

An Internet of Soft Things

Workshop Training Guide



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Introduction

This Workshop Training Guide is intended to accompany the booklet 'Electronic Textile Workshop Toolkit Workshop Guide' and the physical toolkit containing everything you will need for the practical activities in the workshops.

Our intention is to help facilitators effectively plan, prepare and run the workshops. We acknowledge that each setting may be different and each group is different, so flexibility and adaptability will be useful qualities to have at all stages of the process. We offer a tried and tested set of workshops, along with our recommendations that might help them work for you. We found that this framework provided enough structure for facilitators and participants alike to feel safe and supported, while leaving enough space for creativity and individuality.

We hope you enjoy the workshops!

An Internet of Soft Things Team

Sarah, David, Amanda, Martha, Rachel, Richard, Matthew, Sarah, Karen, Tincuta, Steven and Ania.

A copy of this booklet and the accompanying workshop guide can be freely downloaded from aninternetofsoftthings.com

Recommendations

Time

- These workshops are designed to be run over the course of six weeks, in a 3 hour session.
- The 3 hour session was found to be ample, activities can run from one week to the next if necessary.
- Go at the pace of participants - this can make planning difficult. Flexibility is needed to be responsive to individual and group needs.
- Explain to the group that breaks can be taken at any time.

Resources

- There are a lot of materials provided for this workshops - but try to keep the main working areas tidy from clutter.
- Participants may keep their kits and objects from week to week, but these will need to be brought in each week in order to progress. It would be worthwhile offering to store kits from week to week so that they are not accidentally left at home.
- Any objects made are the participants to keep.
- Kits and leftover materials should be returned to Mind (including boxes, booklets, fabric, electronics, embroidery hoops, etc.).
- Try to encourage use of plain canvas fabric as backgrounds for weeks 1 and 2. The coloured felt can be used for the bridge switch panel and for the self-directed, more design-based activities.

Environment

- Tables and chairs will need to be set up in advance.
- If possible, have snacks and drinks available. We provided lunch with our workshop due to the timing of the sessions.
- The workshops worked well around a large table or a couple of smaller tables.
- Make sure to leave space so that facilitators can get around the table and sit next to participants.

Providing feedback

- Value the achievements of participants.
- Avoid offering personal opinions or judgements about the quality or appearance of the made objects. Instead provide feedback on whether the electronics are working and offer assistance in solving practical problems.

Recommendations

Participant needs

- Participants may have different levels of involvement depending on their confidence or any current circumstances.
- Participants may communicate verbally or non-verbally.
- Offer to help participants with physical tasks.
- Offer to help with planning and preparing tasks.

Design tasks

- Participants may have no experience of designing, so offer to help if needed.
- The electrical circuit can be checked with crocodile clips before sewing.

Facilitators

- Present yourself as the skills you can offer rather than by your status.
- Avoid using complex language and think of various ways you can explain the task.
- Make sure to be approachable and sensitive when asked questions.
- Where possible, keep the same facilitators with the same groups to promote trust and develop making relationships.
- Recognise that the process of making is therapeutic in itself, if the electronic object is not finished or does not work, this is not essential...
- But, be aware that participants may be keen to finish objects, so assist where possible.

Introduction to the Person-Centred Approach

While these workshops are NOT therapy, we hope they will be therapeutic in nature. This is based on the following view:

- Personal growth takes place in a safe, supportive environment
- A safe, supportive environment is created by facilitators who are *genuine, warm, empathic, open, honest, congruent and caring*

(Rogers, 1993:8)¹

There is some further discussion of the Person-Centred Approach in the accompanying booklet.

The table below offers some suggestions on the roles of facilitator and participant in these workshops:

Facilitator's Role	Participant's Role
<ul style="list-style-type: none"> • To teach new skills: sewing, electronics 	<ul style="list-style-type: none"> • To participate in a new activity
<ul style="list-style-type: none"> • To offer practice in skills 	<ul style="list-style-type: none"> • To create something handmade
<ul style="list-style-type: none"> • To offer practical support: making, technical knowledge/experience 	<ul style="list-style-type: none"> • To develop design ideas
<ul style="list-style-type: none"> • To support participants' creativity and collaborations 	<ul style="list-style-type: none"> • To accept myself in the moment
<ul style="list-style-type: none"> • To value participants' choices and decisions 	<ul style="list-style-type: none"> • To be myself
<ul style="list-style-type: none"> • To view participants in the context of their lived experience (and not to judge or make assumptions) 	<ul style="list-style-type: none"> • To make individually and/or collaboratively
<ul style="list-style-type: none"> • To value participants 	<ul style="list-style-type: none"> • To participate or not participate in each activity as feels right to me
<ul style="list-style-type: none"> • To support participants' reflection on and evaluation of experiences 	<ul style="list-style-type: none"> • To take time to reflect on and evaluate experiences, either individually, collaboratively or in the group

¹ Rogers, N. (1993) *The Creative Connection: Expressive Arts as Healing*. Palo Alto: Science and Behaviour Books

Structure of Workshops

Beginning (10 minutes guide time)

Check-in: make contact with group members as they arrive or at the start of the session and give them the opportunity to share anything (briefly!) that is going on for them at the moment. These may be things in their daily lives that help or hinder their presence and participation in the workshop. It is OK to not check in. The check-in should be facilitated by someone who feels able to acknowledge and accept what has been said, without feeling they have to fix or problem-solve.

