Clothing and Textile Technologies

Unit: Communication and Technology Communication Skills

Problem Area: Using FCS Technologies

Lesson: Clothing and Textile Technologies

Student Learning Objective.

Instruction in this lesson should result in students achieving the following objective:

Identify clothing and textiles technology trends.

Resources.

The following resources may be useful in teaching this lesson:

E-unit(s) corresponding to this lesson plan. CAERT, Inc. http://www.mycaert.com.

"5 Technology Trends Transforming the Fashion Industry," *Launchmetrics*. Aug. 22, 2019. https://www.launchmetrics.com/resources/blog/5-technology-trends-transforming-the-fashion-industry.

"9 Futuristic Clothing Technologies Available Now," *YouTube.* Accessed Aug. 22, 2019. https://www.youtube.com/watch?v=pB_IbQk0rGY.

Boxall, Andy. "Today we carry technology. Tomorrow we'll wear it." *Digital Trends.* Aug. 22, 2019. https://www.digitaltrends.com/features/dt10-today-we-carry-technology-tomorrow-well-wear-it/.

Dharmar, Aruna. "What is CAD-CAM in Fashion Industry?" *Style2Designer.* Accessed Aug. 22, 2019. https://style2designer.com/pattern-cutting-cad-cam/cad-cam/.

Hu, Jinlian, Editor. "*Computer Technology for Textiles and Apparel*," 1st ed. Woodhead Publishing, 2011.

Islam, Mayedul. "Why CAD And CAM Technology Is Important In The Textile and Apparel Industry?" *GMerchandising*. Accessed Aug. 22, 2019. http://www.garmentsmerchandising.com/cad-cam-technology-textile-apparel/.

"Wearable Technology Could Be The Future of Fashion," *YouTube*. Accessed Aug. 22, 2019. https://www.youtube.com/watch?v=VTyzSaHOLDU.

"What CAD Software Do Fashion Designers Need to Know?" *Pick Glassm*. Accessed Aug. 22, 2019. https://pickglass.com/cad-software-fashion-design/.

Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and internet access
- ✓ Classroom resource and reference materials

Key Terms. The following terms are presented in this lesson (shown in bold italics):

- 3D printing
- computer-aided design (CAD)
- computer-aided manufacturing (CAM)
- clothing and textile arts
- digitizing
- digitizing tablet
- e-textile
- embroidery
- embroidery machine
- flatbed scanner
- grading
- jump drive
- JPEG
- pen drive
- robot
- sewbot
- smart clothing
- software
- technical textiles
- technology
- textile
- thumb drive
- USB flash drive
- wearable technology

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *Divide the class into small groups to brainstorm ways in which technology has become a part of their lives at home and at work. One student from each group serves as the recorder and records the items for all to see (e.g., board, flip chart, projection device, poster board, etc.). Another student group member reports the findings to the class. The poster boards from each group may be displayed. Create a tally of all the technologies listed by the class.*

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective: Identify clothing and textiles technology trends.

Anticipated Problem: What is technology? What are the clothing and textiles arts? How is technology changing the clothing and textiles arts?

I. Clothing and Textile Technologies

Technology is the application of specific mechanical or scientific knowledge for practical purposes. In other words, technology is the use of tools, devices, methods, and techniques to solve problems, or to enhance a product. The clothing and textile industry has embraced the latest computer technology.

A. TEXTILES: A ***textile*** is any woven, knitted, knotted, or non-woven fabric. ***Technical textiles*** are fabrics used for industrial purposes, often chosen for characteristics other than appearance. For example, technical textiles are used for bulletproof vests, tactical clothing, outdoor furniture, umbrellas and awnings, flags and banners, sports fabrics, etc. The ***clothing and textiles arts*** are the design, manufacture, and marketing of clothing, footwear, accessories, interior fabrics, and technical textiles. This includes weaving, dyeing, printing, pattern making, and sewing.

B. COMPUTERS: Computers in the textile and clothing fields are used for a wide variety of functions and tasks: apparel design, digital fabric designs, modeling and simulation, weaving, embroidery, cutting, sewing, defect analysis, 3D body scanning, etc. The Internet has enabled communication between designers, manufacturers, and marketers.

