

Heart & Sole

Samples of Possible Common Core and TN Academic Standards to Incorporate:

As you read the activities, keep in mind the specific skills your students need to practice and master in the different grade levels and use them to guide your approach in how you present the activities and what you have the students do. We encourage you to add additional SPIs and Academic Vocabulary in your plans that are outside the specific ones listed below as there are many which apply and are not listed below.

Kindergarten:

- W.K.3. Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.
- 7.T/E.2 Invent designs for simple products.

1st Grade:

- W.1.3. Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.
- 7.T/E.3 Use tools to measure materials and construct simple products.

2nd Grade:

- 2.MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories.
- W.2.3. Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.
- 7.T/E.2 Invent designs for simple products.

3rd Grade:

- 3.MD.3. Draw a scaled picture graph and/or a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 shoes.
- W.3.3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. Establish a situation and introduce a narrator and/or characters; organize an event sequence that unfolds naturally. Use dialogue and descriptions of actions, thoughts, and feelings to develop experiences and events or show the response of characters to situations. Use temporal words and phrases to signal event order. Provide a sense of closure.
- 7.T/E.4 Evaluate an invention that solves a problem and determine ways to improve the design.

4th Grade:

- W.4.3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.
- Use dialogue and description to develop experiences and events or show the responses of characters to situations. Use a variety of transitional words and phrases to manage the sequence of events. Use concrete words and phrases and sensory details to convey experiences and events precisely. Provide a conclusion that follows from the narrated experiences or events.

5th Grade:

- 5.G.2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
- W.5.3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally. Use narrative techniques, such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations. Use a variety of transitional words, phrases, and clauses to manage the sequence of events. Use concrete words and phrases and sensory details to convey experiences and events precisely. Provide a conclusion that follows from the narrated experiences or events.

6th Grade:

- 6.NS.8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane.
- W.6.3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. Engage and orient the reader by establishing a context and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another. Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events. Provide a conclusion that follows from the narrated experiences or events.
- 7.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications.

7th Grade:

- W.7.3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. Provide a conclusion that follows from and reflects on the narrated experiences or events.

- 7.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications [and know that the engineering design process involves an ongoing series of events that incorporate design constraints, model building, testing, evaluating, modifying, and retesting].

8th Grade:

- W.8.3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters. Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. Provide a conclusion that follows from and reflects on the narrated experiences or events.
- 7.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications [and know that the engineering design process involves an ongoing series of events that incorporate design constraints, model building, testing, evaluating, modifying, and retesting].

9th-10th:

- W.9-10.3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.
- Use a variety of techniques to sequence events so that they build on one another to create a coherent whole. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.
- 0.T/E.2 Apply the engineering design process to construct a prototype that meets developmentally appropriate specifications.
- 0.T/E.5 Design a series of multi-view drawings that can be used by other students to construct an adaptive design and test its effectiveness.

11th-12th:

- W.11-12.3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.
- 0.T/E.5 Design a series of multi-view drawings that can be used by other students to construct an adaptive design and test its effectiveness.

- O.T/E.2 Apply the engineering design process to construct a prototype that meets developmentally appropriate specifications.
Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution).
Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.
Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.

Samples of Possible Academic Vocabulary to Incorporate:

For the Academic Vocabulary we encourage you to use as many of these words as possible, not simply pick one or two. The more words we can introduce in a setting that makes sense to our students, the better.

Kindergarten:

- Pattern
- Tools
- Natural
- Compare
- Contrast
- Human
- Basic needs (food, clothing, shelter)
- Wants
- Map
- Globe

1st Grade

- Sequence
- Predict
- Property
- History
- Past
- Present
- Future

2nd Grade

- Similarities/Differences
- Foot
- Pre-write
- Draft
- Edit

3rd Grade

- Tools
- Cause
- Effect
- Punctuation
- Verb

4th Grade

- Prediction
- Compare
- Contrast

5th Grade

- Theme
- Prompt
- Visual Image
- Punctuation marks

6th Grade

- Cause and Effect
- Criteria
- Similarity
- Design Constraint

- Prototype

7th Grade

- Impact
- Interaction with texts

8th Grade

- Sequence
- Human Impact
- Reasoning

- Ancient

- Property
- Function

- Vernacular
- Mood/tone
- Revision

Heart & Sole

Accessing Prior Knowledge:

