Knits

Unit: Science of Textiles and Manufacturing

Problem Area: Fabric Construction

Lesson: Knits

Student Learning Objectives.

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

1. **Explain knit construction terminology, characteristics, and functions.**
2. **Identify fabric swatches for various types of knit fabrics.**

Resources.

The following resources may be useful in teaching this lesson:

"Geotextiles," *Kord*. Accessed Feb. 6, 2012. http://www.kordarna.cz/en/geosynthetics/geotextiles-woven-knitted-geotextile.

Gopalakrishnan, D. "Knitted Fabrics for Industrial Application." *fibre2fashion*. Accessed Feb. 6, 2012. http://www.fibre2fashion.com/industry-article/textile-industry-articles/knitted-fabrics-for-industrial-application/knitted-fabrics-for-industrial-application1.asp.

"Knitted Fabric," *Fabrics Manufacturers*. Accessed Feb. 6, 2012. http://www.fabrics-manufacturers.com/knitted-fabric.html.

Swantko, Kathlyn. "Knits Feature at Industrial Fabric Show," *IFAI*. Accessed Feb. 6, 2012. http://www.thetechnicalcenter.com/Features/Assets/KIIFAI1205.pdf.

TextileGlossary.com. Accessed Feb. 6, 2012. www.textileglossary.com.

"Textile Warping," *Textile Exchange*. Accessed Feb. 6, 2012. http://www.teonline.com/knowledge-centre/textile-warping.html.

Wolfe, Mary. *Fashion!*, 6th ed. Goodheart-Willcox, 2012.

Wolfe, Mary. *Fashion Marketing & Merchandising*, 3rd ed. Goodheart-Willcox, 2009.

"Woven High Strength Polyester Reinforcement Geotextiles," *U.S. Fabrics*. Accessed Feb. 6, 2012. http://www.usfabricsinc.com/products/polyestergeotextiles.

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):

- course
- gauge
- geotextile
- knitting
- plain stitch
- purl stitch
- raschel knit
- reversible stitch
- rib stitch
- tricot knit
- wale
- warp knit
- weft knit

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.

Ask the students to write down what they think when they hear the word "knit." Then ask the students to describe how knit fabrics look and feel. Have each student write five descriptive words about knits. Next, pair up classmates to explain and describe their word choices for knit fabrics.

Share the fact that knitted fabric is the third major class of fabrics. The first major class is \woven and the second is nonwoven. Also, Coco Chanel's use of a

jersey knit in her classic 1916 suits was a turning point for knit use in the fashion industry. Show an image of the classic Chanel knit suit. Lead this conversation into the lesson plan.

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Explain knit construction terminology, characteristics, and functions.

Anticipated Problem: What are the knit construction terms, characteristics, and functions?

I. Knit construction terms

A. ***Knitting*** is a construction method of intermeshing yarns—by hand or by machine—with needles. After weaving, knitting is the most frequently used method of fabric construction that creates fabrics from threads or yarns. Knitted goods are primarily of two types: those for garment manufacturers and consumers and those for finished apparel items (e.g., sweaters, pantyhose, and underwear). Most knitted garments sold in retail stores are produced on commercial computer-controlled knitting machines. Commercial knitting is faster, so knit patterns are quickly produced on these machines. Numerous patterns and textures exist for knitted fabrics, such as weft (plain-knit, purl, and rib) and warp (tricot and raschel) knits. Using different yarns and knitting needles changes the final product. Knit fabrics have natural flexibility and stretch due to the knit process of looping.

1. A ***wale*** is a row of interlocking loops that run lengthwise.
2. A ***course*** is a row of interlocking loops that run horizontally.

B. Knit construction

1. Yarns are the primary material form in knit construction. Knitting is a popular fabric choice as it has versatile properties: wrinkle resistance, stretchability, and ease of fit (especially for sports and casual wear). The knitting industry is complex and consists of two main areas: producers of knitted goods for garment manufacturers, sewing centers, and consumers; and apparel finishers of hosiery, underwear, sweaters, suiting, coats, rugs, and other home and office furnishings. The number of stitches or loops per square inch is one identifying factor in knit fabric construction.
2. Knitted fabrics can be classified as warp (loops that run in lengthwise rows) or weft (a course of loops that run horizontally; width) knits. Therefore, a knit fabric that has 80 loops in one inch of length (wales) and 70 loops in one inch of width (weft) is said be have: 80 wales and 70 courses. For example:
   a. A knit fabric with more wales than courses creates a stable and rigid width.

b. A knit fabric with more courses than wales creates a stable and rigid length.
c. A knit fabric with many wales and courses per square inch has better recovery from stretching than one with fewer wales and courses per square inch.
d. A knit fabric with few wales and courses produces a stretchy and less rigid fabric with poor recovery from stretching.