Group Agreement: Each individual is given the opportunity to state how they would like to be treated while in the group setting. They can volunteer important qualities, which may include things like: not being judged; being heard; free to be themselves, etc. This is created collaboratively in Week 1 and can be put up at the start of each session. Every week a facilitator may check if anyone wants to amend or comment on the group agreement.

Informed Consent: a verbal reminder each week that ongoing participation in each activity is voluntary.

Middle

Activities as described in the Week by Week Guide

Reflections (see below) may also occur at any time during sessions

Ending (15 minutes guide time)

Reflection: facilitators to support participants to reflect on and evaluate their experiences of the workshop (making, being in the group etc.). Participants may choose to do this individually, collaboratively or in the group.

Check-out: make contact with each group member to invite any thoughts or feelings they want to share with the group. This is an opportunity to celebrate achievement or express any concerns or frustrations (and so not carry them around personally until the next workshop).

Reflection tools

The following two pages feature reflection tools, which feature in the toolkits. If more copies are needed, they can be copied from this document.

Some people may find these tools useful for facilitating their thinking about their experience of the group, the workshop or areas of their life more widely.

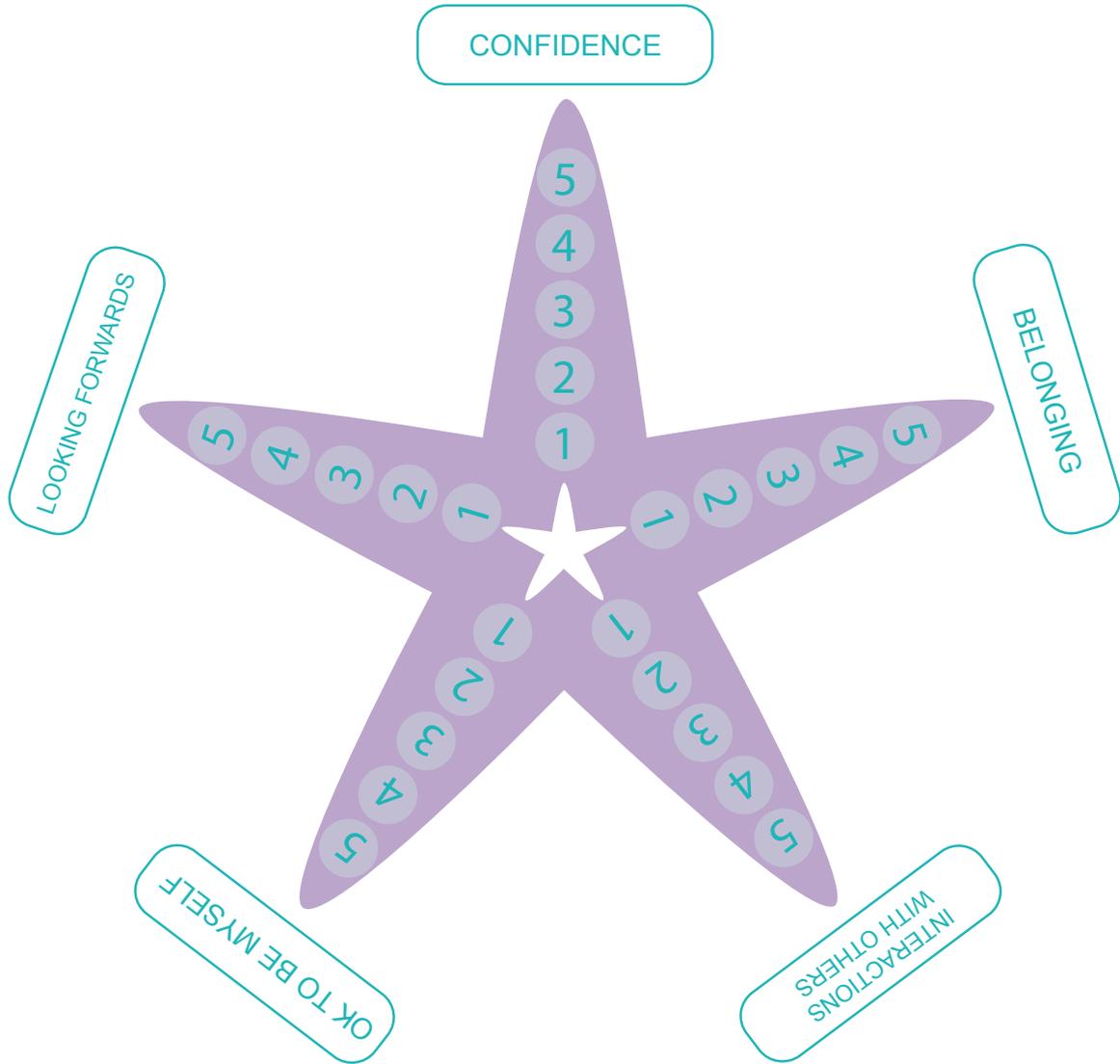
We used these tools each week, but not necessarily with each person, each session. If you do end up doing multiple starfish sheets, these could be used as a journey for discussion.

How to use the starfish

Users can indicate on the sliding scale (1-5) how they feel about each quality, for example 1 being least confident, 5 being most confident.