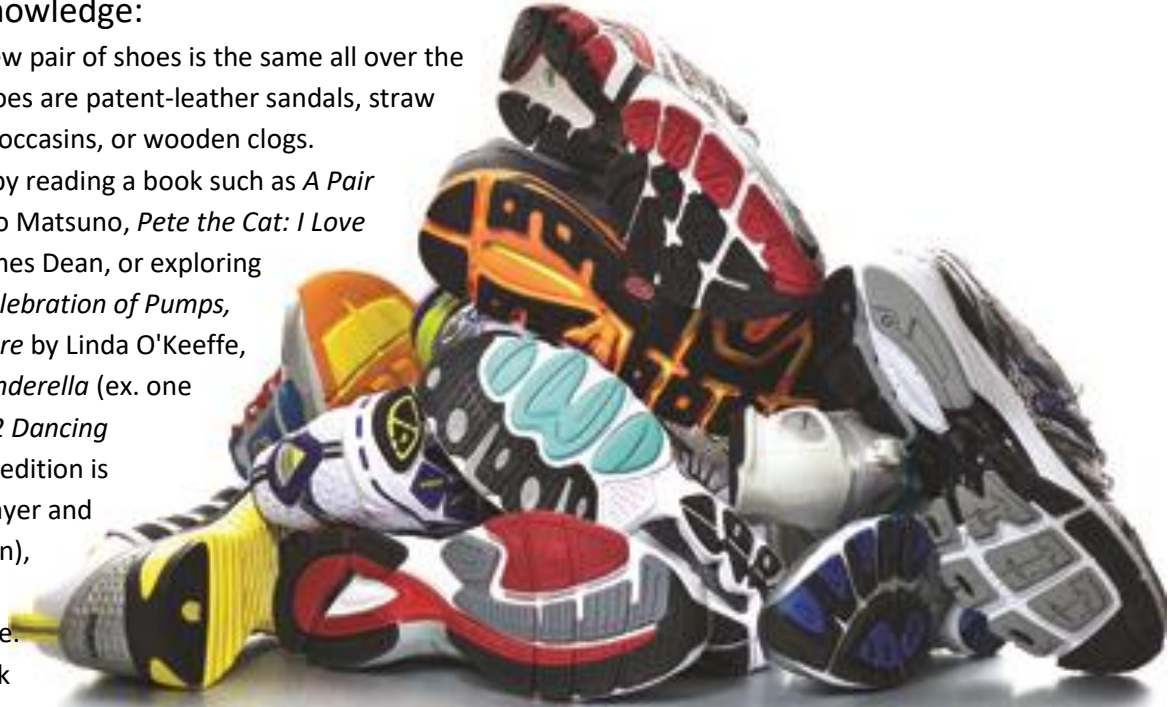
A child's delight in a new pair of shoes is the same all over the world, whether the shoes are patent-leather sandals, straw alpargatas, deerskin moccasins, or wooden clogs.

Introduce the subject by reading a book such as *A Pair of Red Clogs* by Masako Matsuno, *Pete the Cat: I Love My White Shoes* by James Dean, or exploring a book like *Shoes: A Celebration of Pumps, Sandals, Slippers & More* by Linda O'Keeffe, or even a version of *Cinderella* (ex. one by K.Y. Craft), or the *12 Dancing Princesses* (a beautiful edition is retold by Marianna Mayer and another by Errol Le Cain), classic stories in which shoes play a critical role.