3. ***Gauge*** is the number of stitches or loops per inch of fabric. Close- and fine-knit fabrics have a higher gauge and are more susceptible to snagging and raveling when a yarn is pulled. The number of stitches or loops per square inch is one way in which knits are identified.
4. Needle quality affects the quality of the knitted construction. Stitch width varies depending on the thickness of the needle hook (whether hand or machine construction). If the thickness varies from needle hook to needle hook, the stitches would also vary in width. The same is true of the lengthwise loops. Some needle types are used for making specific knits.
   a. Latch needles have a swinging finger (the latch) that closes onto the hook of the needle as it pulls the yarn through a loop to form a new loop. Knit fabrics include jersey and rib knit.
   b. Spring-beard needles have a fine, springy hook that resembles a beard. To use this needle, a sinker and a presser must be added to hold the fabric in place and close to the hook as it forms the loop. Fine-knit fabrics use this smaller loop-forming needle.
   c. Compound needles have a hook and a sliding closing fixture to create fabrics with less fabric distortion (stretch).

C. A ***weft knit*** is a fabric produced by one continuous yarn forming courses (rows) horizontally across the fabric. It may be constructed by hand or by machine (yarns run crosswise or in a circle). Hand knitting is usually weft knitting. Industrial uses include awnings, signs, and banner fabrics made from ***geotextiles*** (fabrics produced for contact with soil or other materials in civil engineering earthworks and building construction projects); fabrics for medical applications; quality marine products and tents. The three basic stitches in weft knitting are plain-knit, purl stitch, and rib stitch.

1. ***Plain stitch*** (jersey or balbriggan) is a stitch that produces a weft knit fabric in which each loop formed is identical. The stitch can be produced as a flat, tubular, or circular knit form. The fabric is different on the front than on the back because the plain stitch produces vertical rows (wales) on the fabric face and crosswise rows (courses) on the back. It produces rather lightweight fabric compared to other knit stitches.
2. ***Purl stitch*** (link-and-link) is a knit fabric produced with a reversible stitch. A ***reversible stitch*** is a stitch that looks the same on both sides, so there is no true “wrong side.” To produce this effect, it is made on flatbed and circular machines by needles with hooks on both ends. The process is slow and costly compared to other knit processes. Crosswise ridges are an identifying pattern for a purl knit garment or industry textile. The crosswise stretch of the purl knit

gives it excellent lengthwise stretch that makes it especially appropriate for infant and children's clothing.

3. ***Rib stitch*** is a stitch that produces alternating rows of purl and plain stitches constructed so the front and the back of the fabric are identical. This knitting process requires two sets of needles operating at right angles. It can be produced on a flat rib or a circular rib machine. A rib stitch product has excellent elasticity in the crosswise direction, so this stitch may be used for sleeve bands, neckbands, sweater waistbands, and special trims for knit and woven fabrics, as well as for outer garments and undergarments.

D. ***Warp knit*** is a knit that requires one yarn for every stitch in the row or course. In contrast, weft knitting requires a single yarn. In a warp knit, the yarns produce vertical parallel wales. The needles produce parallel rows of loops, thereby forming an interlocking zigzag pattern. The stitches on the front appear vertically and the stitches on the back appear horizontally as floats and at a slight angle. This knit type is constructed by machine only. Industrial uses include extra-fine mosquito netting, laundry bags, warp knitted geotextiles, high-visibility safety vests for highway department and military, athletic wear, police body armor, luggage, and hats. The basic warp knit stitches are raschel and tricot.

1. ***Raschel knit*** is a warp knit fabric that contains inlaid connecting yarns in addition to columns of knit stitches. The finished product knit resembles hand crocheted fabrics, lace fabrics, and netting and can be sheer net or have a lace effect. Raschel knit is used for throw and decorative pillows, draperies, etc. It is produced with heavy yarn. Although this knit has lots of texture, it has limited stretch. Ketten raschel knit is also known as chain raschel and is a bit finer.
2. ***Tricot knit*** is a warp knit fabric formed by interlooping adjacent parallel yarns. Tricot is the most common and familiar warp knit fabric. It is used for clingy dresses, socks, shirts, athletic wear, and lingerie as well as other apparel that must drape well. Tricot does not run or ravel. In addition, it is soft and wrinkle resistant.
3. Other warp knits are simplex knit and crochet knit.

E. Knit characteristics

1. Weft knit fabrics for garments
   a. They can be full-fashioned or knitted to fit the shape of the body.
   b. They stretch.
   c. They may run if snagged.
   d. The cut edges may curl.
   e. They have great versatility.
2. Warp knits fabrics for garments
   a. They are stable and durable.
   b. They do not ravel.
   c. They are very run-proof.
   d. They have limited stretch.

e. Their uses are versatile, such as lingerie, sleepwear, athletic wear, and eveningwear.

