



***Hosiery: Function, Fashion, and Patriotism Collide with Science***

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This curriculum unit is recommended for:  
Apparel and Textile Production I and II, grades 9-12th

**Keywords:** hosiery, textile history, common core, fashion history, culture

**Teaching Standards:** See [Appendix 1](#) for teaching standards addressed in this unit.

**Synopsis:** Hosiery, a leading industry in fashion for years, not only lends itself to fashionable choices for the consumer, but also practical choices for all walks of life. Be it military, post-surgery patient, diabetic, athlete, businessman, or fashion conscious student, hosiery fits into everyone's life. Having been around for centuries, hosiery continues to improve our quality of life as a result of chemical engineering. This curriculum unit takes a panoramic view of the history of hosiery. Students will be challenged to investigate apparel from various centuries as it relates to hosiery as well as discuss topics such as modesty, science history, culture, war, and gender issues. While this curriculum was designed to fit into Apparel and Textile Production I and II Essential Standards, parts of it will complement other subjects. Common core standards in writing, literacy, and math are addressed, while also giving the student a rich history in an area of fashion that is often overlooked. Use of current technology is encouraged throughout the curriculum, but can be modified with consideration to technology limitations and accessibility. Upon completing components of the curriculum unit, the student will have an interdisciplinary view of hosiery, necessary for career exploration in the apparel industry.

*I plan to teach this unit during the coming year to 60 students in Apparel and Textile Production I and II.*

*I give permission for the Institute to publish my curriculum unit and synopsis in print and online. I understand that I will be credited as the author of my work.*

## Hosiery: Function, Fashion, and Patriotism Collide with Science

*Wendy C. Potter*

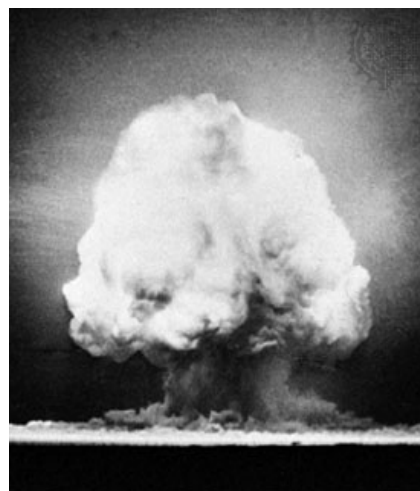
### Introduction

In studying fashion history, one of the most neglected topics is that of hosiery. After months of studying hosiery, I am convinced that it is important to expose students to the topic. As the old l'Eggs commercial says, in a somewhat self-serving way, "Nothing beats a great pair of legs." Hosiery is not only interesting because it concerns a woman's legs (and men's legs as well), but it is also interesting because it leads to many discussions about culture, fashion, technology, and even political events. A look at hosiery will lead to stories of historical significance about WWI and WWII, hemlines in fashion, debates about modesty, and surprisingly, chemical warfare.

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*Figure 1: Photographed by Loomis Dean, following a 1955 atomic bomb test in Nevada. A million dollar village was set up to test the effects of the blast on "everything from houses to clothes to canned soups".*



*Figure 2: The Manhattan Project-Making the atomic bomb ([www.atomicarchive.com](http://www.atomicarchive.com)) Two of DuPont's greatest accomplishments: nylon development and contributing to the Manhattan Project.*

### School Setting

This curriculum was written for a suburban school located just outside of a large city with a population of approximately 800,000. The school has an enrollment of 2078 students, 31.6% African American, 44.6 % Caucasian, 17.6% Hispanic, 4.2% Asian, Multi-racial 12.4%, and Pacific Islander 3%. Forty-three percent of enrolled students are

free and reduced lunch which carries with it a financial hardship. My classes are of similar demographics. The average class size for Apparel and Textile Production is 18. Ninety five percent are female and 5% are male. In Fall 2014, The Academy of Health Sciences was established at David W. Butler High School to prepare students for a career in health sciences, where there is a lot of demand. A STEM focused Project Lead the Way has also been in place since 2011, in response to our nations push for development of engineering education, with an emphasis on encouraging female students to enter the engineering field. So it is quite possible that a student of STEM, PLTW, or AHS will be on the receiving end of this CU. This provides me with the opportunity to collaborate with teachers and students of the many disciplines that are directly or indirectly related to the fashion industry. Students will study hosiery as it relates to the field of engineering, textile science, fashion, the medical field, and social changes in society.

In the 19<sup>th</sup> century, the discipline of chemical engineering emerged through America's industrial growth. DuPont, a chemical powerhouse and family run business; played a major role in the pulling together of science and applied mathematics, from which engineering was established. Employing a number of prestigious chemists and organic chemists, DuPont married the two with mathematics. This is a pivotal point in the industrial culture of the time. From this important time in history, the field of chemical engineering was born. War meant profits and when the wars ended, the brains of DuPont created a consumer product that would make history – nylon stockings. A family dynasty, DuPont manufactured gunpowder, dynamite, neoprene, ammonia, rayon, and metallurgical, most of them dependent on the development of ammonia. Nylon was the first synthetic fiber to be manufactured and became the fiber for hosiery. Rayon had been manufactured but was not synthetic being made from cellulose (wood pulp). With DuPont family members involved in politics, engineering, and the field of chemistry, a business was built.<sup>2</sup>

### **Content Objectives**

My goal is to teach my students to think more broadly and knowledgeably about the subject of hosiery. Common Core Standards for Writing will be addressed in this curriculum unit in conjunction with Essential Standards for Apparel and Textile Production I and II (ATP). This curriculum unit is applicable to both levels of Apparel and Textile Production as they include standards related to textile science, the global marketplace, and fashion history. The Common Core Standards for writing skills is meant to be developed throughout all grade levels, so there is no need to isolate this curriculum to ATP II. Problem solving and analytical skills are also stressed under Career and College Readiness Standards. The debate of whether or not leggings are considered hosiery or pants will easily become a hot topic, among fashion-conscious students, for argumentative writing exercises (Appendix 1).