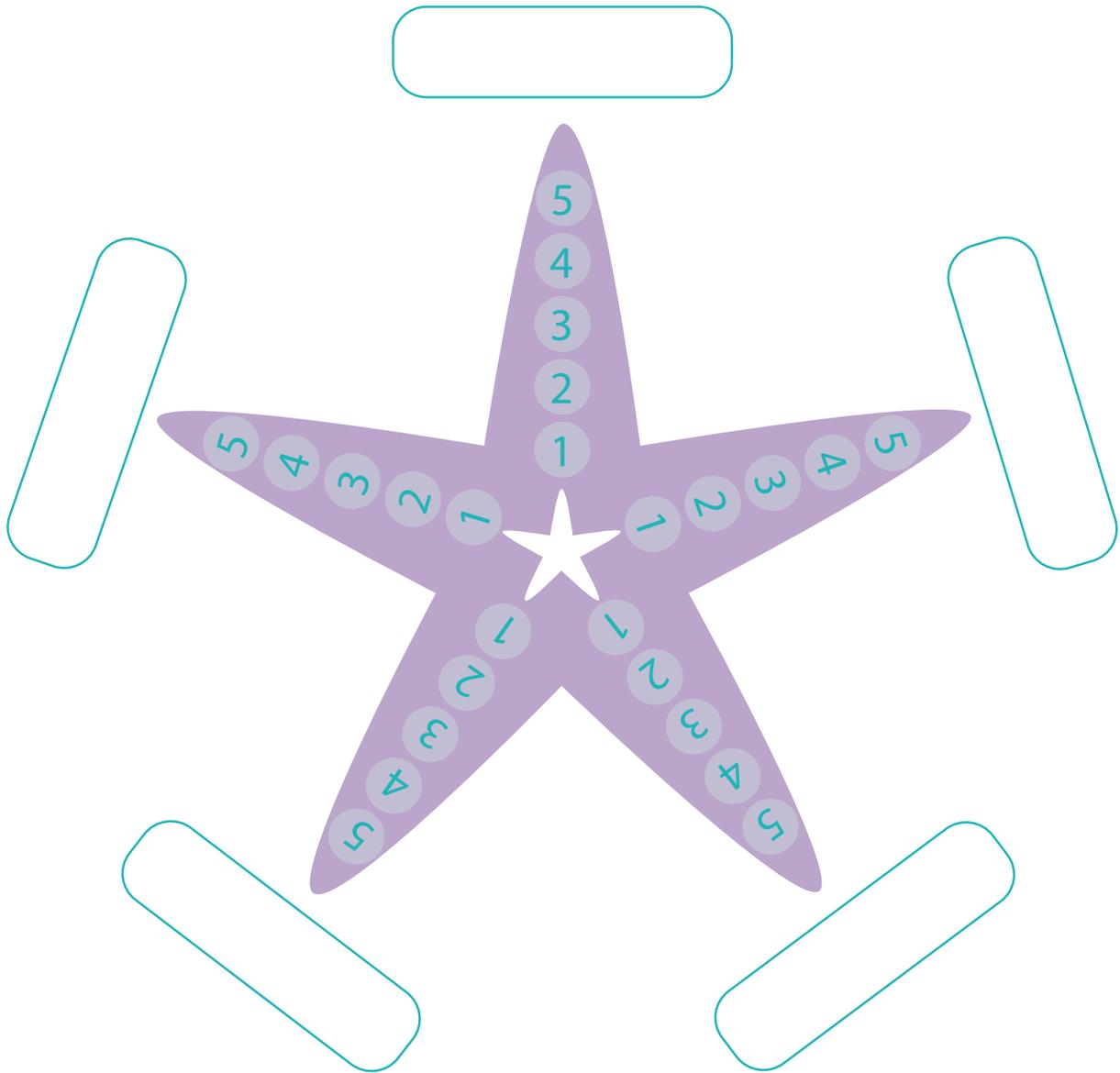
There is a starfish page with blank categories, which can be used to focus on any areas personal to each user.

STARFISH



Name Date

STARFISH



Name Date

Introduction to electronic textiles

Electronic textiles (or e-textiles) refers to any textile which has electronics added on to, or embedded into the fabric to add an extra functionality (for example, to turn a light on).

Unlike conventional circuits, where hard components and wiring are used to make a circuit, e-textiles use electrically conductive, metallic thread and sewable electronic components that are easy to apply to textile surfaces.

Simple circuits can be made in either parallel or series or can use both (see below for descriptions for each). The toolkit explains simple ways to use these circuits to activate one or more LEDs.

Series circuit

A series circuit is one loop that contains all the components. Total battery voltage must equal total voltage of components (e.g. 3V battery = 3V LED)

