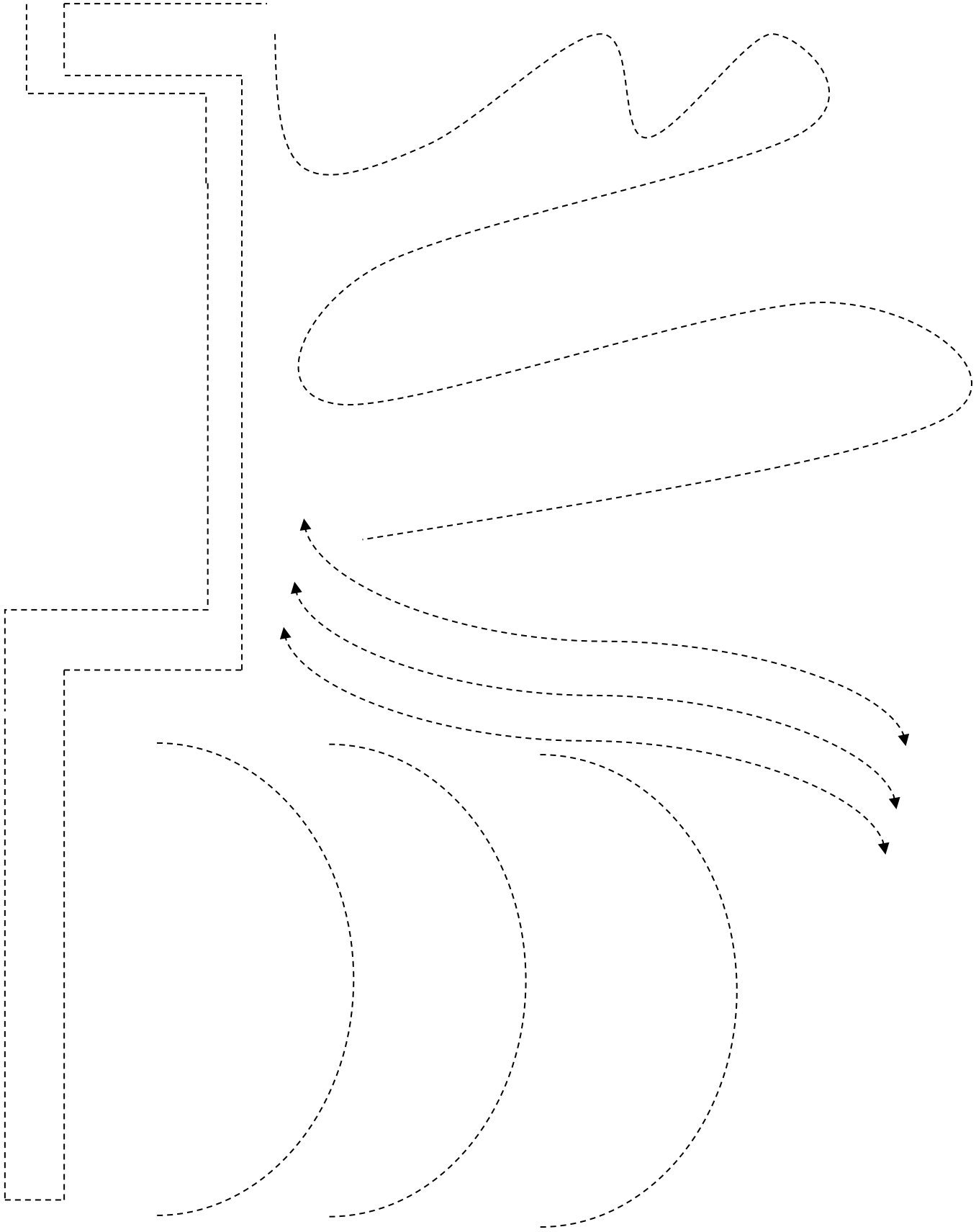
Name_____

Sort the following statements into the order you will use to make your product.