### **Rationale**

There are many ideas and images that come to mind when the topic of hosiery is brought up. What is hosiery? While pantyhose and tights are the most common association with the term hosiery, some will even include socks, knee highs, trouser socks and even leggings. My generation often says hosiery is a pair of panty hose available in different skin tones. Meant to add a professional or finishing touch to a woman's legs, hosiery has been associated with office attire or formal attire, especially where the exposure of legs is concerned. Showing up to work in an office atmosphere with bare legs was unacceptable at one time. Prior to 2000, most office dress code dictated that women must wear pantyhose with professional attire. The image from "The Graduate" (1973) comes to mind, when I think of hosiery being the first article of clothing a woman wants to remove after a long day at work settling in for a cocktail. This movie clip does not exactly suggest "professionalism" and modesty. When I search the internet for images with the keyword of "hosiery" or "nylons", I am given pages of images that are anything but modest, most of the images being quite seductive and sensual. Discussions of modesty will always come around when hosiery is being discussed. What is considered modesty is relative to the time period, be it the sixteenth century or the twentieth century. For example, in the 1930s, having a seam on the back of your leg was evidence that you were wearing hosiery and therefore the seam was equated with a modest and dignified look. Today in the twenty-first century, we now see First Lady Michelle Obama stepping out in public with bare legs. Wearing sheer skin toned hosiery is no longer a trend. Some women now spend hours in the tanning salon to get that perfect sun kissed skin glow on their legs. And that is perfectly acceptable, even in the office.



*Figure 3 - 1940's applying the seam*

Glamourdaze.com

Generation Gap

So is hosiery a thing of the past? I say not! Hosiery in the broadest sense is a part of everyday life, practically and/or fashionably. Hosiery, according to TextileGlossary.com, is described as undergarments worn directly on the feet and legs. This includes then, socks, stockings, and pantyhose. The jury is still out on whether or not leggings are considered hosiery, but their techniques of production are similar to that of hosiery. Still, the debate persists--usually between the younger and older generation. The issue is always predicated on the topic of modesty and is an argument I am very attentive to, as a high school teacher trying to enforce the school dress code while also appreciating the younger generation's style without judgment. Teaching Apparel and Textile Production I and II at the high school level, I would like to take advantage of the leggings controversy and initiate discussion to include a thoughtful and inquiry based study of hosiery. It is not my goal to change the school dress code or to change the student's individual style.

Most students would say hosiery includes leggings in fashionable colors and prints that elicit not only a chic sensibility in the cold months, but also a layer of warmth. They come in an array of colors, prints, and even textures that can become the focal point of a stylish outfit. Technology in the textile industry has made it possible to create any texture from synthetic fibers – faux leather, denim look--alike (jeggings), and snake skin to name a few. Pair them with boots of any sorts and you are wearing the latest in fashion. To put this technology into perspective, a brief history of fabric dyes and printing should be investigated by students. Natural dyes date back to 2600 B.C. (mauve is the first color recorded) and as science progressed; fabric intricacies and textures have become ubiquitous. National Geographic's', *Science of Everything*, is a helpful resource in briefly explaining the basic principle (Ohm's Law) behind inkjet printing, which is now used with fabrics<sup>3</sup>. Having taken a tour of Advance Digital Textiles in Monroe, NC, my students and I can see first-hand, the equipment, technology, and process of printing fabric. This company offers the service of printing small batches of fabric, nylon being an option. A tour of this company reinforces the Essential Standards of Apparel and Textile Production II 1.01 (ATP I 2.00), textile science, dyeing and printing technology. While somewhat costly, I will guide four groups of ATP II students in creating an original design repeat to be super imposed through dye sublimation. Having several yards of fabric printed with original designs, students will then create a pair of leggings (pattern drafting and construction). This project takes the student out of the classroom and into an industry setting and scenario. This activity may materialize the thought that the hosiery industry is strictly a lady's business but I will further show students that hosiery is a business for all, male or female, young or old, modest or provocative, active and healthy or sick.

## Super Heroes

While hosiery comes to the rescue for many, we cannot ignore the notion of men in tights that is super heroes. People have been romanticized by the notion of a super hero for

decades, so why not use this cultural theme while studying hosiery. Whether male or female, a cape, leotard, and tights are almost always an image associated with the super hero culture. Why would it be necessary to wear such pieces? In 1934, Jerry Siegel and Joe Shuster, operating a comic art business, created the original Super-Man. Fascinated with science fiction, Jerry and Joe's original Super-Man was a diabolical scientist who used homeless men to conduct gruesome experiments. This character did not create a following under this type of characterization, so Jerry and Joe set out to transform him into a good superman. While Jerry was influenced by his Jewish heritage, his concerns about the rise of fascism, and a family tragedy, Joe was influenced by his southern heritage and disdain for the Ku Klux Klan. Through their longing to rid the world from evil people, their creativity and imagination brought Superman to the scene, wearing a cape and tights. The image of superman, as Rick Bowers has noted, was very deliberately constructed: "Superman had his rugged good looks, his shock of blue-black hair, his muscular physique, his flowing red cape, and the bold S insignia on his chest. Joe designed his uniform as a cross between a spaceman suit and a classic circus performer outfit-down to the blue tights, red shorts, and cape."<sup>4</sup>

