


DESIGNERS OF CHANGE (LEVEL 3)

Ages 11 to 14 (Level 3)

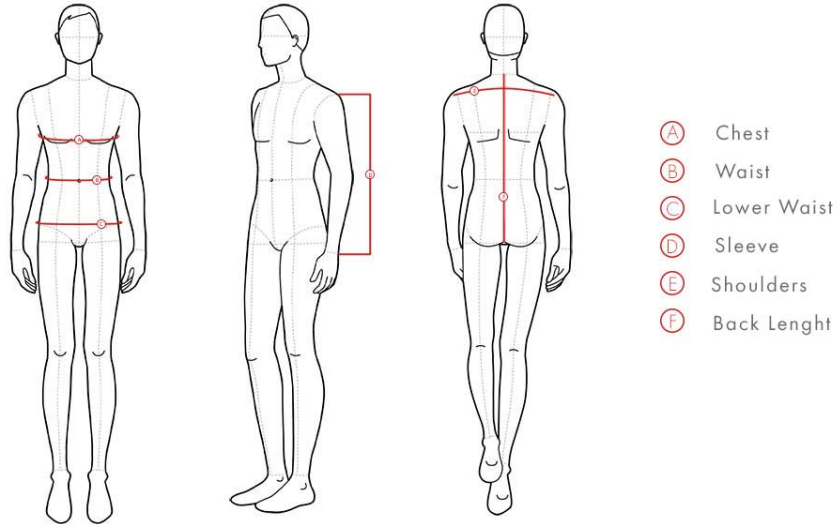
Description:	Unleash your inner fashion designer and entrepreneur by creating attractive designs and pitching your products to be sold in a store!
Leading question:	Can you sustainably design a clothing item?
Age group:	11-14
Subjects:	Mathematics
Total time required:	4 hours over 4 days
Self-guided / Supervised activity:	Self-guided
Resources required:	Paper, ruler, scissors, pen, tape/glue, color pens (optional), natural fabric/large pieces of paper or tissue paper

Day	Time	Activity and Description																								
1	20 mins	<p>In this project, learners will sketch and design their own clothing item(s) and think about what makes clothes sustainable!</p> <p>Today students will design a fashion sketch of the clothing item they want to create.</p> <p>There are many things to consider when designing clothes - what they will be used for, what material should be used to make them, the designs and measurements they should have, and many others. Learners will begin by exploring closets in their own homes and noting down what they notice about their clothes. They will pick at least 5 different items from their and/or their family's clothes.</p> <p>They will write down their observations about them in the table below. An example is shown below:</p> <table border="1" data-bbox="467 1514 1404 1850"> <thead> <tr> <th>Item</th> <th>Function</th> <th>Season</th> <th>Material(s)</th> <th>Size</th> <th>Color & design</th> </tr> </thead> <tbody> <tr> <td>T-shirt</td> <td>Casual wear, keeps me cool</td> <td>Summer</td> <td>Cotton Polyester</td> <td>M</td> <td>Plain, white</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Item	Function	Season	Material(s)	Size	Color & design	T-shirt	Casual wear, keeps me cool	Summer	Cotton Polyester	M	Plain, white												
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T-shirt	Casual wear, keeps me cool	Summer	Cotton Polyester	M	Plain, white																					

	5 mins	<p>Learners will reflect on their findings:</p> <ul style="list-style-type: none"> - What do you notice about the different items of clothing? How are they different and in what ways are they similar? - How do you think they are made? - Do you have any idea whether or not it is good for the environment? Why or why not? - Did you find any items that have not been used in a long time because they don't fit anymore or just not wanted? <p>What do you think the function of the clothing items below are? What assumptions can you make about the image below? What do you think the weather is like on that day? What occasion do you think they are dressed for?</p> <div style="text-align: center;">  </div> <p>source: http://thelifepile.com/2017/05/01/an-introduction-to-qatari-culture/a-family-in-traditional-qatari-clothing/</p>
	30 mins	<p>Each clothing item serves a function - whether it is to protect us from certain elements like the weather, or to just make a statement.</p> <p>The garment worn by the man and the child in the picture is the thobe, and that worn by the woman is an abaya. These items constitute the traditional clothing of the people of Qatar and many Arabian Gulf countries. They are characterized by loose fitting designs that help maintain a cool body temperature, which is important given the harsh desert climate of these countries. Can you name 4 other countries in the Arabian Gulf? (Answer: Kuwait, Bahrain, Oman, Saudi Arabia, the United Arab Emirates)</p>