1. <u>Software</u>: ***Software*** is a set of instructions or programs that provides the information to direct the operation of a computer. Typically, the software comes with the documentation about how to install or how to use the software. Soft-

ware programs are used in clothing and textiles design, production, advertising, merchandising, marketing, etc.

a. ***Computer-aided design (CAD)*** is software used to create precision drawings, technical illustrations, or models according to specific industry or company standards. CAD can be used to create, modify, and enhance a design. CAD software increases the productivity of the designer while improving the quality of design. Most companies use a computerized grading process today with the use of CAD systems. ***Grading*** is the process used to increase or decrease the sample size, by using each company's own grade specifications, or rules. For example, a size 10 pattern would be adjusted to create larger sizes, 12, 14, 16, etc. and also smaller sizes, 8, 6, 4, etc.

b. ***Computer-aided manufacturing (CAM)*** is technology that uses computer software and machinery to facilitate manufacturing processes. The CAD application software can be directly imported into computer-aided manufacturing software (CAM) to create products. Manufacturing processes (such as spreading, cutting, and sewing) are made more efficient through the use of CAM.

2. *Flash Drive*: A ***USB flash drive*** (also known as, a ***jump drive***, a ***pen drive*** or a ***thumb drive***) is a portable flash memory device that plugs into a USB port. A flash drive allows materials or content to be transferred from the Internet. For example, in embroidery designs, flash drives are used to share embroidery designs for use on the embroidery machine. Data can be stored and retrieved from various locations.
3. *Scanner*: A ***flatbed scanner*** is an electronic device used to save images of existing documents/pictures/objects into a file for later use. Scanned images can be used with embroidery digitizing software, and other clothing and textile software programs.
4. *JPEG*: A ***JPEG*** is a compressed image or graphic file format. A technical sketch of a garment or project can be saved as a JPEG and imported into different machines.

C. TEXTILE TRENDS: Textile trends include embroidery digitizing, layout models, CAD/CAM, pattern software, 3D printing, wearable technology, and nanotechnology.

1. *Machines*: Machines can perform specific tasks, according to the directions given to them by the computer software.
   a. A ***robot*** is an automated machine that can perform basic fabric handling, and can "pick and place" materials.
   b. A ***sewbot*** a piece of equipment that executes direct stitching tasks with little distortion. Adidas owns a "speedfactory" in Germany designed to increase the pace of the supply chain. The company projects a speedfactory could produce 500,000 pairs of shoes annually.
   c. ***Embroidery*** is thread art (lettering, monograms, designs) that embellishes a garment, hat, or other clothing or object. An ***embroidery machine*** is a computer-driven machine that moves a pantograph (a part of the machine

that moves the hoop to form the pattern) with hooped items in various directions to form different stitches. These computerized sewing machines use microprocessors to embroider and make the small decorations. The digitized software program controls each movement of the machine. Embroidery machines can be single- or multiple-head tools with multiple needles per head. Embroidery and computerized sewing machines usually require training for the operator. These machines:

(1) Offer pre-programmed patterns and memory cards
(2) Allow patterns to be downloaded from the Internet
(3) Use a loop embroidery feature (on some high-end models)
(4) Create personalized products

2. *Embroidery Digitization*: ***Digitizing*** is a computerized process that converts artwork into a series of commands read by an embroidery machine's computer. A ***digitizing tablet*** is a CAD device used by the digitizer to plot needle penetration for embroidery designs. In short, a pencil sketch is enlarged and taped to the tablet. Then, the digitizer's mouse selects stitch types, shapes, underlay, and needle penetration.
3. *Layout Models*: CAD software (such as *AutoCAD* and *Digital Fashion Pro*) allows fashion and pattern designers to create layouts for garment and accessory pieces. A technical sketch of a customized garment is saved as a JPEG and imported into the CAD templates. The software allows the designer to see the design as a digital image, to scale (proportion) the pieces, and to set the dimensions on the computer. The software saves tailoring and altering time, and allows for colors and fabrics to be selected after viewing the virtual models.
4. *CAD/CAM*: These application programs are used to design products and to program various manufacturing functions. For example, *OptiTex*, a popular software program, offers solutions that cover the entire design process including:
   a. Product Development: *ODev* perfects garments before cutting or sewing.
   b. Production: *OPro* reduces material costs and waste during production, ultimately saving time, money, and resources.
   c. Sales Showroom: *OSel* allows online customers, buyers, and merchandiser to view and buy clothing with 360° photorealistic designs.
5. *Pattern Software*: Patternmaking software programs include *Gerber* and *Red Tree*. Industry pattern software helps decrease production costs by organizing the pattern pieces and sewing steps. Using an individual customer's body measurements, the software uses a 3D manikin to customize a garment's color and fabric.
6. *3d Printing*: ***3D printing*** is an additive manufacturing process that creates solid objects based on instructions in a digital file. 3D printers create fabrics, tiles, rugs, shoes, accessories, etc. by laying down successive layers of seamless material until the "fabric" is created. Many unique designs are found in high fashion, and in the printing of sports shoes. *Forbes* magazine predicted that 3D printing will be a $5.2 billion industry by 2020.