While Superman was the first individual hero to be featured in a comic book, he was not the first hero to be dressed in tights. Phantom, a creation of Lee Falk in 1936, was not only the first hero to usher in the comic book genre, but also the first super hero to wear tights. For children growing up through the Great Depression and fascism, reading about a super hero who could rid the world of evil was a great means of escape. Phantom, who emerged from the sea and into the jungle of Africa, wore a skin tight costume that made him resemble a "native idol."

So while hosiery seems to be an all American fashion piece, it can be traced to many cultures, countries, and time periods; reality or fantasy. And in these different time periods, regardless of the limitations of science and technology, society has always found a need and want in hosiery. Today, my students are still fascinated with super heroes. Using super heroes can be an entertaining way to focus on the science of hosiery. I will use a tic-tac-toe grid in which super heroes of various time periods are listed. Required to complete "three in a row", the student will create a brief comic strip (6 blocks) for each super hero. The comic strip will be a fun and imaginative way to summarize the science culture of that time. Focus should be on the science and technology that is related to hosiery, knitting, textiles, and/or quantum physics. The goal of this activity is for the student to get a bird's eye view of science, culture, and fashion technology within a given time period. Just as important, I want the student to think more broadly about hosiery. It bears repeating that when the subject of hosiery is searched through an internet search engine, a narrow and inappropriate perspective is given to the subject. Too often today's student relies heavily on the internet, failing to dig through various texts and library resources to get a more panoramic view.



Figure 4 – Robin Hood, hero from

Lookandlearn.com



Figure 5 – Statue of Robin Hood in Nottingham, a place recognized for its center of hosiery and knitwear industry and also where William Lee, in 1589, invented the stocking loom.

## Hemlines-Gibson Girl to Beyoncé

It is a common theory, taken quite seriously by some, that hemlines and the lowering and rising of the stock market are related. Perhaps rising hemlines suggest a cultural optimism that simultaneously plays out in the stock market. Others say it is just a myth. This is another topic of consideration and discussion for students of Apparel and Textile Production to research. Addressing this debate in this curriculum unit is necessary because hemlines obviously create varying degrees of modesty which in turn affect the hosiery industry. In the 1600s it was unacceptable for women to show their ankles, so any subtle lifting of the dress to reveal hosiery was considered quite worldly. To feed this curiosity, Victorian women were fancied by the embellishment of hosiery around the outside area of the ankle. Lifting a skirt just enough to see beautiful embroidery on the hosiery was excitement for the day.

At the turn of the century, influenced by the women's suffrage movement, women found interest in being more active. Women were particularly attracted to tennis and bicycle during this time. Paul Poiret and Coco Chanel were visionaries for what the fashion industry calls the sportswear movement. Chanel played a part in women coming out of the corset. I believe that dressing women in a fabric mainly used for men's underwear as Coco Chanel did, was ahead of her time and no doubt influential on women's wear, but her influence eventually took a back seat to other priorities when Germany marched into Paris.

With women beginning to wear a more relaxed fashion silhouette and becoming more active, it was inevitable that the hemline would begin to rise. Playing tennis or riding a bicycle in a long dress or skirt like the Gibson girl was sure to be short lived. Soon hemlines were at their highest in the 1920s when women were sporting a more relaxed silhouette and bobbed hair. What's more, women began to roll down their stockings just enough to see a little skin above the knee while doing the Charleston dance.<sup>5</sup> Throughout the 20<sup>th</sup> and 21<sup>st</sup> century, women have become increasingly more prominent in the worlds of sports, business, and politics. With more opportunities for women, the sportswear industry has grown to offer apparel to meet every need. More leisure and entertainment activities are enjoyed by both men and women and the response of the apparel industry has filled the need for "movement". Hosiery is one facet of sportswear that has evolved to meet this need. Having students study sports and leisure wear cannot be done without also addressing the growing number of activities available.

Now at the turn of this century, Beyoncé has become a much idolized celebrity. Known for her curvaceous physique, women look on with envy as they once did with Tina Turner. This year, 2014, Beyoncé will introduce a line of clothing to fit in with the trend of athletic wear. Fashion historians know that certain parts of the body are a focal point within various decades; bustles, shoulders, waists, legs for example. Presently, a trend of athleticism is prevalent, creating big business for companies selling yoga wear, performance gear, and what is now coined, "athletic chic" or "ath-leisure". The focal point of the decade now seems to be showing off our assets, with an athletic physique being the desirable. Sporting events of all kinds, be it triathlons, marathons, or adventure obstacle courses, are immersed into today's culture for all ages. With that culture, textile science and engineering have been busy creating the highest performing athletic wear, thanks to nanotechnology and synthetic fibers (spandex, nylon, and polyester). Of course with new high tech fibers, laundry care products now find it necessary to create detergents and other care products specifically designed to maintain the performance characteristics of the athletic fibers (wicking, elasticity). Studying this trend within this curriculum is necessary because hosiery includes running tights and athletic socks. In a report announcing Beyoncé's line of athletic street wear, it is stressed that, the two designers needed for this brand will be "one sports-related who understands the technical aspects of work-outwear such as stretch and wicking; the other, a fashion designer."<sup>6</sup> Here is where science and culture meet with technology. It is not enough for fashion to be aesthetically pleasing. Fashion must also perform, and this is where fashion is a beneficiary to science. The articles in *Womens Wear Daily*, the ultimate fashion trade newspaper, goes onto say,

"The Topshop-Beyoncé collection will encompass clothing, footwear, and accessories across dance, fitness and sports categories. It will have technical performance characteristics as well as an ath-leisure side, targeting women who go to yoga or the health club, as well as those who just want to look as if they do."<sup>7</sup>



I am certain that hosiery is a part of the “footwear” portion!