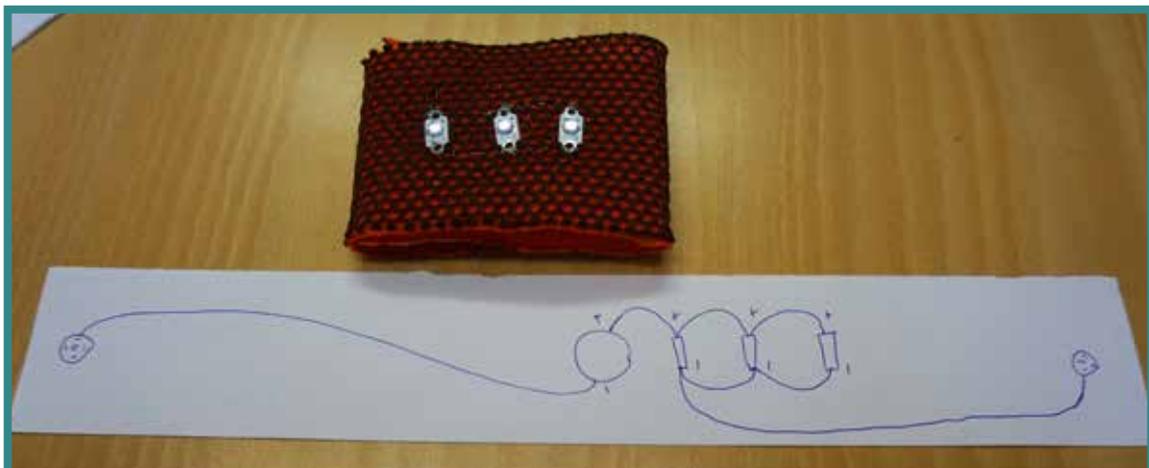
Parallel circuit

A parallel circuit allows you to run more than one LED off one battery. Total battery voltage must equal voltage for the LEDs in each parallel section.

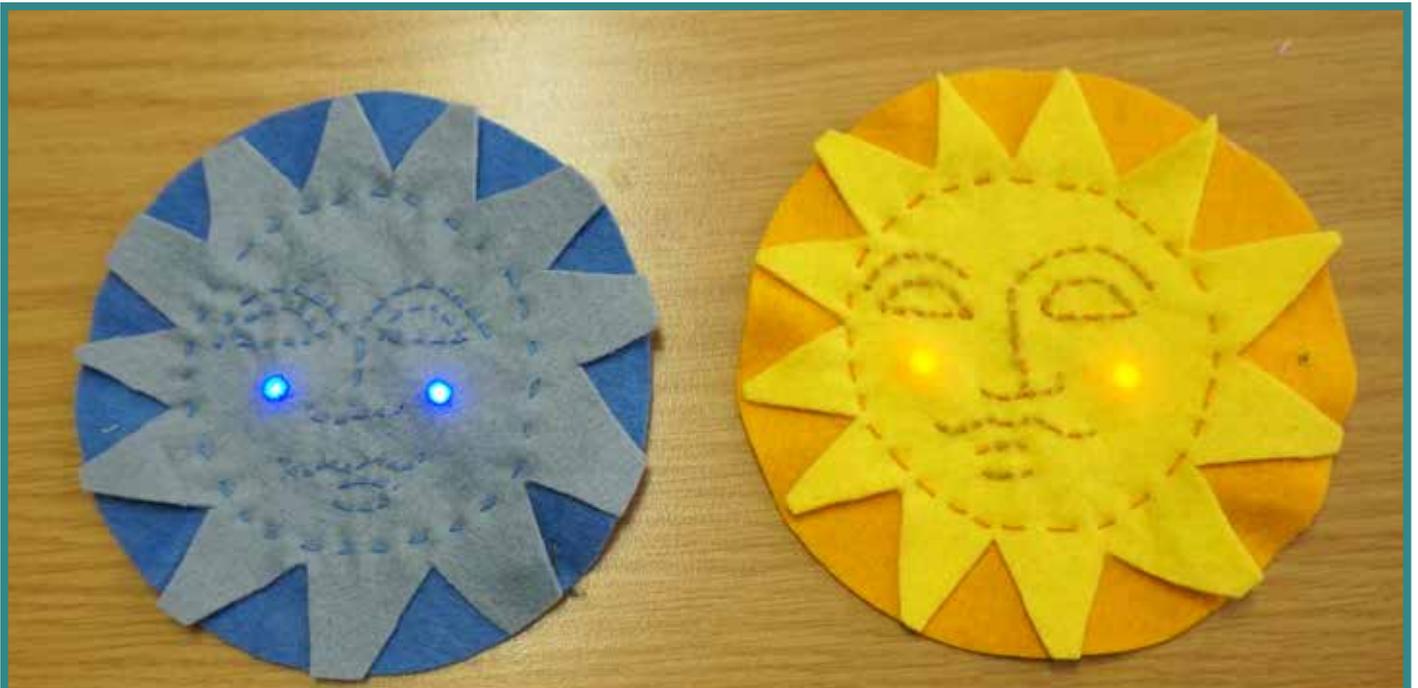
A more detailed introduction to electronic components, circuits and terminology see accompanying booklet.

Please note, circuits do not have to be regular in shape, they can be any shape, so long as they obey the basic principles of the chosen circuit.

See image below for an example of a wristband using a parallel circuit which has been opened out to include a press stud switch. When the wristband is fastened the circuit is completed and the LEDs will turn on.



Examples of e-textiles



Week by week guide

Week 1 - introduction and simple circuit

Start with an ice-breaker activity. Introduce the concept of electronic textiles.

Electronic textiles are any kind of textile which is either conductive and can be part of a circuit, or a textile that has electronic components attached to it.

In order to make sewable electronics, special thread is made that can conduct electricity (show thread) and components are made specially with conductive holes, so that they can be sewn to textiles easily (show components - LEDs, battery holders, etc.).

In week 1 we hope to:
All - understand the concept of e-textiles.
All - know how to make a basic circuit.
Most - be able to make a textile circuit.

The group agreement can be started during this session.

Example outcomes from activity 1



With discussions - encourage participants to write ideas down and keep record for yourself to refer back to.

Discussion suggestion 1

How many things can you see in this room (or think of generally) that emit light?

Talk about different types of light and why they are used.

Write some of these down to refer back to in the design weeks (3-6).