7. *Wearable Technology*: ***Wearable technology*** is electronics worn on the body as an accessory, or as part of a garment's fabric.
    a. An ***e-textile*** is the use of electronics in fabrics/textiles: sensors, batteries, LEDs, etc. E-textiles are not necessarily worn on the body. Some are fabrics for upholstery, window treatments, and other decorating tasks. Examples include activity trackers, Smart watches, and Smart clothing.
    b. ***Smart clothing*** is an adaptive garment that is connected to the wearer electronically. Smart textiles come in two types: aesthetic (visual, artistic) and performance enhancing. Aesthetic fabrics may light up or change color. Performance-enhancing textiles are often military- (bulletproof) or athletic-focused (reduce wind resistance or regulate body temperature). For example, smart clothing may sense when the wearer is warm and release chilled water vapor, or the clothing may sense when the wearer is cold and heat up accordingly. A wearable sock can use artificial intelligence to gauge an athlete's gait, in order to choose the most suitable footwear to minimize injury. A wearable heater, created by modifying Kevlar® fabric with nanowires, can conduct and retain heat (especially for joint injury and disease).
8. *Nanotechnology*: Nanotechnology (tasks at the microscopic level of individual atoms and molecules) treatments are coatings that cover individual fibers and threads. In terms of clothing and textiles, nanotechnologies have created water- and soil-resistant clothing, odor-less socks, and intelligent clothes that help individuals perform climate control.

> **Teaching Strategy:** *Many techniques can be used to help students master this objective. Use VM–A to illustrate examples of clothing and textile technologies. Use VM–B to illustrate technical textiles. Use VM–C and VM–D to illustrate examples of clothing and textile trends and to introduce the Lab Activity. Assign LS–A.*

- **Review/Summary.** Use the student learning objective to summarize the lesson. Have students explain the content associated with the objective. Student responses can be used in determining whether the objective needs to be reviewed or taught from a different angle. If a textbook is being used, questions at the ends of chapters may also be included in the Review/Summary.

- **Application.** Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Matching

1. h
2. f
3. c
4. a
5. b
6. d
7. e
8. g

Part Two: True/False

1. T
2. F
3. T
4. T
5. T
6. F
7. T
8. F

Part Three: Short Answer

Answers may vary but should include three of the advantages listed below. Embroidery machines:

1. Use microprocessors to embroider and make the small decorations. The digitized software program controls each movement of the machine.
2. Can be single- or multiple-head tools with multiple needles per head
3. Offer pre-programmed patterns and memory cards
4. Allow patterns and designs to be downloaded from the Internet
5. Use a loop embroidery feature
6. Create personalized products

Sample Test

Name _____

Clothing and Textile Technologies

Part One: Matching

Instructions: **Match the term with the correct definition.**

a. computer-aided drafting (CAD)
b. computer-aided manufacturing (CAM)
c. grading
d. robot
e. sewbot
f. software
g. textile
h. technical textile

_____1. Fabrics used for industrial purposes, often chosen for characteristics other than appearance

_____2. A set of instructions or programs that provides the information to direct the operation of a computer

_____3. The process used to increase or decrease the sample size, by using each company's own grade specifications, or rules

_____4. Software used to create precision drawings, technical illustrations, or models according to specific industry or company standards

_____5. Technology that uses computer software and machinery to facilitate manufacturing processes

_____6. An automated machine that can perform basic fabric handling, and can "pick and place" materials

_____7. A piece of equipment that executes direct stitching tasks with little distortion

_____8. Any woven, knitted, knotted, or non-woven fabric

Part Two: True/False

Instructions: **Write *T* for true or *F* for false**

_____1. Digitizing is a computerized process that converts artwork into a series of commands read by an embroidery machine's computer.