Figure 6 – 1920’s rolled stocking trend; [www.smithsonianvacation.com](http://www.smithsonianvacation.com). Figure 7 – Rolled stockings of 1920’s

### Fashion Designer or Engineer

Many scholars who study fashion history have a list of well known fashion designers they find pertinent to investigate; Charles Frederick Worth, Coco Chanel, Christian Dior, and Paul Poiret are names most prominent on those lists. But I would like to submit an additional list to the state curriculum of Apparel and Textile Production. The curriculum does not dictate a limited list, but too often, takes the stage when comes to “influential people” of fashion. I would say that the DuPont Empire that made larger footprints on the world of fashion than any designer.

Stockings have been thought to have evolved into pantyhose as a result of Mary Quant’s popularization of the miniskirt. If a girl is to wear a miniskirt, she’s going to have to conceal the traditional mechanism that held her hosiery in place, the garter belt. Ethel Gant came up with the idea for attaching the stockings to panties. Her husband Allen Gant, owner of Glen Raven Inc. (fabric manufacturer) debuted the first “panti-legs” in 1959. Did the “panti-legs” catapult the idea of a mini skirt or did the rising of hemlines spark the idea of pantyhose? The fashion industry is affected by many factors including the economy and social issues such as feminism. While Allen Grant may have earned favor of women, his idea was too late for men in the Renaissance period.

### Hosiery for All

Covering ones legs with strips of cloth or animal hide was common for both men and women prior to 1800. The word hosiery comes from the Anglo-Saxon word, hosen,

which means covering. Both men and women found this routine necessary for protection and warmth. Sometimes for the battle and sometimes for comfort, strips of cloth were wrapped around the leg and tied in some way to keep them from coming undone. The problem of keeping hosiery in place has been addressed in many ways over the centuries. The “hosiery” has been held in place by cutting the stockings and tying them to a belt or shirt. It has also been tied in place using animal gut. In the Renaissance, items such as canions, netherhose, venetians or trunk hose were all types of hosiery or parts of the hosiery/pants. Breeches were part of the hose and while men sported this look, the hosiery would soon evolve to become trousers, thanks to the French Revolution.

### Medicine for the Legs

Talk of hosiery has not always been centered on a woman’s legs. In 1790, William Buchan, M.D. felt so strongly about the medical benefits of “fleecy hosiery” that he published a letter to be made public. The letter is 34 pages in length and outlines the benefits of manufacturing fleecy hosiery to be “an excellent medicine, both for the prevention and the cure of all diseases arising from obstructed perspiration.” Buchan also states that, “The manner in which your fleecy hosiery is made, gives it a degree of elasticity not possessed by cloth of any kind; from which many advantages are derived.”<sup>8</sup> Today, various types of hosiery (often “compression” socks) are prescribed for people with diabetes, recovering from surgery, and for those suffering with leg aches and pains. Sports that involve running have also adopted the use of compression socks, and the more recent innovation, compression sleeves. Watching a basketball game, one will notice many players (both male and female) wearing these on their arms. Running tights warrant similar benefits for muscle performance, circulation, and recovery.

### Gender Bender

*Timeline:* I think it is most important to first discuss the term hosiery. The semantics can often be misleading when discussing hosiery. This discussion will eventually arrive at the question of who wears hosiery. With this question, brings many different time period inferences. It will then be important to create some sort of timeline of hosiery history. Separate the class into two groups – men and hosiery, women and hosiery. Groups are to seek out historical information pertaining only to their assigned gender. Run a piece of bright colored tape across a long wall, and place dates along it. As students find information, they are to write this on an index card and place it in the appropriate time period. It will be most effective if groups have a particular color of index card (i.e. blue for women, yellow for men). Students should research types of hosiery and fibers used for hosiery, as well as popular culture as it relates to sports and leisure. If it is not feasible to create the timeline on a wall, then bulletin board paper or several sheets of construction paper can be used to create a timeline. Observing group dynamics with this type of student activity is always interested. Individuals will begin to assert themselves in an area they are most comfortable with in class work (art, organizing, leading others, etc). The

use of Venn Diagrams comparing women’s leisure activities of 19<sup>th</sup> and 20<sup>th</sup> century or comparing men’s leisure activities of 19<sup>th</sup> and 20<sup>th</sup> century is another strategy that can demonstrate changes in society. Creating a timeline as a group or the use of Venn Diagrams are both strategies that will help the student to make relationships between historical events, fashion, and social change.