We will use the thobe to explore measurements. Learners will imagine that they are asked to sketch a design for a thobe for someone whose measurements are as follows (they can also use their own measurements):

- 6 feet tall
- 15 inches shoulder width
- 35 inches chest width
- 30 inch arm length



Learners will draw a sketch of a thobe keeping in mind the measurements above. They must:

- Convert inches to centimeters and write the measurements in both units. 1 inch = 2.54 centimeters
- Think about the parts they need to write measurements for
- Consider how tight or loose the design will be
- Think about how they will scale measurements from the sketch to the measurements of a real person. How much bigger are the actual measurements compared to the sketch?
- Other things to consider when designing a sketch for a clothing item

Allow learners to work independently and support them as needed with the tips below:

- Write the measurements for the length, shoulders, chest, sleeve length according to the measurements provided in both centimeter (cm) and inches (")
- Make sure that the thobe is symmetrical
- Make sure that there is enough wiggle room by making designs a little taller and looser than the person's actual measurements
- Measure the length of the different parts of their sketch and write the ratio of their measurements to the actual measurements of the person for whom they are designing the thobe. For example, if the length of the sleeve for a child's shirt is 15 inches and in your sketch you draw a

	5 mins	<p>sleeve of length 5 inches, then the ratio would be 5:15 or 1:3 and the scale factor would be 3</p> <p>Learners will reflect on this exercise:</p> <ul style="list-style-type: none"> - What did this teach you about designing clothes? Was it easy or hard? - What additional measurements do you need to design different clothing items like pants, for example? - How do you think the fabric or material you use to design clothes will affect the measurements? <p>Learners will find the scale factor and actual measurements in the following scenario: Ratio: 6:24 Scale factor: ? Length of parts on sketch:</p> <ul style="list-style-type: none"> - Sleeve length: $4\frac{1}{8}$ inches, actual length on mannequin: ? - Shirt length: $6\frac{3}{4}$ inches, actual length on mannequin: ? - Shoulder width: $3\frac{2}{3}$ inches, actual length on mannequin: ?
2	<p>20 mins</p> <p>15 mins</p>	<p>Today learners will create 2D versions of their designs</p> <p>Learners will first come up with the concept for their piece. They will reflect on why they want to design this item and answer the following questions in their notebook:</p> <ul style="list-style-type: none"> - What is the clothing item? - What is the function of this item? On what occasions can it be worn? - Is it a traditional piece or a trendy item that makes a statement? - What inspired you to create this item? Where did you get the idea for it or its design? <p>Learners will then think about what makes clothes sustainable. They will ask adults and research the meaning of sustainability and sustainable fashion or look at the information below:</p> <div data-bbox="477 1409 1065 1640" style="background-color: #f0f0f0; padding: 10px;"> <p style="text-align: center;">sustainable fashion</p> <p style="text-align: center;">/sə'stānəb(ə)l/ /'faʃən/ noun</p> <p style="text-align: center;">the design, production, and consumption of clothing in a manner that respects the planet and the people who make our clothes.</p> </div> <p>Eco-friendly: refers to products that have been manufactured in a way that has not harmed the environment.</p> <p>Circular Fashion: refers to a cycle in which resources are continuously cycled in various forms, following a reuse and recycle loop. These resources, therefore, do not go to waste.</p>