3. As mentioned previously, geotextiles are fabrics produced for contact with soil or other materials in civil engineering earthworks and building construction projects. In engineering projects, these fabrics are placed between the soil and pipe to enhance water production. The major geotextile classifications are nonwoven, woven, and knitted fabrics. Because of their manufacturing process, knitted geotextiles offer high strength and elasticity. Geotextiles have five major functions:
   a. Separation
   b. Reinforcement
   c. Filtration
   d. Drainage
   e. Protection from the elements

Teaching Strategy: *Use VM–A, VM–B, and VM–C to illustrate various knits and to facilitate a discussion of the industry terms, characteristics, and functions.*

Objective 2: Identify fabric swatches for various types of knit fabrics.

Anticipated Problem: How are weft- and warp-knit fabric swatches identified?

II. Warp- and weft-knit fabrics

A. Warp-knit fabrics
   1. Tricot knits have fine vertical ribs on the face and horizontal ribs on the back.
   2. Raschel knits range from heavy crochet-like knits to sheer nets or a lace look.

B. Weft-knit fabrics
   1. Plain-knit stitch is small and has closely spaced stitches. These fabrics can stretch up to 25 percent along the grain.
   2. Purl stitch fabrics are constructed by doing a plain stitch backwards. The identifying characteristic is a fabric that appears to have a wavy horizontal line.
   3. Rib stitches are highly elastic in the crosswise direction. To create a rib knit stitch, the knitting machine requires two sets of needles working at a right angle.

Teaching Strategy: *Conduct a "Knit Scavenger Hunt" to review the knit types. Use fabric swatches (or the pictures in VM–B and VM–C) to create a scavenger hunt around the classroom. Put the swatches (or pictures) in random order around the room, and have students walk to each and record the knit type (weft or warp) and two characteristics of each. Debrief the activity with the class after all students are finished. Assign LS–A.*

- **Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may also be used 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. f
2. a
3. e
4. d
5. b
6. c

Part Two: True/False

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

Part Three: Short Answer

Answers will vary but would approximate the following response. Geotextiles are fabrics produced for contact with soil or other materials in civil engineering earthworks and building construction projects. In engineering projects, these fabrics are placed between the soil and pipe to enhance water production. The major geotextile classifications are nonwoven, woven, and knitted fabrics. Due to their manufacturing process, knitted geotextiles offer high strength and elasticity to engineering and construction projects.

Sample Test

Name _____

Knits

Part One: Matching

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

a. plain stitch
b. raschel knit
c. rib stitch
d. tricot knit
e. knitting
f. purl stitch

_____1. A knit fabric produced with a reversible stitch so there is no true "wrong side"

_____2. A stitch that produces a weft knit fabric in which each loop formed is identical

_____3. A construction method of intermeshing yarns together that is done by hand or by machine with needles

_____4. A warp knit fabric formed by interlooping adjacent parallel yarns

_____5. A warp knit fabric that contains inlaid connecting yarns in addition to columns of knit stitches

_____6. A stitch that produces alternating rows of purl and plain stitches constructed so that both the front and the back of the fabric are identical

Part Two: True/False

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

_____1. Knitting is a construction method of looping yarns together.

_____2. Close- and fine-knit fabrics have a higher gauge and are more susceptible to snagging and raveling.

_____3. Warp knits are not stable or durable.

_____4. Weft knits run when snagged.

_____5. A knit fabric with many wales and courses per square inch has better recovery from stretching than one with fewer wales and courses per square inch.

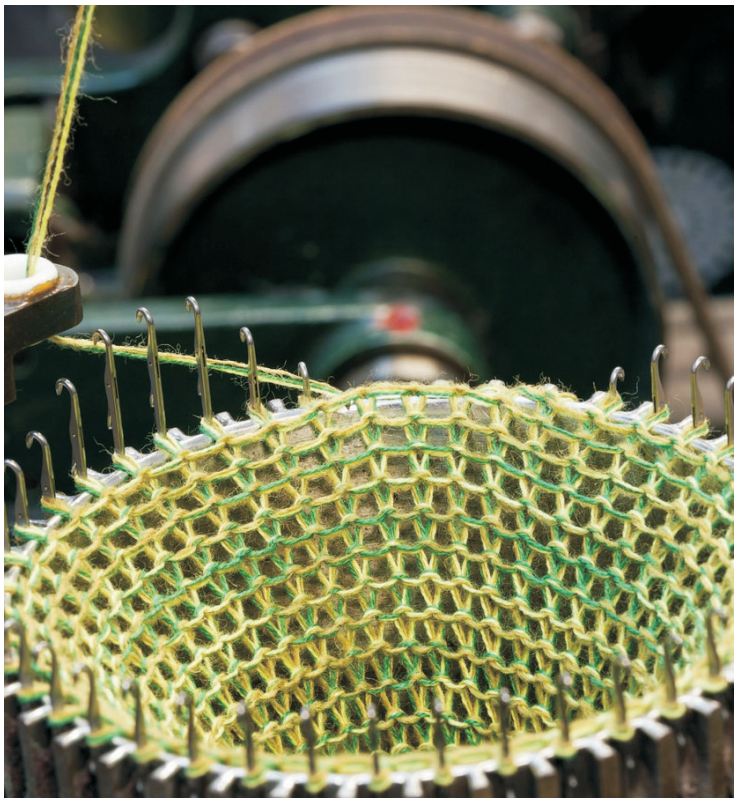
_____6. Rib stitches are highly elastic in the lengthwise direction.

