# Transcript

## Textiles and Design: Properties and performance of textiles

**(Duration 32 minutes 21 seconds)**

(soft music)

Hello everyone, and welcome to the Textiles and Design HSC Hub.

I'd like to start off by paying my respects and acknowledging the traditional custodians of the land which this meeting takes place and also pay my respects to elders both past and present.

So, the main focus of this HSC Hub is, Textiles to enhance performance. This comes under the area of study for the HSC of Properties and performance of textiles. So content throughout this presentation is going to be based on content from the Area of study of Properties and performance of textiles.

Some key points to keep in mind when we're looking at the content of here. Within the HSC exam in Section II, there is three short-answer questions. These questions will be based each on, each of the three areas of design, design, the properties and performance of textiles and Australian textile, clothing, footwear and allied industries.

Each of these three questions is worth eight marks, and though each of those questions will be broken up into parts like a, b, and c.

Section III of the HSC exam will be based on two questions, and it's based on the area of study of design, and the area of study, properties and performance of textiles. Each of these questions is worth eight marks and you have to answer both of these questions in Section III.

Now, questions in this exam will be drawn on your knowledge, especially for properties and performance of textiles, will draw from your knowledge of fibre, yarn and fabric that you covered in year 11, as well as year 12.

The content that you covered in year 11is assumed knowledge, so it is important that you refresh your knowledge of properties of fibres, yarns and fabrics and use the terminology that you learned in year 11.

Having a look at past HSC papers which are available on the NESA website. Some of the feedback from the markers are that students should try and avoid generic statements when answering questions. That means that you should refer your information that you were writing, back to what the question is asking you. Don’t just put all of your knowledge down on a piece of paper, make sure that you are answering the questions specifically.

In better responses, students are able to demonstrate their understanding of properties of fibres, yarns and fabrics relevant to the specific end use listed in the question. So you should be able to draw relationships between the properties of fibres, yarns and fabrics and the performance of the required products at the end.

We're just going to have a look and refresh ourselves of the terminology that we used in year 11.So when referring to the properties of fibres, yarns and fabrics, we should be discussing aesthetic properties, durability, the comfort and care of these fibres, yarns and fabrics. It's very important that you use this terminology to show your knowledge in this content area. It’s also very important that you reacquaint yourself with the different properties of fibres relevant to the different end uses.

We know that there are three different types of yarn structures: A staple spun yarn, which is weak, it has poor lustre and is quite absorbent. We have a monofilament which is a single filament extruded yarn, which is quite fine and strong. It has good lustre but it is not absorbent. And then a multifilament yarns, which is multiple monofilament yarns twisted together, it's very even and strong, has slightly elasticity, and it's a little bit absorbent. And so it's important that if the HSC exam asks you a question regarding yarn structures, that you use one of these terminologies in your answer.

We know that there are three types of fabric structures, woven, knitted and non-woven. And it would be good to brush up on the different types of fabrics within each of these three areas and know the properties and characteristics of each of these fabrics.

Again, because HSC questions will ask you to make a recommendation of a fabric structure. And you should be able to use the correct terminology when answering your question, stating what properties are suitable for the end use asked for, in the question.

Moving on to HSC content in properties and performance of textiles. The syllabus states that we should look at fibre, yarn and fabric innovations.

For fibre innovations. We’re going to look at microfibre. So microfibre by definition is a fibre that is less than one denier thick, so denier is how we measure the width of fibres.

Microfibres are made by modifying the spinning process or altering the way the fibre is extruded through the spinneret heads. The most common type of synthetic material that microfibre is made from is polyester, but it can use nylon or other different types of polyamides as well to produce a microfibre. Obviously, depending on the end use of the fibre, will determine how and what it is produced with.

This is a cross section of a microfibre. So the cross section here is, no larger than one denier across. To put that in perspective, cotton fibres are usually 1.6 to two deniers thick. So this is quite a lot smaller than a single cotton fibre. So this cross section is known as a split microfibre and this was the original development of microfibre back in the 1970s. Because of the high surface area, because of all of the different cross sections and cut-outs, it's highly absorbent, and was manufactured for cleaning cloths originally.

Microfibre is also produced as a flat microfibre. It's very smooth and thin. It's comparative to silk in that it's very thin and very lightweight.