	10 mins	<p>Ethical: fashion that aims to reduce the negative impact on people, animals, and the planet. Producing an item of clothing involves design, labour, and materials. Ethical fashion is kind to the planet and people every step of the way: from seed to garment.</p> <p>Fast Fashion: used to describe clothing designs that move quickly from the catwalk to stores to meet new trends. Fast-Fashion is often created as cheaply and quickly as possible, meaning that clothes are often crafted with poor quality and garment workers are often subject to dangerous and unfair working conditions.</p> <p>Sustainable: capable of being sustained. Harvesting or using a resource without depleting or permanently damaging the resource. Meeting our own needs without compromising the ability of future generations to meet their own needs.</p> <p>Upcycling: Upcycling, also known as creative reuse, is the process of transforming by-products, waste materials, useless, or unwanted products into new materials or products perceived to be of greater quality, such as artistic value or environmental value.</p> <p>Zero-waste: Zero Waste is a set of principles focused on waste prevention that encourages the redesign of resource life cycles so that all products are reused. The goal is for no trash to be sent to landfills, incinerators or the ocean.</p> <p>source: https://www.swapociety.co/blogs/all/sustainable-fashion-dictionary</p> <p>The learner will reflect:</p> <ul style="list-style-type: none"> - Think about your own closet. How do your fashion-related habits influence the environment? Would you say that your habits are eco-friendly? Why or why not? - Now think about your design. How does your design incorporate some of the information you learned? - How is your design sustainable? Can it be worn more than once? Is it a fast fashion item? How long can someone typically keep it? - What material will you use? What are some examples of sustainable material? Learner will research. Suggestions: paper, natural fabrics like cotton, wool etc. - Look at the table you created on day 1. Do you think these clothing items are sustainable? Why or why not? Do any of the terms you just learned - fast fashion, upcycled etc. - apply to your clothes? <p>Learners will imagine and draw the lifecycle of their product. How does it start (by using sustainable materials) and how long does it stay in use until is it</p>
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discarded? What happens to it at the end? How can we discard it in a way that does not hurt the environment? Can we reuse it? An example is shown below:

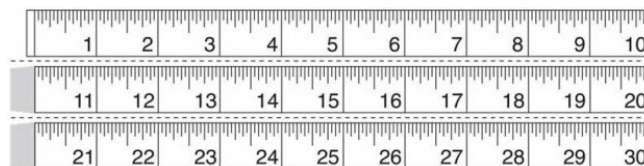


source: https://twitter.com/scgreen_home/status/494230403343847424

20 mins

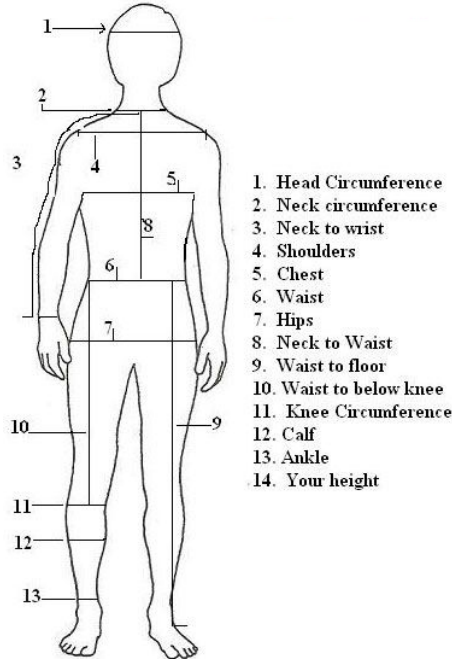
Next, the learner will create a sketch of their design using scaled measurements:

- The learner will think about how they can take the measurements of a real person. What tools around you can you use?
- The learner can come up with their own tool or technique or create a do-it-yourself paper measuring tape using a ruler or any small object that can be used to ensure an equal distance between the numbers. The learner can make several strips of measuring tape and glue them together to make a long measuring tape of about 150 cm



- The learner will then decide whom the design is for and take the measurements of that person (it could be a friend, sibling, or the learners themselves). The learner must measure the following for a dress: height, shoulders, arm length and circumference, chest. For skirts, measuring the waist is also important. For pants, measuring the waist, hips, and circumference of the thighs and legs is important.

- The learner will draw a silhouette and write down the measurements in centimeters and inches for the relevant parts. An image has been provided below as an example:

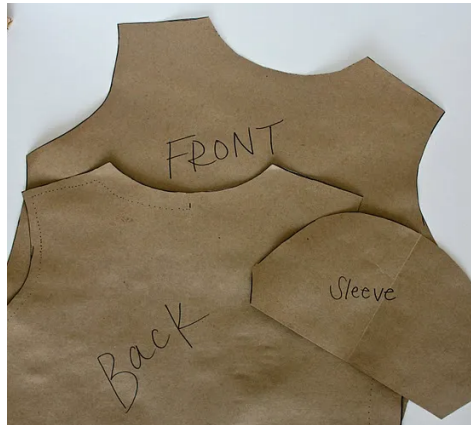


source: <https://www.pinterest.com/pin/121034308713302645/>

- The learner will then scale the measurements down to reasonable numbers that they can use to sketch their design. For example, a scale factor of 10 can be used so that if the actual measurement is 150 cm for height, on the sketch it is 15 cm.
- The learner will sketch their clothing item according to the scaled down measurement and write the scale ratio and add designs to the clothing item. Example:

		<div data-bbox="860 262 1117 892" data-label="Image"> </div> <p data-bbox="565 898 948 919">source: https://www.alhashmithobes.ca/size-chart</p> <p data-bbox="467 955 1386 1060">Optional: learners can conduct an investigation in their homes or neighborhood to identify the degree to which sustainable practices are being applied:</p> <ul data-bbox="516 1066 1403 1276" style="list-style-type: none"> - They can create a survey and share it with members of their family and community. It can include questions on how they buy and discard clothes (and how frequently that is done), whether they repurpose old clothes etc. - Learners will collect the surveys and analyze and share the findings with their family or class
3	20 mins	<p data-bbox="467 1318 1003 1350">Today, learners will bring their designs to life!</p> <p data-bbox="467 1388 1403 1493">Learners will explore their environment to identify material they can use to create their clothes. They should prioritize using any previously used clothes or material they discovered on day 1 (this is called upcycling)</p> <ul data-bbox="516 1499 1386 1885" style="list-style-type: none"> - Learners should try to repurpose their existing clothes for this or use scrap fabric from old sheets, towels, rags etc. that are not being used. They can also ask their parents, siblings or neighbors for their old clothes. These must be washed and dried before use. - Learners can instead use paper or napkins if no unwanted clothes or materials are available. If they choose to do this, they will create a model of their design for a doll so that they do not waste large quantities of these materials - The learner will think about the properties of the material and what makes it sustainable and note down observations in a notebook. For example: cotton is a natural fabric that can disintegrate naturally

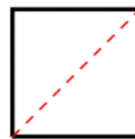
	<p>40 mins</p>	<p>without harming plants and animals when discarded. It is also durable and can last several years if maintained well.</p> <p>Once the learner has decided on the material, the next step is to create the different parts of the item in order to then bring them together as one piece of clothing. How do you think this is done (for example, for a t-shirt)? What are the different parts and how are they brought together?</p> <p>The learner will reflect and answer on their own after which the educator can provide the example of a thobe, which is made of the following three parts:</p> <div data-bbox="787 661 1079 1092" data-label="Image"> </div> <p>After a tailor makes each part separately, they are then sewn together to make a thobe.</p> <p>The learner will divide the item they sketched into different parts to be made separately as shown above. Next, they will think about what is needed to create each piece:</p> <ul style="list-style-type: none"> - Imagine what each piece looks like as a piece of cloth or paper (before it becomes the final piece as we know it). For example, notice how the sleeves looked before being attached to the bodice of the shirt below: <div data-bbox="568 1507 1356 1843" data-label="Image"> </div> <p>source: https://www.itsalwaysautumn.com/free-raglan-tee-shirt-sewing-pattern-womens-size-large.html</p>
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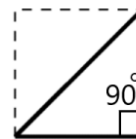
source: https://makezine.com/2011/07/23/how-to_make_your_own_sewing_pa/

- Draw the outline for each part as shown in the examples above and cut out the individual parts
- If you are using a large piece of fabric, you can place an old t-shirt, dress etc. on the fabric and trace its outline to get an estimate of your measurements
- To create sleeves, we need to know the circumference of the arms as well as the length of the arms. Use your measuring tape to find out these details or use your old t-shirt or dress for an estimate.
- To create a v-neck or collar, learners must ensure that the opening of the neck area forms a 90 degree angle in order to have enough neck room. In order to get a 90 degree angle, learners can cut a piece of paper so that it makes a perfect square (equal sides). Then they can fold it in half diagonally as shown below and use the perpendicular lines (lines that intersect at a 90 degree angle) to create their v-neck or v-shaped collar:

Original paper



Folded right-down



- Remember, depending on how elastic your material is, you may need to make each piece bigger than the actual measurements so the person wearing it is able to move freely.
- If you are using paper or tissue paper and making the item for a doll, remember to use smaller measurements

Next, learners will put all the pieces together by sewing, gluing or taping them depending on the material used. They can add any final designs or touches.