Figure 8: 1918 Everwear Hosiery Milwaukee WI Men’s Silk Stockings Socks (fashion ad)

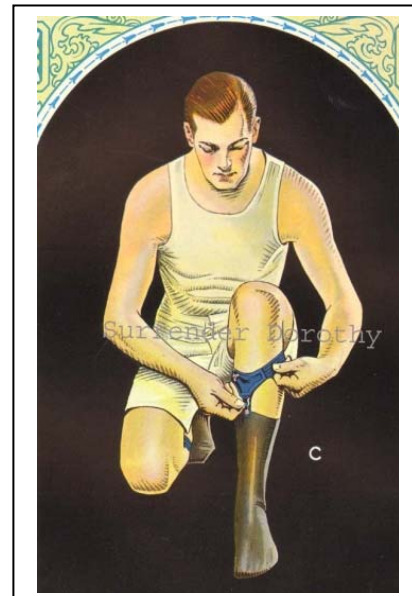


Figure 9: Men’s hosiery garters 1920s advertisement; Art Deco print from [www.etsy.com](http://www.etsy.com)

**Graffiti Board:** Small groups (3) study the area of hosiery on their card (See Appendix 3 for group cards) and share their findings through pictures and words creatively on the white board. Each card gives a specific type of consumer (person); some have a specified time period. The purpose of this activity is to direct students a topic study on the various uses of hosiery. It is also meant to broaden their idea of hosiery and perhaps even erase some connotations or false impressions about hosiery. Students will share by approaching the white board at a given time to draw, doodle, or “wordle” their findings. To use drawings or doodling in notes is an effective strategy for students to remember the content they have studied and to also make connections to the real world. Be sure to have plenty of dry erase markers of various colors and tips.

**Scavenger Hunt with Technology:** Upon completion, it would be most gratifying for students to take pictures of their graffiti and then create a QR code to place around the

school for students to view using their Smartphone or Android. The ATP I class could share their findings with other content areas, such as History, Human Geography, and Psychology classes. Using a scavenger hunt throughout the building students can complete a graphic organizer listing various uses for hosiery throughout the ages. Science classes could make a real world connection by participating in this activity with Apparel and Textile Production students. Students usually appreciate any opportunity to move around while learning rather than taking a passive role in learning while sitting at desks. Research is also showing that when students have the opportunity to move around more, blood circulates and positively impacts their brain functions. (See Appendix 2 for cards and scavenger hunt graphic organizer).

### Industrial Revolution-hand knitting to automation

Without continual progress in industrial technology, hosiery would not be so accommodating, practical or fashionable. North Carolina history is studied in Apparel and Textile Production classes to give students a pride in our history but also to understand how dependent the fashion industry is on industrial technology. North Carolina history of textiles is often forgotten or not known to most students. Charlotte has a very transient and diverse population that includes very few native North Carolinians. The NC state curriculum standards for Apparel and Textile Production I intentionally begins with the Essential Standard of “Understand the apparel industry and design” with the objective (1.01) to Remember the apparel industry. Course materials located on NC moodle for teachers provide essential questions and activities to lead the student through a study of the textile industry in North Carolina as well as important pioneers and inventors during the Industrial Revolution. While the spinning jenny, sewing machine, flying shuttle, and cotton gin are the focus, the CU will expand on the scientists and engineers during the Industrial Revolution that impacted specifically the hosiery industry.

*Prezi:* In this activity, students will draw a card to determine what part of knitting or hosiery technology is studied (individually or with a partner). Students will be able to focus on one facet of hosiery technology so as to discover important details that may otherwise be skimmed over. Their findings will be presented in the form of a Prezi or PowerPoint. It is important that students not only be familiar with using this type of presentation technology, but also knows how to upload these reports on the teacher Gaggles account. This provides a platform for sharing research findings, and participating in discussion through Google Classroom sharing. (Refer to Appendix 3 for student cards )

*Construction Project:* A group construction project (Appendix 3) will complement this study, showing the students how hosiery technology has progressed. In groups of 3, students are to plan, organize, and execute construction of a pair of stockings (no panty attached) that would resemble those of earlier time periods (15<sup>th</sup> – 18<sup>th</sup> century) and of a particular fabric (linen, wool, silk) or construction layout (cut on the bias). Students will

find it challenging to design a pattern to not only fit the leg, but to keep the stockings in place while allowing for movement. Deciding where the seams are to fall will be an important part of the pattern engineering. Upon completion, students will put the prototype through a series of tests, reporting their findings in an organized report.

*Learn to Knit:* Understanding the basic differences of a woven fabric and a knitted fabric is crucial to this curriculum unit. ATPI State Essential Standard 2.00, Understand textiles, includes the study of fibers, fabrics, and finishes. During this study, a hosiery CU component should be inserted. Students often ask me if they are going to learn to knit in my class. They are disappointed because I have yet to take on this instruction. This skill is not even a part of the state curriculum, probably because of its link to the “hobby industry”. However, I now have reconsidered this student request, knowing they would benefit greatly with learning basic knitting skills, if for no reason but to appreciate even more the industrial technology which produces our knitted fabric. Pulling in a few parent and community volunteers to teach a few sessions will be necessary. It is very much a one on one type of instruction, with further opportunities to problem solve with their peers when they have “dropped a stitch”. Students will more than likely want a finished product out of this exercise, so I would suggest a scarf, the simplest project for a beginner of knitting.