Examples:

- for warning (alarms, ambulance)
- for illuminating spaces (lamps, room lights)
- to guide people (cinema floor lighting, emergency exits)
- to light the way (car headlights, torch)
- to tell you something is turned on (laptop light, TV standby light)
- for comfort (candlelight)
- for warmth (firelight)
- as part of nature (sun, moon, stars), etc.

Discussion suggestion 2

Talk about design preferences. Write some of these down to refer back to in the design weeks (3-6).

- What kind of colours do you like?
- What kind of shapes, symbols, characters do you like?
- Do you have any ideas what you might make?

Discussion suggestion 3

Talk about different textiles that you encounter. Write these down and discuss what they are for - refer back to in the design weeks (3-6).

- for protection or warmth (clothing)
- to block out light (curtains)
- for comfort (soft furnishing, cushions, etc.)
- for display (wall hangings, flags)
- in public (bus seats)
- at home (bedding)

Week by week guide

Week 2 - switches

In week 2 we hope to:
All - Learn about a range of textile switches
All - Make a simple textile switch
Some – Make more than one textile switch

Start with a recap of week 1.

Discussion

What is a switch?

Switch completes or breaks a circuit

E.g. light switch, pulling a battery out of an appliance.

What is a sensor?

Sensor detects an action or change

E.g. burglar alarm, Wii, thermometer.

Activity 2

There are 2 switches featured in today's session

Switch 1 - Press Stud Switch (the easiest)

This circuit uses a press stud to fasten and to break the circuit.

Switch 2 - Press Stud Bridge Switch (more work, but can be added to switch 1 afterwards)

The circuit is the same as the press stud switch, and a separate piece of fabric is made with two press studs connected by a piece of conductive thread that 'bridges' the gap in the circuit.

Things to remember with all activities

- Always connect positive to positive
- Always connect negative to negative
- Do not sew across the components. The (+) and (-) should not be connected to each other using thread
- Attach each component securely using several stitches pulled tight.

New issues for this week

- Check press studs are facing the right way to be fastened.
- Check the gap between the press studs is not connected with conductive thread.
- Check the press studs on the circuit are a similar width apart to the press studs on the 'bridge'.

Press stud switches

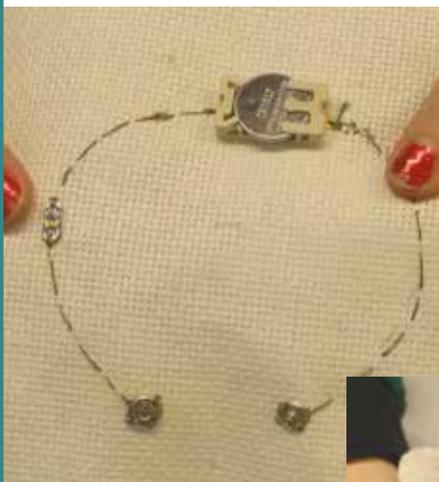


- Switch open
- Circuit broken
- Light off



- Switch closed
- Circuit complete
- Light on

Press stud 'bridges'

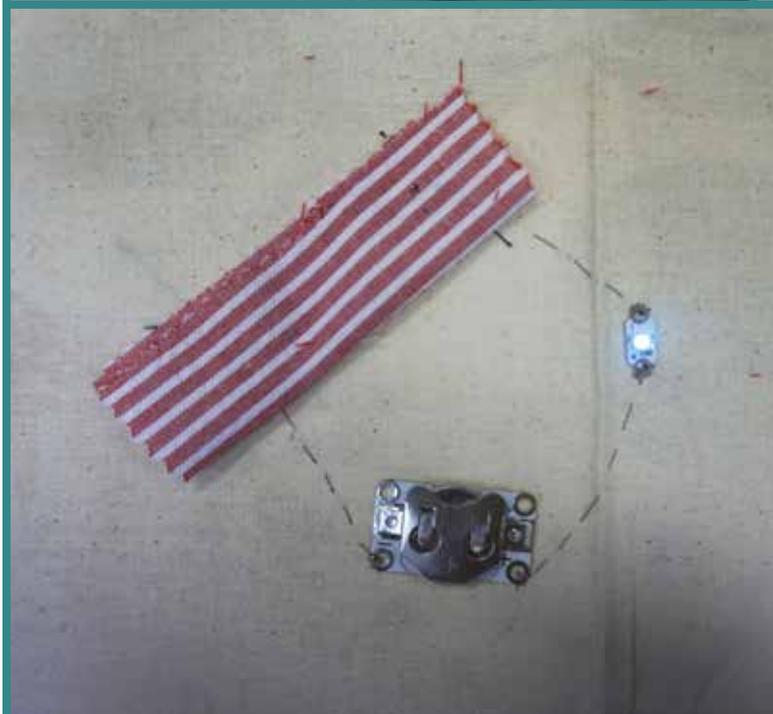


- Switch open
- Circuit broken
- Light off



- Switch closed
- Circuit complete
- Light on

Example outcomes from activity 2



Week by week guide

Week 3 - garment circuits

In week 3 we hope to:

All - think about designing on garments and 3-dimensionally

All - design a circuit on a garment

Most - complete a circuit on a garment

Discussion

Think about how you wear this garment - what interactions are typical with it?

How might you interact with it to create a circuit (remember, a circuit is just a loop of any shape)?

Activity 3

Make sure to encourage drawing the circuit on paper and testing with crocodile clips before sewing starts.