Part Three: Short Answer

Instructions: **Answer the following.**

Describe geotextiles in terms of uses, characteristics, and classifications (types).

KNITTED PRODUCTS



- Industrial knitting machines make three-dimensional knitting easy.

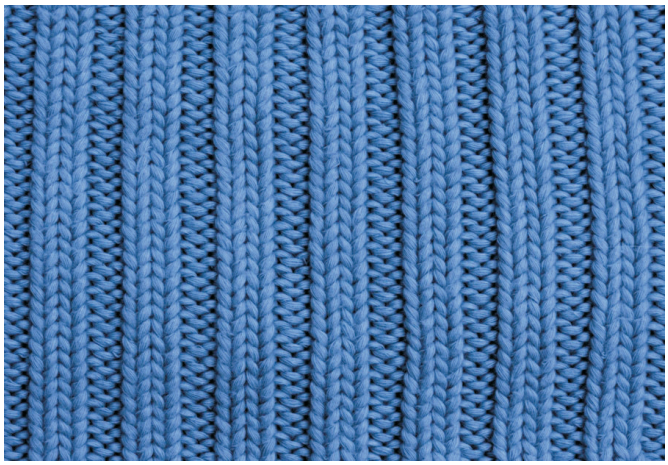
- Hand-knit items can be simple or complex patterns.

- Geotextiles, such as this roofing felt, are commonly used for engineering and construction projects because of their ability to withstand the elements—sunlight, wind, water, and fire. Other uses include body armor, such as this bulletproof vest.

WEFT KNITS

- In plain knit stitches, each formed loop is identical.

- Purl stitch yarns run crosswise and, as in this infant's T-shirt, are reversible—the same pattern on both sides.



- The rib stitch produces alternate lengthwise rows of purl and plain stitches.

WARP KNITS

- Tricot knit yarns run lengthwise and do not ravel, making them a perfect choice for this soccer uniform.
- Some raschel knits have a lace pattern, and others have a net pattern. This fabric has a lace pattern and a net background.

LS–A

Name _____

Knit Fabric Identification

Purpose

The purpose of this activity is to identify and describe knit fabrics.

Objectives

1. Identify weft-knitted fabrics.
2. Identify warp-knitted fabrics.
3. Describe the uses and characteristics of the knit fabrics displayed.

Materials

- lab sheet
- writing utensil
- glue stick
- scissors
- weft knit samples
- warp knit samples
- class notes
- textbook

Procedure

1. With a partner, look through various knit samples provided by your instructor.
2. Examine each sample. Then select two weft and two warp samples.
3. Cut pieces of each knit fabric sample and mount them on your lab sheet.
4. Describe each knit fabric's characteristics.

5. List two uses (one apparel and one industrial) for each of the knits.

   a. **Weft Knit Fabric Sample #1:**

      Description of characteristics:

      Uses:

   b. **Weft Knit Fabric Sample #2:**

      Description of characteristics:

      Uses:

c. **Warp Knit Fabric Sample #1:**

Description of characteristics:

Uses:

d. **Warp Knit Fabric Sample #2:**

Description of characteristics:

Uses:

6. Display your warp- and weft-fabric swatches.

7. Turn in your completed lab sheet to your instructor.

Knit Fabric Identification

1. Set up the room with five stations by placing multiple samples (enough for each pair to have four samples) of each of the following knits at the designated station.
   a. Station 1: Weft—plain stitch
   b. Station 2: Weft—purl stitch
   c. Station 3: Weft—rib stitch
   d. Station 4: Warp—tricot knit
   e. Station 5: Warp—raschel knit
2. Grading
   a. Use this lesson plan and the class notes to grade the characteristics.
   b. Use this lesson plan and the class notes to grade the uses. Students should list one apparel and one industrial use.