*The Story of Knitting:* There is no better way to understand the limitations of early knitting than experiencing it yourself or imagining you are in someone’s shoes from the 15<sup>th</sup> century. Have students recreate the “story” of knitting. This forces the student to think in the context of a different time period. Give the students “The Development of Hosiery Knitting” handout to read (Appendix 3) Assign each student the task of simplifying this history by creating a story from digital media to share with the class. Give options such as animation or storyboard platforms, applications and software. It might be necessary to have students of Media Design to come into the class to peer teach how to use such platforms. Emphasize the requirement of telling a story “visually” in an entertaining manner. PowerPoint and such will not be an acceptable medium. This is a fun and creative way to reenact, collaborate and challenge the student to summarize what they have read, selecting the most important parts of the story. When this assignment is completed, schedule a Cinema Party with popcorn so the students can enjoy watching the creations of their classmates. All the while, they are watching the “story” of knitting several times from various perspectives, definitely reinforcing what they have learned.

### Patriotism and the Apparel Industry

Prior to World War II stockings were only made of silk or rayon (known as “artificial silk”). While these two fibers offer great properties, DuPont made quite an entrance with the creation of nylon. The world of hosiery would never be the same and neither would the company of DuPont. Nylon was the first product offered to the consumer market, bringing in a lot of profit and shares. DuPont was a diversified

company at the time with several different plants. Outside of the nylon business, DuPont continued to manufacture explosives for the war.<sup>9</sup> Eventually, WWII put a cramp in the style of hosiery. Nylon was needed for military powder bags, parachutes, and ropes. From this need arose not only the trend of “liquid stockings” but an air of patriotism. It was patriotic to not buy silk stockings because it supported Japan. Wear nylon hosiery only. But soon a shortage of nylon created marketing campaigns for women to recycle, donate, and repair their nylons. Donated nylon stockings could be recycled for the making of powder bags. On December 27, 1942, the New York Times reported that enough hosiery was salvaged for 100,000 powder bags. Ironically, not only nylon hose, but silk hose were reclaimed to make them.<sup>10</sup>



Figure 10: Leg cosmetics came with issues-flaking, streaking, and staying put in the rain. [www.glamourdaze.com](http://www.glamourdaze.com)



Figure 11: Depots were placed around town where women could donate their hosiery for war efforts.



Figure 12: Nylon was needed for war supplies such as parachutes and powder bags. Stockings could be recycled for war efforts. [glamourdaze.com](http://glamourdaze.com)

## Nylon Wars

We often talk of how war negatively affects the economy. While the government is spending money on war materials, other national programs may take a cut. In WWI and II, men left their work to serve the country, taking women out of the home and into the workforce. Somebody had to run the factories, especially the factories that manufactured items needed for the war. But America always seems to rise to the occasion and in difficulty Americans find ways to escape hardships and also to market a product. The film industry provided a great means of escape, nylon became a great consumer product, and the American designer emerged. Travel to Europe ceased so dependence on Paris designers was cut off. To this day, Coco Chanel is often credited as the most influential designer during this time, but I argue that a group of chemists and engineers changed the apparel industry forever. When Germany marched into Paris, Chanel closed up shop. But the men of DuPont persisted. Yes, DuPont's main product through the years may have been gun powder and dynamite for war efforts, proving a great resource to the government, but DuPont was business savvy. The empire of DuPont created a "consumer product" that would sustain the company during times of peace.

*Relive the 1940s:* After watching the film, "A Leg Up" (Appendix 3), challenge students to organize an outline of the short film. This can be done with a partner to encourage the students to recall and summarize what they have learned. Students will then research various products that were used to give the appearance of sheer stockings on the legs. Find 2 or three products on the market today, attempting to "paint" stockings on their legs, just above the knee to the foot. Don't forget to include the seam on the back of the leg. Open discussion about the down side to this fashion trend; how much time you would need to get ready, keeping the product on the leg for long periods of time, and the cost of products for your budget. This would also be a good time to discuss the fashion of the 1940's, giving the students a chance to dress in that time period. This may lead students to thrift stores or the closets of family members.

*A Rosie by Any Other Name:* An American icon of that time was Rosie the Riveter. This icon represented all of the women who entered the workforce during WWII, specifically those working in factories that manufactured supplies for the war. Fashion was not the only aspect of life affected by the war. Discuss the daily lives of women during the time of 1940s. Is Rosie a positive icon, why or why not? Divide the white board in half, labeling one side "women's role prior to Rosie" and the other side, "women's role upon Rosie's appearance". How was fashion affected in either of these time periods? Apply these social phenomena and ask students to identify another time period where a woman's role changed abruptly. Focus on common core standards for writing in this activity and use journaling for thoughts and graphic organizers to organize material.

DuPont – from nylon to The Manhattan Project

On the way to the fabric store with students on a school bus, I had a student blurt out a comment, “Hey Ms. Potter, I saw how nylon was made the other day.” While traveling to the local fabric store to purchase supplies for his required project, pajama pants, he made a connection between his science class and my class, Apparel and Textile Production I. Of course he proceeded to comment on his observations of the nylon being “stringy and gross”. He remembered ingredients being poured together into a beaker. Although it seemed gross to him, the student seemed fascinated by the connection. For this reason, I have sought out resources for purchasing a demonstration kit for nylon synthesis. Collaborating with a science teacher, I will schedule three science labs for my students to either observe or participate in to understand the science principles involved in textiles, specifically nylon, polyester, and spandex. All three of these manufactured fibers have been continually used for various types of hosiery. Perfecting the engineering of nylon led to the successful manufacturing of other synthetics. A lab in nylon synthesis, polymers, and viscosity will give the student a glimpse of chemical engineering and the importance it plays in our everyday lives. Students will also find it surprising that both women of the 1940s and the military/government shared something in common. DuPont depended on them both for the success of their company. Both the military and women were a “target customer.”