- Attach pieces to blanket
- Sew on machine
- Sew in the components by hand
- Sew the pocket/flap for the circuit board
- Mark the fabric lining for where my electronic components need to be
- Cut out pattern pieces

1	2
3	4
5	6

Worksheet – Sewing machine practice sheets



Worksheet – Advertising my product

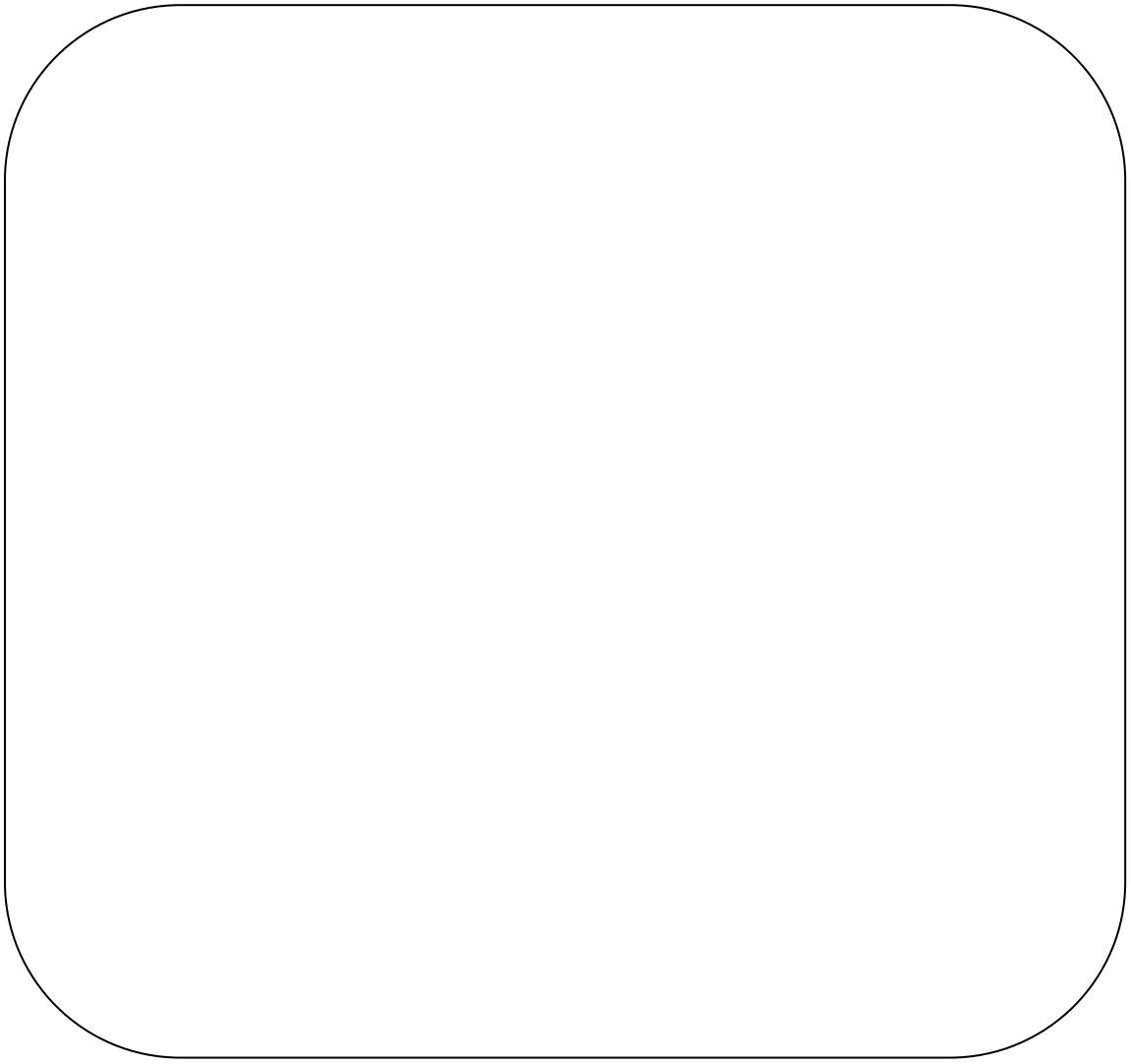
Name _____

You are to design a small flyer for distribution to potential customers in the local shopping centre. Think about what information would persuade someone to buy your product. It should be brightly coloured and informative, advertising the different functions of your design.