Microfibres can vary in properties depending on what the fibre is created from, whether it's your polyester or nylon or different polyamide.The qualities of microfibre can change depending on whether it's a flat or a split fibre as well. The main properties of the microfibre are that it's really fine, very lightweight, and it's very soft and comfortable. It has a very good handle and high drape because it is so fine and it's very absorbent.

Now as a flat microfibre is so thin, it can be woven really tightly together and therefore can insulate really well and then be water resistant, which is opposite to the split microfibre which is highly absorbent.

There are many uses of microfibres. Some areas of use include apparel, such as sportswear and active wear, hosiery, blouses and ties. Microfibres are also used in furnishings, including curtains, sheets and blankets. And the main area that we know of microfibres are in cleaning cloths.

Now these are examples of microfibre cleaning cloths [holds up three fabric squares], and you can tell if you place the cloth flat in your hand and put your hand, rub your hand over the surface very gently, it tends to stick to your skin. That's because of the high surface area of the fibre, and that's what traps to, in particles and absorbs all of the water.

These microfibre cleaning cloths have been marketed as environmentally friendly because it reduces the need or removes the need completely for the use of harmful cleaning chemicals as it will absorb a lot of water and take a lot of the bacteria away with it.

Now the impact of this microfibre on society, the manufacturer employees and the environment is varied. So because the microfibre is lightweight, and has a soft handle, it's very comfortable for bedding and homewares. And because of the high drape it works well in blankets and for curtains.Because the flat microfibre can be woven so tightly together, it's good for outerwear and sportswear in that it can be water resistant and wind repellent, wind resistant.

Because it's made from a polyamide mixture that's extruded, it can be dyed in a variety of colours as well. Because it can be made from a variety of different polyamides, the fibres can be engineered to meet specific end uses.

Now, because of that need for higher skilled jobs, the pay for workers should be increased, but then that can lead to increased cost for consumers, which is a disadvantage.

An advantage for the environment, as we said, is that it doesn't require the use of harsh chemicals and cleaning as it picks up all of the dirt, debris and most of the bacteria on surfaces.

Some of the disadvantages include that it can be expensive to purchase, and the fibre may not be as comfortable to be worn as other fibres, especially if it's so tightly woven, the fabric doesn't breathe, making it less comfortable for the wearer.

Another disadvantage is that the production of microfibres use a lot of energy and can emit pollution, both during production and the transport of items. Some research has suggested that microfibres are released during the washing process and then carried through our waterways and then affect our wildlife and our natural ecosystems in the water. So more research is being carried out on this, but consumers who are conscious and environmentally aware are turning away from purchasing microfibres as they concern the impact that they have on the environment.

Next we're going to look at innovations in yarn, and we will be looking bicomponent yarns. A bicomponent yarn consists of two filaments that are chemically or physically different. They are produced from two types of polymers, are extruded together through a spinneret.

All right, it's very important that you mention when discussing bicomponent yarns that they're extruded together. They're not two different yarns or fibre blends twisted together, they're extruded together to form one single yarn.

They can be extruded in a number of different ways, including side by side extrusion, core and sheath extrusion and biconstituent fibre extrusion. Complex cross sections can be created using a spinneret with different shape holes, different shapes outsides, which then produces a range of different shaped yarns, which are then suitable for a range of different applications or end uses.

These are images of cross sections of bicomponent yarns. So, we see side by side extrusion [circle split centrally], a core and sheath extrusion [circle with a smaller circle inside] and a biconstituent extrusion [circle containing multiple smaller circles]. So depending on how the yarn is extruded and the two different filament, if it's either physically or chemically different fibres used, it will change the end use of the product.

So bicomponent yarns can be soft, they can be light or medium weight, they are usually quite durable and abrasion resistant. So, due to the use of two different filaments, even though they're extruded together, the yarn could have increased stretch or they could crimp up because if they're two different filaments are extruded together and one shrinks with heat, it will produce a crimped effect on the final yarn.

Because of the range of different production methods of bicomponent yarns, they have many and varied uses. Some of these uses include apparel such as hosiery, knitwear, and baby wear. All furnishings such as cushion covers, upholstery and floor coverings. Bicomponent yarns are quite often used in industrial fabrics because they can be quite strong and manufactured to suit a variety of needs.

Advantages of using bicomponent yarns include the fact that they could have increased strength or stretch. They can be quite quick to produce and the cost to consumers can be reduced especially if using a core and sheath extrusion method, only the outer layer needs to be coloured or dyed. Therefore, less dye needs to be used making the end product cheaper.