Place the selected book in front of the students and have

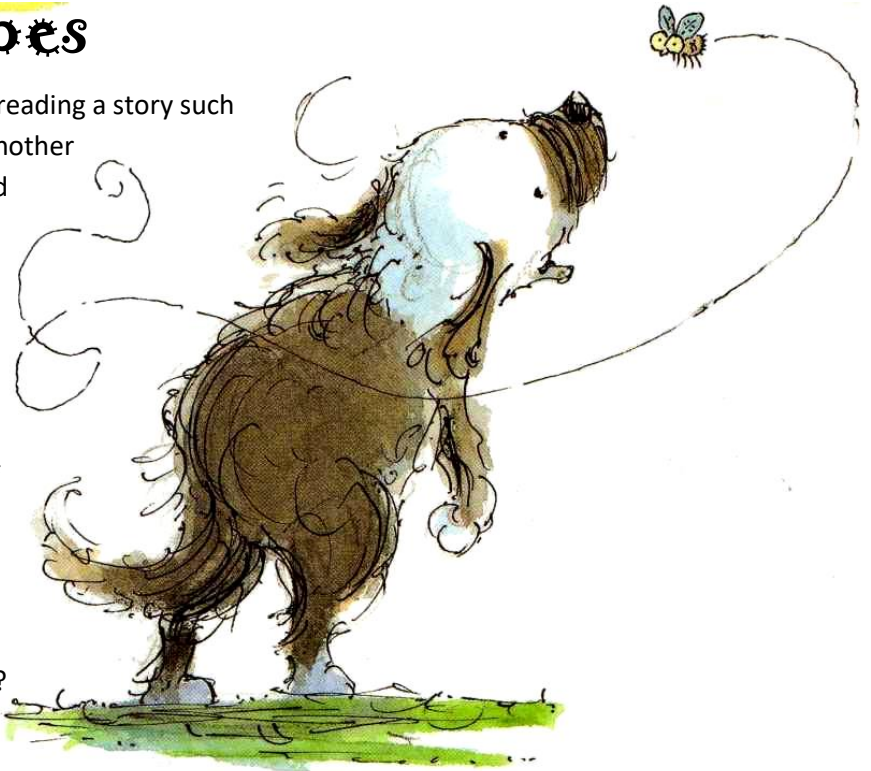
the students look at the picture and title on the cover and use their schema (student's own experiences and background knowledge) to make predictions about the story. Model this procedure for your students. After they have settled in for read aloud we discuss what is on the board and make predictions as a group about the story. When students are given the opportunity to use their schema prior to opening the book they are often more engaged in the reading because they want find out if their predictions are correct.

And/Or: Explore what they already know by doing a Class Brainstorm. After writing a word or phrase in a circle (whiteboard, poster paper) have students write as many words connected to it that they can think of around it. For example, you might write "shoes" in the center and kids write things like, "new," or brand names or anything else they associate with shoes. Have students use a timer with this activity to create a sense of urgency (which adds to the fun). Keep the web visible throughout the project and refer to it as you explore shoes in-depth, even asking them to add words and facts to it. This also may be done individually if you want to have students create personal webs and you could structure it like Scattergories—students get points or extra points for anything they think of that no one else did.



A Mile in My Shoes

You may wish to introduce this section by reading a story such as *Mutt Dog* by Stephen Michael King or another which allows you to discuss perception and perspective (ex. *Not a Box* by Antoinette Portis, or *Duck! Rabbit!* by Amy Krouse Rosenthal and Tom Lichtenheld.) Discuss perspective with the students. Sample Discussion Points: How do we perceive other people, or stray dogs like *Mutt Dog*? How do we look at him at the beginning of the story? How do we perceive him after seeing his story? How did the other characters in the book treat him, or see him? What made the difference by the end? Who sees a duck? Who sees a rabbit? Is it a box? Or more than a box? If we see things differently does that really mean someone has to be wrong?