## **Summary**

For years adults have talked about the “generation gap,” referring to how little they have in common with the younger generation, and likewise. But I find this inexcusable for those who plan to build a career in the fashion industry. Students, educators, and professionals in the fashion industry must always seek ways to bridge the gap. While fashion is often referred to as a cycle, continually sending us back to previous trends, I would like to stress more of a pendulum motion for the history of fashion. Fashion swings back and forth, but not always in the same degree. Development also swings back and forth between disciplines, traveling between cultures. Science is often that journey between two cultures. Studying how science has made technology development possible throughout various cultures within fashion is to appreciate and fully value our dependence on various disciplines.



## **Appendix 1: Implementing Teaching Standards**

Common Core Geometry, Writing and Language standards will be revisited through the teaching of North Carolina's Essential Standards for Apparel and Textile Production I and II. This curriculum unit will take an interdisciplinary approach to the study of hosiery. The essential standards for Apparel and Textile Production, while vaguely stated, encompass a depth of knowledge about pattern engineering, North Carolina's rich history in the field of textiles industry, as well as textile science and development. Geometry skills will be strengthened as students participate in the assigned hosiery construction project. Applying practical math skills, with precision, as stated in the common core math practices, are crucial to designing and executing a product that, while one dimensional in its inception, must fit properly to the human form (cylinder like). Other components of this curriculum challenge the student to study, reflect, write, and argue topics centered on hosiery. Some topics include modesty, hosiery for both genders, and science history with regards to knitting technology. Women entering the workforce, super heroes, and medical innovation are other topics of interest to investigate using various media (social media, art, and journaling).

### **Common Core State Standards**

#### Writing and Language Standards 6-12

- W1 - Write arguments to support claims with clear reasons and relevant evidence.
- W2 - Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- W9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.
- L4 - Determine or clarify the meaning of unknown and multiple meaning words and phrases based on grades 11-12 reading and content, choosing flexibility from a range of strategies.

#### Geometry-Congruence and Modeling

Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.)

Use geometric shapes, their measures, and their properties to describe objects (e.g. modeling a tree trunk or a human torso as a cylinder).

Apply geometric methods to solve design problems (e.g. designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

#### Apparel and Textile Production I

- 1.01 Remember the apparel industry.
- 1.02 Understand apparel design.
- 2.01 Understand fibers, fabrics, and finishes.
- 3.00 Understand apparel engineering.

#### Apparel and Textile Production II

- 1.02 Understand technical design and textile science.
- 2.01 Understand product construction.

## Appendix 2: Resources for Teacher and Student

*A Leg Up (Stockings)*. Films Media Group, 2013. DVD.

A short summary of hosiery history. This is part of the series, "A Stitch in Time". Quite expensive to purchase for the classroom, but was found at the university library.

Barnwell Andrews, Mildred. "Development of Hosiery Knitting." *Development of Hosiery Knitting*. January 1, 1953. Accessed November 26, 2014.

<http://www.textilehistory.org/Development/HosieryKnitting.html>.

Although a dated article, it gives a great written account of the technology of knitting. This article should be used for the curriculum activity, "The Story of Knitting".

Bell, Jennie. "All-American Sock Brand Debuts Running Line." *WWD*. October 17, 2014. Accessed November 26, 2014. <http://www.wwd.com/footwear-news/markets/all-american-sock-brand-debuts-running-line-7989713>.

A supplemental article for students to read for current trends in the industry.

"Free Technology for Teachers." *Free Technology for Teachers*. Accessed October 26, 2014. <http://www.freetech4teachers.com/>.

An up to date resource for teachers. This website helps the teacher to find free technology resources for the classroom.

"Hosiery Buzz: L'eggs, Commando & More." *WWD*. April 15, 2014. Accessed October 27, 2014. <http://www.wwd.com/footwear-news/markets/hosiery-buzz-leggs-commando-more-7642638>.

Information on the new idea for a "dig-free" legwear. It is recommended that the teacher subscribe to *WWD* to give students daily news in the fashion industry. *WWD* is the leading trade publication in fashion.

"Infinite Variations." *SnippQR Custom QR Codes*. Accessed October 26, 2014.

<http://qr.snipp.com/>.

Provides assistance for creating QR codes.

Karr, Arnold J. "Men Pace Growth in Sock Sales." *WWD*. October 2, 2014. Accessed October 27, 2014. <http://www.wwd.com/menswear-news/clothing-furnishings/men-pace-growth-in-sock-sales-7964997>.

A good read to remind students of the need and trend for hosiery among men.

Monget, Karyn. "Hosiery Expands Fashion Footprint." *WWD*. January 3, 2014. Accessed October 27, 2014. <http://www.wwd.com/markets-news/intimates-activewear/hosiery-expands-fashion-footprint-7330860>.

A great read about hosiery trends and the growing trend for fashionable hosiery.

"QR Codes in the Classroom." Kathy Schrock's Guide to Everything. Accessed November 13, 2014. <http://www.schrockguide.net/qr-codes-in-the-classroom.html>.

An introduction to using QR codes for student assignments and engagement. A great resource for the novice.

"THE NEW WAY TO WORK WITH DOCUMENTS." TagMyDoc. Accessed November 13, 2014. [http://www.tagmydoc.com/?l=en\\_US](http://www.tagmydoc.com/?l=en_US).