Another advantage is that, if the manufacturer knows the end product, they can specifically design the yarn for the end to use. Now because of the method of production there is a need for higher skilled labour again, increasing the wages of these workers but then this can have a flow and effect in making the end product more expensive for the consumer. A lot of these bicomponent yarns can also be reused and recycled, melted down and reused again.

Some of the disadvantages include, the bicomponent yarns aren't aesthetically pleasing, especially in long garments where you're seeing a lot of the fabric. The production methods can be expensive to set up, and the use of bicomponent yarns can reduce the need for other yarns or natural fibres, which can be a disadvantage for those producers. As with any textile products, the manufacturing and transport of goods can produce pollution that uses energy and can affect workers so that is another disadvantage.

Moving on to fabric innovations we will be looking at washable webs. A washable web is a non-woven fabric and it's produced using natural or synthetic fibres, and these fibres are then bonded together with heat or adhesives. It's a strong non-woven fabric, and it can be reused without ruining the structural integrity of the fabric.

Whereas a lot of typical non-woven-fabrics can't be washed. A washable web can be placed in water, time and time again without destroying its integrity. It doesn't have a long lifespan, but it can be reused for multiple applications.

Washable webs can be designed for specific end uses, and depending on their end use will determine how thick or thin the washable web will be. Like other non-woven fabrics, washable webs don't fray. They're quite durable and they are abrasion resistant. They are highly absorbent and can withstand lots of water applications, which makes them suitable in cleaning products.

So talking about cleaning products, we have a washable web, cleaning cloth [holds up a roll of cleaning cloth], which is quite thin, but can be washed and placed into water and used multiple times before it needs to be thrown away. Other washable webs are used in clothing, in interfacing and also in padding, in thicker clothing.

Washable webs have been designed and manufactured and are used in nappies, filters, tea bags, and the environmental shopping bags, the reusable shopping bags.Some washable webs are treated with a special finishing product as well, making them suitable for use as medical textiles. We're seeing a lot of washable webs at the moment being worn as face masks.

Advantages of washable webs are that they are relatively cheap to produce and they do not fray. They have many applications and are suitable for use in cleaning products and medical environments. Some disadvantages include that they don't have a very long lifespan like traditional fabrics, they're not very durable. And because the way that washable webs are manufactured, many manufacturing processes utilize CAD and CAM manufacturing, rather than people for their labour.

So a disadvantage is that people have lost their jobs or manufacturers aren't employing as many people to produce these fabrics. Another disadvantage is because they don't have a long lifespan, washable webs will eventually end up in a landfill because they cannot be recycled.

Machinery to improve construction and, or save time within the textiles industry. Even small businesses today are able to use technology to speed up their production, to manage their stock inventory, to liaise with clients or manufacturers, and to reduce their production costs.

Textile items can be designed locally and then communicated to manufacturers overseas, where they can be produced at a much cheaper cost than they would be if they were produced here.

Many designers use graphic systems to design prints for fabrics or patterns to be cut out, which then saves time and money. It is important to know the difference between CAD and CAM systems. So CAD stands for Computer Aided Design whereas CAM stands for Computer Aided Manufacture. It's very important to differentiate between the two and do not use the terms interchangeably, they mean different things.

Computer Aided Design is just that, it helps to design an end product, it has nothing to do with the making of the products. Computer Aided Manufacturing, is then the use of computers and technology to make the textile items.

Some of the different systems used in textile production include pattern making systems. So patterns used to be drawn by hand, but as now they can be manipulated via computer. Most pattern making companies will start with a basic pattern block and work from there, rather than sketching patterns out by hand. The pattern making system goes hand in hand with the grading and marking system. So, grading and marking is the adjusting of patterns for different sizes.

This used to be a very complex process done by highly trained individual, whereas now it can be done with a few clicks of a button. The original pattern can be then produced into a range of sizes or with computer generated information.

Automatic cutting systems allows the electronic pattern to be transferred to fabric and cut out via machinery.So this machinery is computer controlled. It uses an electronic cutter, and cuts the pattern just in the same way a printer would print a design from a computer.