_____2. Embroidery machines require no electronic memory.

_____3. Smart clothing is connected to the wearer electronically.

_____4. CAD's accuracy saves tailoring and alteration time.

_____5. Patternmaking software uses a 3D manikin to customize a garment's color and fabric.

_____6. Nanotechnology treatments apply coatings, such as soil- and water-resistant coatings, to finished garments.

_____7. Wearable technology is electronics worn on the body as an accessory or as part of a garment's fabric.

_____8. 3D printing technologies have little application to clothing and textile products.

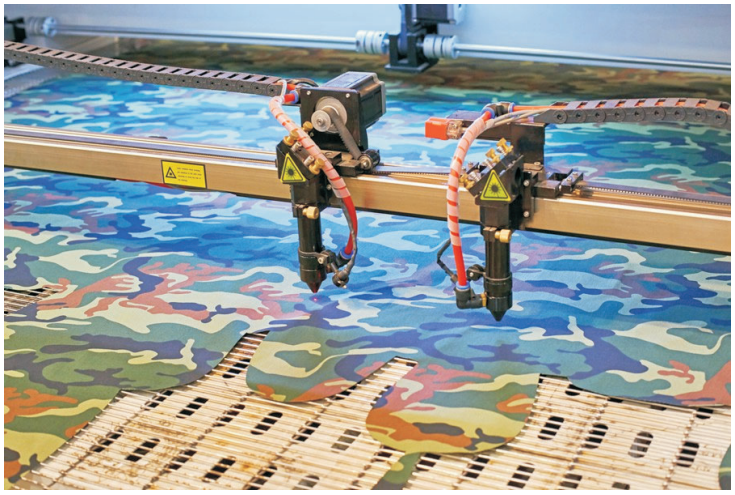
Part Three: Short Answer

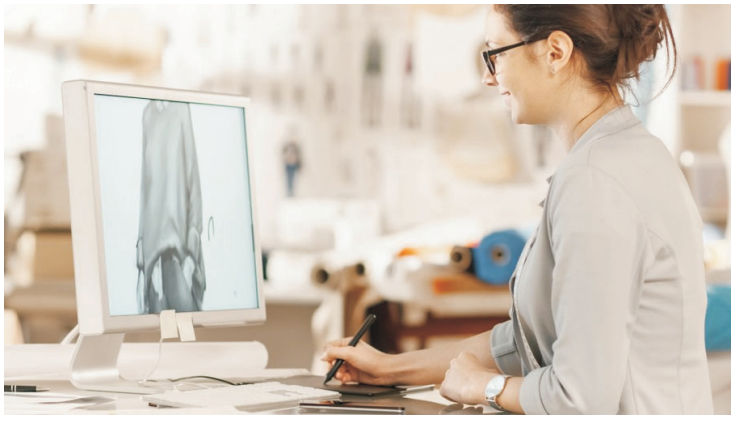
Instructions: **Answer the following.**

Name three advantages of an embroidery machine.

CLOTHING AND TEXTILE TECHNOLOGY

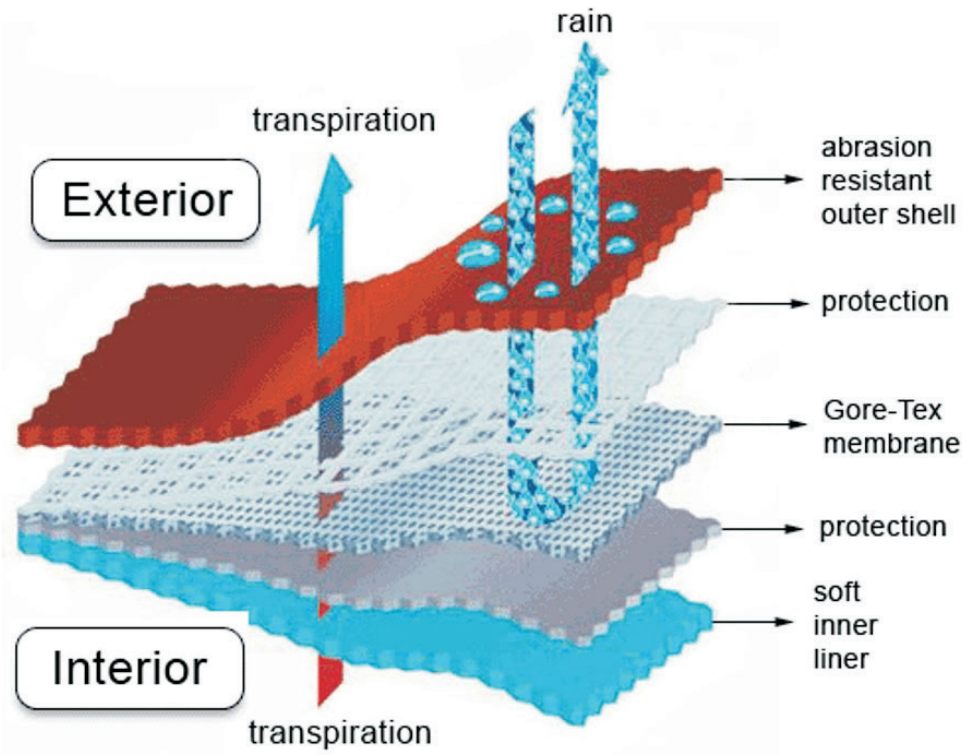
Technology is the use of tools, devices, methods, and techniques to solve problems or enhance a product.