### Appendix 3

#### Activity Resources (See following pages)

1. Construction Project: “Performance of Fabric and Fibers in Hosiery”
2. Grafitti Board: Cards for students, “Hosiery for All”
3. Super Hero Tic-tac-toe assignment grid

4. [www.flinnsci.com](http://www.flinnsci.com)

Small Scale Synthesis of Polymers Activity Station Kit Item # AP7371

Mystery of Nylon Factory Chemical Demonstration Kit Item # AP2088

Polymers, Polymers, Polymers Chemical Demonstration Kit Item # AP4426

5. [www.youtube.com/watch?v=1AESWxko4nI](http://www.youtube.com/watch?v=1AESWxko4nI)

What is Viscosity?



## Performance of Fabric and Fibers in Hosiery

### Standards

CCLiteracy	
CCMath	
ATPI	
ATPII	

<p>Pattern engineering A T P 3 . 0 1 T e x t i l e s A T P 1 . 0 2</p>	<p>Demonstrate how to take measurements at certain points of the leg. Select model for whom the stockings will be made. Take measurements. Create a pattern for a pair of stockings that reach 9 inches above the knee. Use the assigned materials and layout for a pair of stockings.</p> <ul style="list-style-type: none"> <li>• Woven cotton with lengthwise grain</li> <li>• Woven wool with lengthwise grain</li> <li>• Woven cotton on the bias</li> <li>• Woven wool on the bias</li> <li>• Woven cotton on the horizontal grain</li> <li>• Stretch knit cotton</li> <li>• Stretch knit nylon</li> </ul>					
<p>Materials and Equipment</p>	<p>Internet access for researching patterns for leggings/socks 6 yards of lightweight woven wool 10 yards of cotton flannel 3 yards of jersey cotton and 3 yards of tricot Serge machines, conventional machines and thread Bulletin board paper for making patterns Pencil French curve, T-square, Yard stick, Tape measure Ball point sewing machine needles, Glass head straight pins</p>					
<p>Day One (90 minute class)</p>	<p>Preparation</p>	<p><b>Measuring</b></p>	<p><b>Research and Collaborate approach to pattern</b></p>	<p><b>Pattern Drafting</b></p>	<p><b>Plan steps for construction and fitting</b></p>	
<p>Day Two (90 minute class)</p>		<p>Layout, Cut, and Construction</p>				
<p>Day Three (90 minute class)</p>		<p>Finish Construction/Fitting/Make necessary changes Document Process/challenges</p>				
<p>Day Four (90 minute class)</p>		<p><b>Fitting Test</b></p>	<p><b>Movement Test</b></p>	<p><b>Resiliency and Elasticity Test</b></p>	<p><b>Abrasion Test</b></p>	
<p>Day Five (90 minute class)</p>		<p>Conclusion Questions for Inquiry Present Conclusions thru Google Docs</p>				

**Graffiti Board: Use the following to make group cards.**

Women swimming at the ocean in 1800s	
60 year old man with diabetes (present day)	
Roller derby girls	
Soldier in 1890	
Soldier in the Korean War	
Native American	
European men from 15 <sup>th</sup> century	
Men in the 13 <sup>th</sup> century	
Soldier in the Korean War	
Native American	
European men from 15 <sup>th</sup> century	
Men in the 13 <sup>th</sup> century	

## Super Hero Tic-Tac-Toe

**Directions:**

1. Choose 3 Super Hero boxes (must be 3 in a row – diagonal, across, vertical).
2. Use the internet to research the time period in which the hero debuted.
3. You will create a brief comic strip (at least 6 blocks) for each super hero. The comic strip will become a fun and imaginative way to summarize the science culture of that time.

[http://en.wikipedia.org/wiki/List\\_of\\_superhero\\_debuts#Comic\\_book\\_6](http://en.wikipedia.org/wiki/List_of_superhero_debuts#Comic_book_6)

<b>Wonder Woman (1941)</b>	<b>Spider Man (1962)</b>	<b>X-Man (1994)</b>
<b>Robin (1940)</b>	<b>Barbara Gordon (1985)</b>	<b>Phantom (1936)</b>
<b>Zorro (1919)</b>	<b>Bat Man (1939)</b>	<b>Superman (1934)</b>

<b>Black Canary (1947)</b>	<b>Super Man (1934)</b>	<b>Elastic girl (2004)</b>
<b>She-Hulk (2008)</b>	<b>"Flash" Gordon (1940)</b>	<b>Cat Woman(1940)</b>
<b>Wonder Woman (1941)</b>	<b>Captain America (1941)</b>	<b>Jesse Chamber (1992)</b>

<b>Miss Martian (2006)</b>	<b>Peter Pan (1904)</b>	<b>Anna Mercury (2008)</b>
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<b>Atari Force (1982)</b>	<b>Plastic Man (1941)</b>	<b>Batman (1939)</b>
<b>Spiderman (1962)</b>	<b>Power Girl (1975)</b>	<b>Robin (1940)</b>

<b>Cat Woman (1940)</b>	<b>Peter Pan (1904)</b>	<b>Phantom (1936)</b>
<b>Anya Corazon (2004)</b>	<b>Dazzler (1980)</b>	<b>Batman (1939)</b>
<b>Plastic Man (1941)</b>	<b>Bionic Woman (1975)</b>	<b>Spiderman (1962)</b>

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## Notes

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