Garment distribution on the sewing floor looks at the more efficient ways to move garments from person to person who is piecing together the garment or the item. This process used to be done by passing garments from person to person. Bigger manufacturers now have automated systems of rollers, or little machines moving garments from person to person. They now keep track of each piece of these garments or textile items using barcodes or QR codes rather than handwritten notes that could be lost or misinterpreted making the information much more accurate.

Some other technology that is helping to improve the production of textiles include computerized sewing machines. These are just like the at-home embroidery machines or sewing machines that you probably have seen in shops or you might even have at school. These computerized sewing machines, they save time, which in turn saves money for the manufacturer making items cheaper for the consumer.

3D body scanning allows consumers to be scanned for their precise measurements to be taken in store. These measurements can then immediately be transferred to the manufacturer. Then the manufacturer interprets those measurements to produce a well-fitting garment for the client.This saves the client both money and time.

Seamless technology makes use of knitting machines that produce items without seams. An example of this is the Chesty Bond singlet, in that it doesn't have any side seams making it much more comfortable for the wearer.

Decorative techniques to enhance design. The syllabus states that we should look at digital imaging and digital printing techniques. There are a range of different technologies and techniques for digital printing onto fabrics. Some of these include digital image transfer, which we generally refer to as heat transfer printing, direct to digital printing, and sublimation.

Digital imaging techniques, use the latest computing software, so different graphics software, depending on what the designer is comfortable using, and then it transfers those designs onto the fabric either via a medium or straight from the printer onto the fabric.

A digital image transfer, also known as the heat transfer, is the process where an image once designed on a computer, is printed onto special transfer paper.This transfer paper is then placed on top of pre-washed fabric and then heat pressed into place. So the heat then transposes the image from the paper onto the fabric.

Digital image transfer leaves the transfer sitting on the surface of the fabric, so it's not really suitable for large quantities of fabric for design. It's usually used domestically to apply designs to T-shirts or bags, even baseball caps.

It's quite easy and can be done just using a basic home ink-jet printer, but the transfer paper can be quite expensive. Therefore isn't really suitable for mass production. The digital image transfer that's been heat pressed onto the surface of a garment can change the feel and handle of the fabric, therefore it's not suitable for large designs.

Direct digital printing refers to the process of directly printing onto special coated fabric. Now this makes use of ink-jet technology. Reactive dyes are used and are printed onto natural fibres, while dispersed dyes are used and printed onto polyester fabrics.

These fabrics have to have a special coating on it for the dye to be able to penetrate.

Direct digital printing requires specialist machinery. Therefore, it's really only used in textile industries rather than for at home purposes. Direct digital printing can be done on large bolts of fabric. It does take a lot of time and a lot of preparation. It requires a special finish to be applied to the fabric first, then the printing of the dye.

Direct digital printing is used to manufacture the large advertising banners that you might see hanging from lampposts or overhead bridges for example.

Sublimation is the process of changing a solid substance directly into a gas. It bypasses the liquid stage. So for textiles applications, this basically means that heat activated inks are pressed using pressure and heat straight onto the fabric. So this allows the dye to penetrate straight into the fabric rather than sitting on top of the surface of the fabric, and this provides the fabric with a better feel and handle.

Sublimation is a quicker process in that it doesn't require the fabric to have a special finish applied to it first. Sublimation does require the use of large and expensive machinery, and therefore is expensive in setup, but in long term is one of the cheaper alternatives.

The impact of digital printing technology, is that there are more environmentally friendly option than traditional dyeing methods, as they have minimal waste may use a lot less water than traditional dyeing methods.

Digital printing also allows for a full range of colours and images to be transferred onto the fabric or end textile products.

Digital printing has also changed the nature of work within the textiles industry, more graphic designers are needed than labourers, to actually produce the end product. Because the need for graphic designers, there are more skilled worker, they have to be paid more which then increased the long term costs of the item.

Now it's important when choosing which printing method to refer to, but you consider the end use of the textile item. If you're talking about applying and design to a bag that you will be selling at a market, heat transfer printing would be suitable. If it is for,800 metres of fabric to produce a range of maxi dresses, sublimation printing would be much more suitable and much more cost effective.

Finishing techniques to enhance fabric performance. There are a range of different finishing techniques that can be applied to fibres, yarns and fabrics. These finishing techniques will obviously be determined by the end use required of the textile item.