Worksheet – What I've done up to now

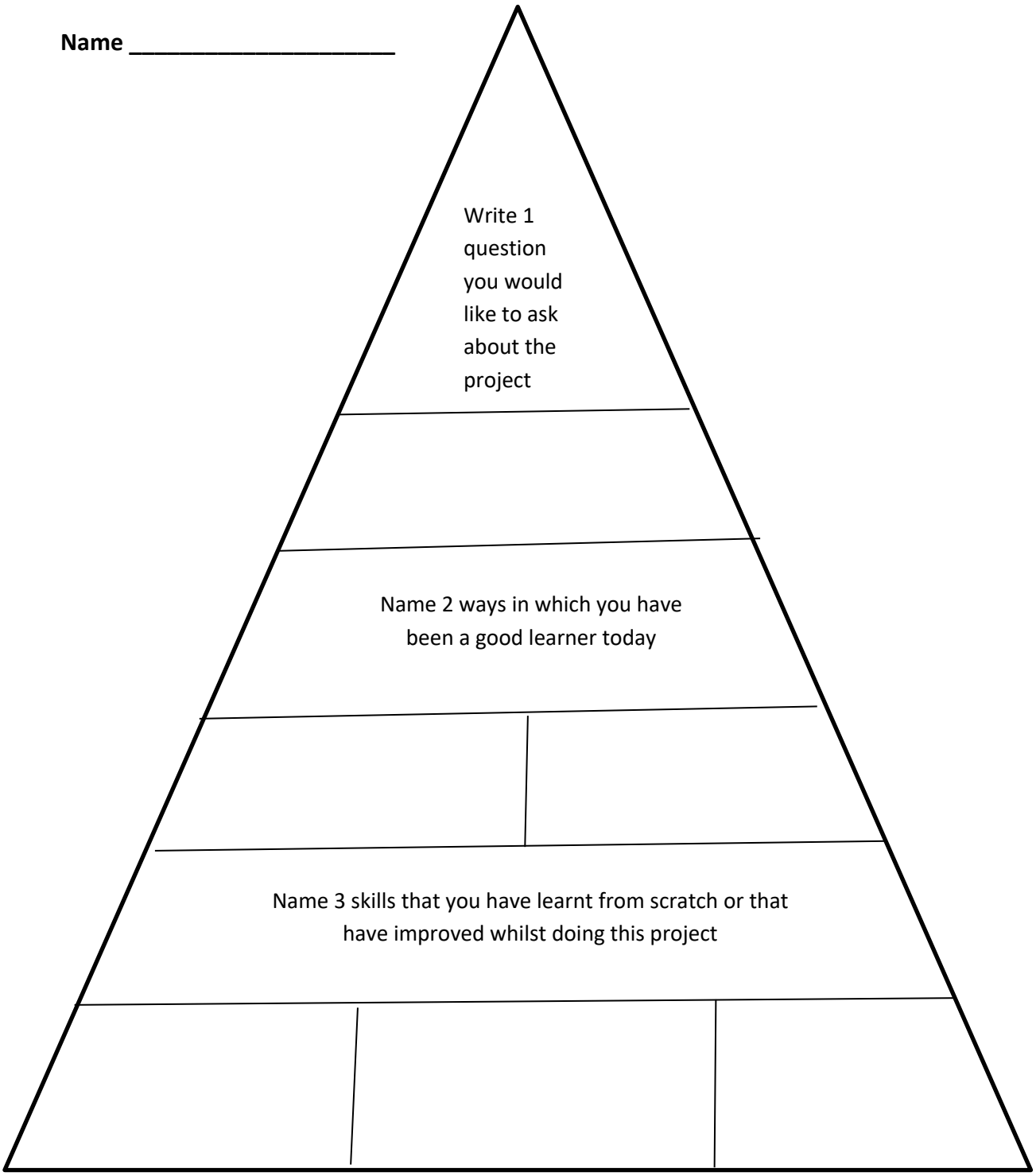
Name _____

Write in the box below what you have done up to now. For instance: Where did your design come from, what influenced you, what process did you use to get where you are up to now, how difficult have you found using the tools, was your process plan correct or has it been changed? You may add other information to this list. This information will help at the end of the project when you have to evaluate your product.



Worksheet Learning Pyramid

Name _____



Worksheet – Record of completed worksheets

Name _____

Tick each one of the worksheet titles that are in your folder. If they are not there you will need to do them to get the best possible mark. Ask the teacher for another copy.

TITLE OF WORKSHEET/BOOKLET	**RAG**
Assessment booklet	
The Design Brief	
Threads	
My Design Specification	
Research	
My Design Sheet	
Product Analysis	
Star Diagram	
Reflective v Fluorescent	
Reflective v Fluorescent word search	
Process Planning	
Sewing machine practice sheets	
Advertising my product	
What I've done up to now	
Learning Pyramid	
My Evaluation	
Have I brought my assessment booklet up – to – date?	

Worksheet – Evaluation

Name _____

Answer the following questions in full sentences and as honestly as you can.

1. How well have you met the needs of the design brief?

2. Was your product successful or unsuccessful? Explain why.

3. What improvements could you make to your design?

4. What did you find difficult about the designing or the making?

5. Explain why you are satisfied or unsatisfied with your final piece.

6.What went well (WWW) and what would be even better if (EBI)?