4	40 mins	<p>Today, learners will determine the price of their item and present their final design</p> <p>Learners will now think about how they can market and sell their product. Selling clothing items for money is a great way to ensure that your design business is sustainable.</p> <ul style="list-style-type: none"> - First, determine the total cost of producing the item. This will include the cost of the materials and any help you received making it. For example, if 5 meters of cloth used cost \$0.23 per meter, the total cost of materials is \$1.15. Let's say the cost of the sewing equipment used (needle, thread, buttons etc.) was \$5 and you paid your brother \$2.5 per hour for 10 hours to help you take measurements. The total cost is then $1.15 + 5 + (2.5 * 10) = \\31.15 - Find the cost per unit (meter, cm etc.) of your fabric by asking a local tailor or an adult like your parents, neighbors etc., or by looking at price tags in your local market. - After you calculate the total cost, add a markup. When you buy something, you are not giving the seller the same amount it cost them to make the item. The price you pay includes an additional amount that sellers add so that they make a profit. When you divide the profit by the cost, you get the markup, which is how much we are making compared to the cost. If you sell your thobe for \$100 and it cost you \$60 to make it, your profit is $100 - 60 = 40$ or $40/100 * 100 = 40\%$, but your markup is $\text{profit/cost} * 100 = 40/60 * 100 = 66.67\%$ <div style="text-align: center; background-color: #f0f0f0; padding: 10px; margin: 10px 0;"> $\text{markup} = \frac{\text{profit}}{\text{cost} * 100\%}$ </div> <ul style="list-style-type: none"> - Using the formula above, add a markup on your total cost so that you are making \$5 profit. What is the selling price? What do you think is an ethical markup on the cost? - On a poster, write the following details: <ul style="list-style-type: none"> - Item description (what it is, what it is used for, how it was made, what makes it sustainable) - Price - include markup expressed as a percentage - Price in at least two currencies. Find the exchange rates for today by asking an adult, looking at the newspaper etc. For example, 1 Qatari Riyal = 3.64 US Dollars
	20 mins	<p>The learners will present their product and describe:</p> <ul style="list-style-type: none"> - The clothing item, its concept, uses and sustainability of both the product and their business as a designer - The product life cycle

	<ul style="list-style-type: none"> - The cost and price of making the product - their reflections and one lesson they learned about fashion and sustainability (what does this mean for their shopping habits and how does this influence their relationship to the clothes they currently own) - One fashion-related change that the learner and/or their family will commit to in order to reduce wasteful habits <p>Parents/classmates will provide the learner with feedback on the product. The learner will make changes to the design, concept or price based on feedback received to improve their product. Learners can also make a poster to market and promote their product and share it with the family.</p>
Assessment Criteria:	<ul style="list-style-type: none"> - Critical thinking and creativity displayed in the identification of the concept and function of the clothing item and selection of the material - Accurate measurements and scaling. Correct identification of the ratios and scaling factors - Critical thinking applied in ensuring sustainability of the item and developing the life cycle - Creativity of the design of the clothing item

Learning outcomes:	<ul style="list-style-type: none"> - Understanding the role of clothes and their functions - Understanding the impact of fashion on the environment - Understanding the role of mathematics in fashion design - measurements, areas, angles, profit, markups etc. - Holistic understanding of sustainability from production to retail
Required previous learning:	
Inspiration:	https://www.hmhco.com/blog/math-meets-fashion-mathematics-in-fashion-design
Additional enrichment activities:	<ul style="list-style-type: none"> ● Learners can explore the importance of repairing clothes instead of purchasing new ones and can attempt to repurpose or repair an old piece of clothing to appreciate the benefit of this practice on the environment as well as on household budgets. ● Learners can visit a local landfill or talk to local waste management workers/companies to understand and report on the prevalence of clothes in landfills or the ways through which fast fashion impacts the environment
Modifications for simplification	<ul style="list-style-type: none"> ● Learners can eliminate the markup portion and focus on profit margins ● Learners can limit the final product to a 2-D sketch of the product if materials are unavailable