Some examples of design ideas

- Gloves with a circuit between finger and thumb.
- 2 gloves with a circuit spread out connecting at finger and thumb on each hand.
- 2 socks with connections made when you put two feet together at heels and toes.
- Hat with bridge switch applied (similar to a brooch/badge) - the bridge could have the LED on it.
- Hat where circuit is connected as the brim is folded up.
- Sock made into glove puppet with circuit connected when 'mouth' is closed.

Things to remember with all activities

- Always connect positive to positive
- Always connect negative to negative
- Do not sew across the components. The (+) and (-) should not be connected to each other using thread
- Attach each component securely using several stitches pulled tight.

New issues for this week

- Remember to check the explanations of series and parallel circuits when planning the circuit.
- If making a 'touching' connection (e.g. connecting by pressing finger to thumb) make sure there is a reasonable area of contact to ensure a strong connection (such as a small piece of conductive fabric or a wide piece of embroidery in conductive thread).



Example outcomes from activity 3

Pair of socks with circuit and press studs.

Circuit is complete when the two pairs of press studs are fastened at each end.

Pair of gloves with a series circuit connected by touching together finger and thumbs.

There are 2 batteries and 2 LEDs (one on each glove).

Each glove will light up on its own when finger and thumb are touched.



Single glove with LED in the knuckle.

The circuit is complete when forefinger and thumb are touching.

The idea was to illuminate the keyhole when unlocking the front door. The metal key also carries the current and helps complete the circuit in this example (also works without key).



Week by week guide

Week 4 - group circuit

In week 4 we hope to:
All - design a form for the group circuit object
All - start making group circuit object
Most - finish group circuit object
Some - finish off work from previous weeks (instead of group circuit)

Activity 4

The group circuit is designed to include a set circuit in an object of the individual's design. So long as the circuit is exactly as described in the hand-out it should be able to be fastened together on its own using the press studs, as well as linked to any number of other objects with the same circuit to make a larger, linked circuit.

Each object uses a series circuit, and when fastened together the larger circuit is a series circuit (using one battery for each LED).

Each group member can design their own form for the group circuit to be applied to. These could be flat or stuffed. The shape can be something personal to the individual. Using the felt in the kit will minimise fraying and make sewing easier (though other fabric can be used if desired).

A simple stuffed object can be made with 2 layers of felt stitched around the edges. Leave a small gap in the seam to get the stuffing inside. When stuffing is filled, sew up the gap in the seam (this seam can be sewn by hand or on a sewing machine)

the circuit can be stitched on after making the 3D object. If you want to sew before constructing the 3D object, you may not be able to use the sewing machine (due to the hard parts on the surface of the fabric).

Things to remember with all activities

- Always connect positive to positive
- Always connect negative to negative
- Do not sew across the components. The (+) and (-) should not be connected to each other using thread
- Attach each component securely using several stitches pulled tight.

New issues for this week

- Make sure press studs are the correct way round, as shown on hand-out.
- Make sure all components are the correct way around (+) and (-), as shown on hand-out.
- Check that when the press studs are fastened that the LED isn't covered up (on individual objects and when connected to others).
- If object is tightly stuffed it may not be able bend to fasten the press studs.

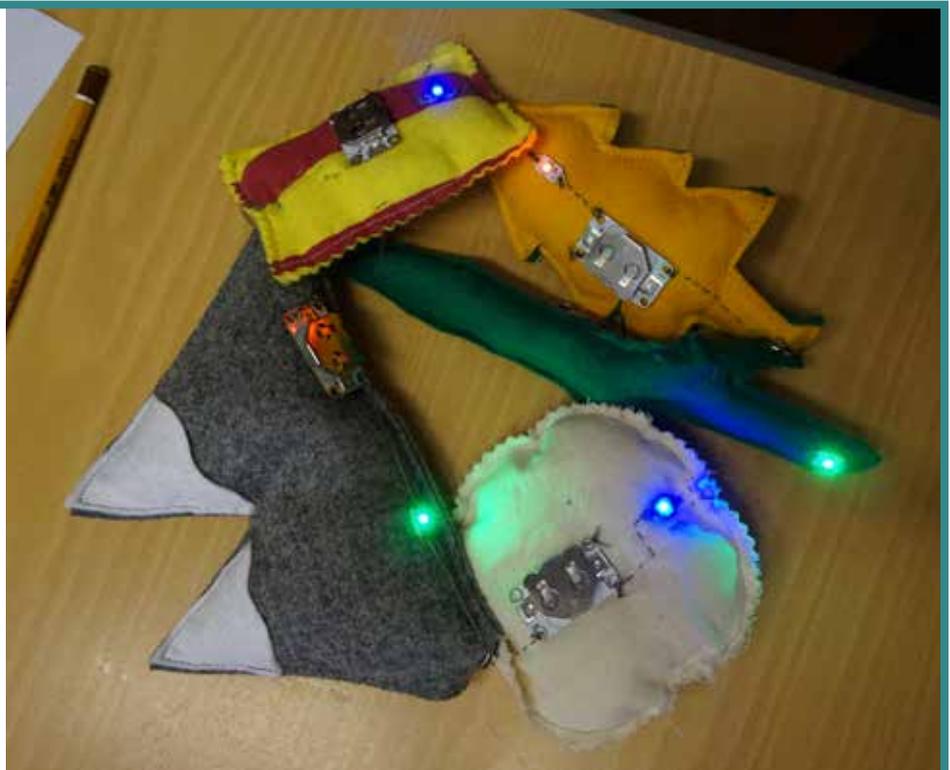
Example outcomes from activity 4

Individual group circuit objects made using felt and stuffing.