Some finishing techniques include crease resistant finishes, soil or stain resistant finishes, and the application of chemicals to make the garment and easy care item. A finishing technique such as water repellent or flame retardant can be important depending on the end use of the textile item. Antimicrobial finishes can also be used, and they are usually applied to textiles used in the medical industry.

The syllabus for textiles and design states that you should investigate two innovations in finishing techniques. One of them should be soil resistant finish. So soil resistant finish is a fluid chemistry process, such as scotch guarding or teflon. So it's important that you have a solid understanding of that process and another that you could refer to in the exam.

The HSC exam will always ask questions that require you to refer your knowledge back to the end use of that particular textile item. It is very important that although you do show your knowledge and understanding of the properties of the fibres, yarns and fabrics that you're referring to, that you link that knowledge back to the intended end use and purpose of the textile item.

Up next is a HSC style question taken from the 2019 Textile and Design HSC exam.

[Part a. What properties make bicomponent yarns suitable for school tights?   
Part b. Describe how one innovation in fibre technology has benefitted the environment.  
Part c. Explain how a polyester weave fabric achieves the functional properties required for an overnight bag]

Feel free to pause the video and respond to the questions and then click through to the next part of the video with a suggested response from NESA for this question has been answered and compare your answer to the suggested response.

[Suggested response  
Part a) Properties such as good durability allow for constant use. Increased stretch and recovery provide good fit. Softness and bulkiness provide comfort and warmth, making bicomponent yarns suitable for school tights.  
Part b) Bamboo is a fibre technology that benefits the environment. Growing bamboo can restore degraded land and protect against soil erosion. Its cultivation requires little water or pesticides that can leach into the environment. Bamboo is a regenerated fibre that is biodegradable in both soil and sunshine which reduces waste and landfill.  
Part c) An overnight bag in a polyester plain weave fabric would provide outstanding durability due to polyester’s excellent strength, abrasion resistance and dimensional stability. Polyester’s poor absorbency allows it to repel water. The smooth surface created by a close plain weave makes the bag water resistant and helps to keep the contents dry. The plain weave used in the handles and shoulder straps will provide comfort for the user]

(soft music)

This is an extended response question taken from the 2019 Textiles and Design HSC exam, it is worth eight marks. It is expected that you read and answer the question. Pause the video and attempt to answer this question, and on the next slide is the suggested response. Compare your answer to this suggested response.

[Justify the selection of a fibre, fabric structure and fabric finish for a textile fabric that can be used to cover the seats on public transport.

(soft music)

[Wool/nylon could be used. Nylon is strong, absorbent and inexpensive. The seats would be easy to keep clean because nylon is less likely to absorb spills due to its hydrophobic properties. It can be made comfortable by means of texturizing the yarns or being woven into a pile weave which also improves its absorbency and comfort. Wool is resilient and flame retardant. When combined, a wool/nylon blend is suitable as wool is naturally flame retardant and nylon will improve the durability of the blend. A suitable dinish that can be applied to a wool/nylon fabric is a soil resistant finish. It provides a barrier to protect the fabric from dirt and residue. A dense low cut pile weave resists staining as there is no flat surface. The pile weave hides stains so the fabric can appear clean even when it isn’t. A pile weave provides a raised surface that can aid comfort, and the lack of loops in the cut pile means that the fabric will not snag, so keys and bags will not damage it. The cut pile provides a velvet finish and maintains a luxurious look. The pile fabric can also be woven into intricate patterns, making it possible to produce individual and bespoke designs.]

Some other information for Textiles and Design in 2020. NESA has released information regarding the marking of the major textiles project for 2020. There has been some changes made to the way your major textiles projects will be marked. Your textile item will be marked at school by your classroom teacher.

The supporting documentation, your folio, will be submitted as usual for external marking. As always, the supporting documentation will be limited to 24, A4 pages or 12, A3 pages, printed on one side only. As always, it is important that you choose an easy to read font. It should be the equivalent of size 12, Times New Roman.

One of the major changes this year, for the supporting documentation is that you may submit images of your project. You can submit up to six images on four, A4 pages or two, A3 pages. These images can have simple annotations and should be positioned at the beginning of the folio. It is important to note that these images and these pages won't be marked, they're simply to provide some information to the marker who is looking at your supporting documentation. Further information on this can be found on the NESA website.

Thank you for joining me, if you have any further questions always ask your teacher. They are the point of knowledge in your classroom and good luck with your major textiles project in HSC exam.

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