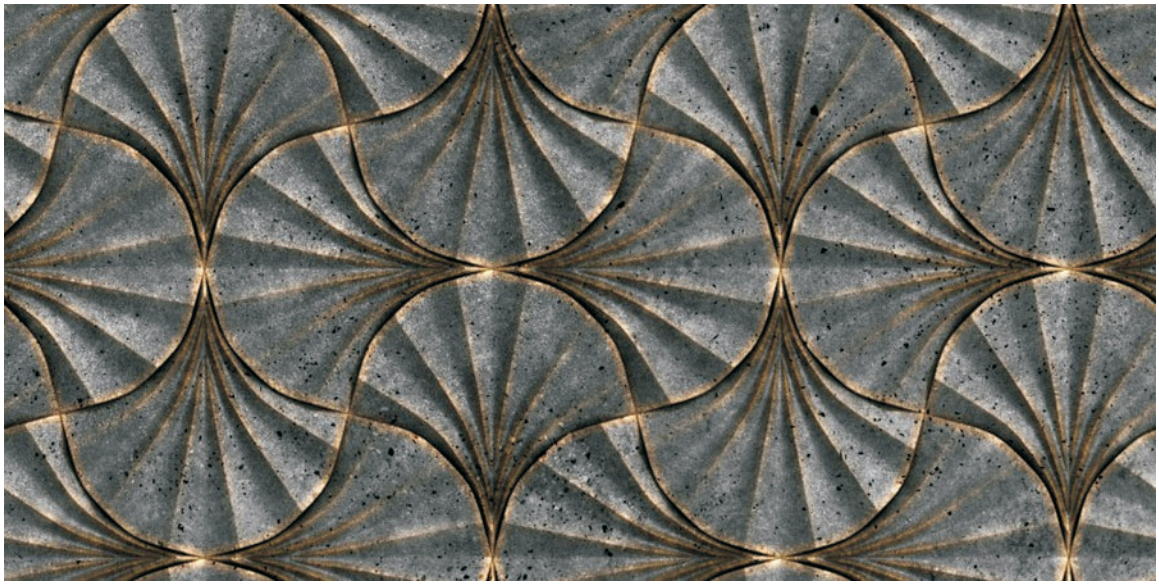
TECHNICAL TEXTILES

Technical textiles are fabrics used for industrial purposes, often chosen for characteristics other than appearance.



TRENDS: 3D PRINTING

3D printers create fabrics, tiles, rugs, shoes, accessories, etc. by laying down successive layers of seamless material.



HIGH FASHION 3D PRINTING

Iris Van Herpen's high fashion smart fabric "water dress" is an example of 3D printing technology and rapid prototyping. Van Herpen is a Belgian designer. (Image courtesy Wikipedia)

LS–A

Name _____

"Futuristic" Technologies

Purpose

The purpose of this activity is to review and rank futuristic clothing and textile technologies.

Objectives

1. Review futuristic clothing and textile technologies available now.
2. Describe the unique features of each technology.
3. Calculate the overall ranking for each technology.
4. Discuss positive and negative features of the new technologies

Materials

- lab sheet
- pen or pencil
- computer with Internet access
- VM–D

Procedures

1. Work individually to complete this lab activity. Review your class notes and VM–D as an introduction to this lab activity.
2. Watch the video, "9 Futuristic Clothing Technologies Available Now" at https://www.youtube.com/watch?v=pB_IbQk0rGY.
   a. TASK #1: Complete the table by recording the technology name and its unique features.
   b. TASK #2: Rank each technology innovation: 1 = not useful to 9 = most useful.

Technology Name	Unique Features	My Ranking	Overall Mean Score
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

3. Share your rankings with the class. Tally the scores for each technology. Then, calculate the average (mean) score for each clothing and textile technology.
4. Discuss the overall mean scores and the positive and negative features associated with each new product. Discuss the reasons the top technologies scored well among the class.
5. Turn your completed lab sheet in to your instructor.