Fastening the press studs together on each object completes the circuit and lights the LED.



Group circuit objects fastened together, showing LEDs illuminated.



Week by week guide

Week 5 - self-directed object

In week 5 we hope to:
All - discuss design ideas
All - plan design of self-directed object and test with crocodile clips
All - start making object

Activity 5

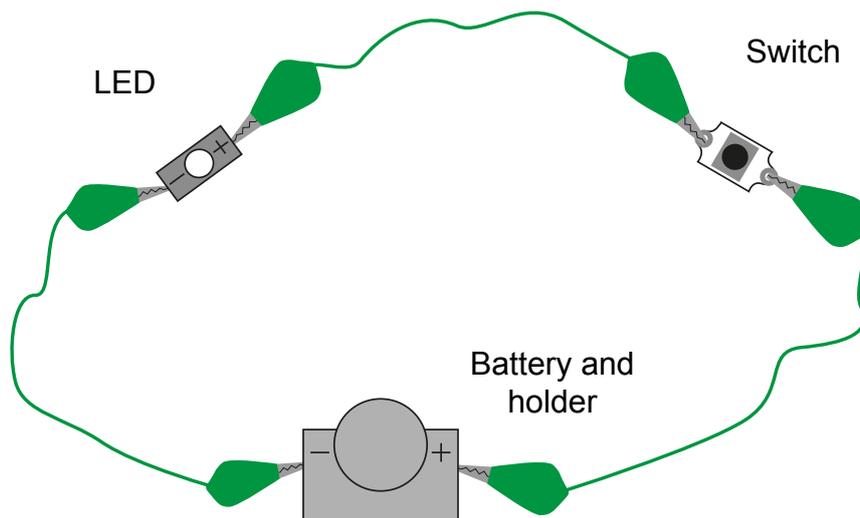
Each group member can design and make their own e-textile object.

This activity involves designing the circuit AND the shape of the object - either can be done first.

Warm-up activity

Draw attention to the pre-made switches in the toolkits and to the different colour LEDs. Using crocodile clips, test how each switch works - this can be done individually or in pairs/groups.

Each LED, battery holder and light sensor have (+) and (-) that need to be correctly aligned - the switches do not (see diagram below).



USEFUL TIP

Participants should be encouraged to plan their circuit - this can be done by sketching and by prototyping with crocodile clips. This will help to pick up problems and save time and potential heartache if done before the sewing starts.

Be clear that this activity lasts for 2 weeks, so does not need to be finished in one session.

Things to remember with all activities

- Always connect positive to positive
- Always connect negative to negative
- Do not sew across the components. The (+) and (-) should not be connected to each other using thread
- Attach each component securely using several stitches pulled tight.

New issues for this week

- Remember to check the explanations of series and parallel circuits when planning the circuit.
- If making a 'touching' connection (e.g. connecting by pressing finger to thumb) make sure there is a reasonable area of contact to ensure a strong connection (such as a small piece of conductive fabric or a wide piece of embroidery in conductive thread).
- Finishing off objects, make sure that the batteries are not enclosed inside the objects - access to the battery holder is needed to change batteries.

Example outcomes from activity 5



Week by week guide

Week 6 - self-directed object

In week 6 we hope to:
All - continue to discuss design ideas
All - continue making self-directed object
All - finish making object

Use this week to finish off any design tasks from week 5 (or before).

Things to remember with all activities

- Always connect positive to positive
- Always connect negative to negative
- Do not sew across the components. The (+) and (-) should not be connected to each other using thread
- Attach each component securely using several stitches pulled tight.

New issues for this week

- Finishing off objects, make sure that the batteries are not enclosed inside the objects - access to the battery holder is needed to change batteries.
- Check that circuits work by checking the problem-solving guide at the end of this book. Always trim loose conductive threads so they don't cause short circuits.

Problem solving for electronics

The following section hopes to clear up some common problems experienced with textile circuits. If the circuit is not working there may be:

Problems with (+) and (-) alignment

- Check the (+) symbols are linked to other (+) symbols and (-) symbols are linked to other (-) symbols.

Short circuits

Electric current will always take the shortest possible route, so if your circuit allows a quicker alternative than passing through the necessary components, that will be taken. Some examples of common short circuits are listed below.

- Check that there are no short circuits on the front or back of the fabric. Remember - the conductive thread must not be continued behind components such as LEDs, batteries, switches, etc. (Reason - the current will bypass the component rather than going through it. Electricity always takes the easiest route.)
- If there are loose threads or long threads hanging from knots, cut them shorter and/or tape down with a small piece of masking tape so they can't move around and cause false connections or short circuits.
- A circuit must not cross over itself. If the crossover may allow the power to bypass some of the components. If a crossover is necessary, you can insulate the conductive thread from itself by passing it so the fabric in between separates the two threads.

Loose connections

- Check that the sewing of the components is secure. Each side of each component must be sewn tightly to the fabric with several stitches of conductive thread. If the component is hanging loose or can move around this probably needs reinforcing.

Faulty component

- You can check that the component is working by:
 1. Change the battery to see if that has power
 2. Attach 2 crocodile clips to a new battery holder with battery in. Attach the clips to LED to check that the LED works.
 3. If battery and LED are working, it may be the battery holder. This can be replaced.
- N.B. You can check components with crocodile clips **before** sewing to fabric.

Problem solving for electronics

Problem with circuit design

- Check that the circuit has the correct voltage balance.
- In a series circuit there must be one battery for every LED.
- In a parallel circuit you can power multiple LEDs from one battery, but the circuit must obey the design of a parallel circuit (see diagram in accompanying booklet for details).
- Check that any switches or design features create a working circuit (plan on paper and with crocodile clips).
- Occasionally, the circuit can be too long for the power to make it round. This shouldn't be a concern when making small objects.

Other advice for workshops

Running workshops throws up all kinds of challenges, but try to remain calm and listen to individual needs.

Sewing

- Offer to do sewing for participants.
- Try to express that neatness is not important and encourage 'having a go'.
- One alternative to sewing would be to use strips of iron-on conductive fabric - N.B. components still need sewing to this. All the same rules apply - e.g. there needs to be a break in the fabric behind the components.

Designing

- Designing might be something which participants have a lack of confidence in.
- Offer design decisions as a set of simple, broken down questions. E.g. What colour fabric shall we use? What shape shall we cut out? Do you want a switch on that? What kind of switch? Etc.
- Make sure to play with the components and crocodile clips and do some sketches before designing - this will give the decisions about switches and shapes some context.

Not finishing activities in one session

- Participants may not finish their activities in the sessions. Offer support to finish them in the following session. During weeks 5 and 6 of the sessions there is one activity for 2 weeks. This time could also be used to finish off previous activities.

Managing expectations

- By breaking information into smaller chunks, it should be easier to manage expectations. In these sessions it is important to make sure that everyone realises that the objects that they are making have simple functions - no 'all singing all dancing' objects, just simple LEDs turning on and off.
- This being said - objects can reflect participants' personalities through the design, colour and shape.
- Try not to run before you can walk! Start with something simple and easy to manage. Different participants will have different skills when it comes to sewing so try to start small and develop complexity through the activities.
- A simple design can be made that has dramatic effects e.g. a switch could be part of a wristband that lights up when fastened.

Re-ordering supplies

If you need to reorder the supplies from the kits, here is the information about the original suppliers. Only specialist items and consumables are listed here.

The activities are designed around Kitronik components, so if other electronic suppliers were used, you would have to check compatibility of components (e.g. voltage) for the activities.

For many of the commonly found items (e.g. needles, pins, etc.) any supplier may be used.

Component	Code	Supplier
Stitchable LED (white)	2714 - Electro-Fashion LED board (white)	Kitronik Ltd. https://www.kitronik.co.uk Unit 3a, Shipstones Business Centre, North Gate, Nottingham, NG7 7FN, United Kingdom. Tel: +44 (0) 845 8380781 Fax: +44 (0) 845 8380782 sales@kitronik.co.uk
Stitchable LED (red)	2712 - Electro-Fashion LED board (red)	
Stitchable LED (green)	2723 - Electro-Fashion LED board (green)	
Stitchable LED (blue)	2713 - Electro-Fashion LED board (blue)	
Stitchable battery holder	2701 - Electro-Fashion, Sewable Coin Cell Holder	
3V coin cell battery	2262 - CR2032 3V Coin Cell (pack of 5)	
Conductive thread (50 yards)	2722 - Electro-Fashion, Conductive Thread, 50 yards / 45m	
Stitchable push button	2708 - Electro-Fashion, Push Button Switch	
Stitchable slide switch	2709 - Electro-Fashion, Slide Switch	
Stitchable tilt switch	2710 - Electro-Fashion, Tilt Switch	
Stitchable magnetic switch	2720 - Electro-Fashion, Magnetic Switch	
Stitchable light sensor	2721 - Electro-Fashion, Light Sensing Coin Cell Holder	
Iron-on conductive fabric	Adhesive Conducting Fabric (ACF) 234-307A	Mindsets http://www.mindsetonline.co.uk Mindsets (UK) Ltd, Unit 10, The IO Centre, Lea Road, Waltham Cross, Herts, EN9 1AS Tel: +44 (0) 1992 716 052 websales@mindsetonline.co.uk
Felt squares	Assorted Colours Squares - 100 Pack (50 Shades) SKU: ASST-50-100	Colourful felt http://www.colourfulfelt.co.uk Tel: +44 (0) 845 305 8460 Colour-Full Felt, Anglo Brands Ltd, Bridge End Mills, Tong Lane, Whitworth, Rochdale, Lancashire, OL12 8BG

Re-ordering supplies

Component	Code	Supplier
Stuffing	Minicraft Supersoft Hi-Loft Polyester Toy Filling	Hobbycraft http://www.hobbycraft.co.uk Tel: +44 (0) 330 026 1400 (customer service only)
13mm press studs	Hemline Snap Fasteners 13mm (nickel option only)	
Gloves (mens)	Mens Knitted Winter Magic Gloves. Product ID: UTGL574	Universal Textiles UK Ltd, http://www.universal-textiles.com 50 Oswin Road Leicester, LE3 1HR, United Kingdom Tel: +44 (0) 116 218 2188 Fax: +44 (0) 116 218 2198 orders@universal-textiles.com
Gloves (womens)	Ladies/Womens Plain Winter Magic Gloves. Product ID: UTGL310	
Beanie hat	Beechfield Unisex Two-Tone Knitted Winter Beanie Hat. Product ID: UTRW242	
Striped beanie hat (mens)	Mens Striped Knitted Beanie Hat. Product ID: UTHA340	
Socks	Ladies/Womens Pastel Coloured Plain Socks (Pack Of 3). Product ID: UTW332	

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