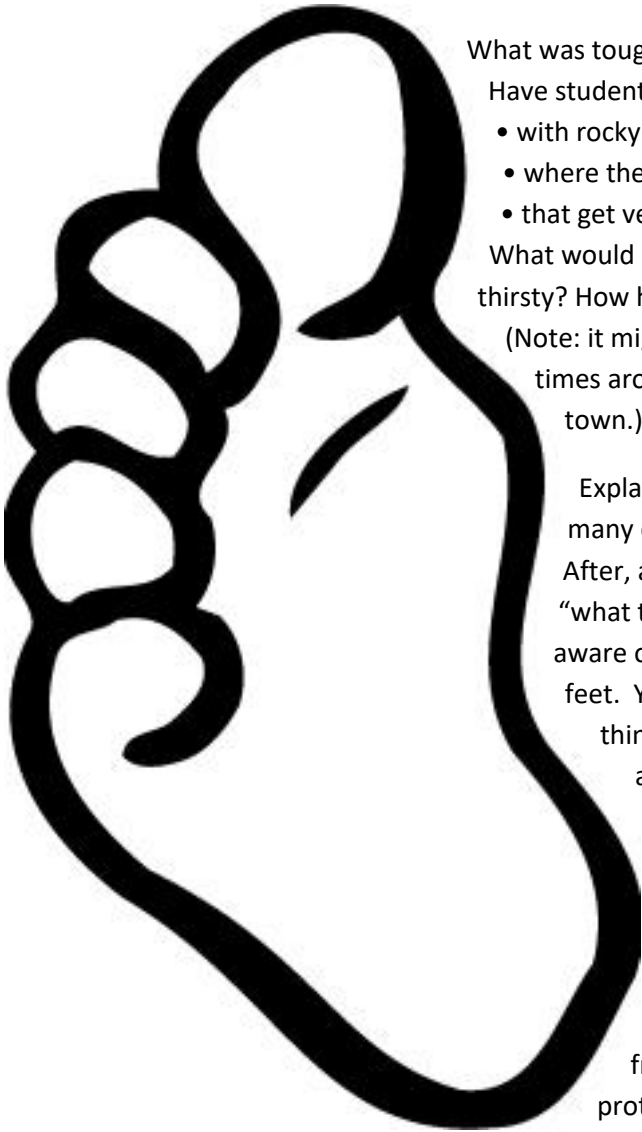
Prepare students to step into someone else's shoes, or lack thereof, and see the world from a different perspective. In *To Kill a Mockingbird*, Atticus explains to Scout that "You never really understand a person until you consider things from his point of view...until you climb into his skin and walk around in it" Others say "Never judge a person until you've walked a mile in their shoes." As we log miles in the shoes of other people, we learn that the desire to judge disappears. It's been replaced with respect, understanding and compassion. Make this advice more literal by inviting students to imagine spending a day in someone else's shoes in this writing activity.

Use creative ways to make it personal and relevant to your students. For example:

- Run a set of relays, without their shoes on,
- Have kids experience what it's like to walk barefoot on different terrains, like sand and gravel
Have the students simply participate in a barefoot walk together or by using a Walk Box (bins, boxes, or aluminum containers lined up) or a mat on the floor with easily available materials, ex. sand, straw, gravel, or other materials placed in piles along the walkway.

Whichever way works best for your students spark conversation about how it can be tough to walk without shoes. Stroll around your area with your class, and along the way, talk about what surfaces are hard to walk on, what are easy. You can do this in or outside, whatever works best for your space.

What surfaces were easy to walk on?



What was tough?

Have students think about places:

- with rocky terrain
- where the ground is very hot
- that get very cold in the winter

What would it be like to be barefoot in those places? Are your students thirsty? How hard would it be to walk a mile to collect water barefoot?

(Note: it might be useful to help kids understand how far a mile is – 4 times around the running track, or from the school to X location in town.)

Explain that your students experienced for a few moments what many children around the world experience every single day! After, as the students complain about their aching feet, and that “what the heck is on the bottom of my foot???” feeling. We are so aware of when something doesn’t belong on the bottom of our feet. Yet children, youth, and adults every day run around in things that we would never dream of touching. Tell students about the 400 million youth that go without all the time. In Ethiopia, approximately 1 million people are suffering from podoconiosis, a debilitating and disfiguring disease causes extreme swelling, repeated ulcers and deformity in the feet and legs caused by walking barefoot, and eventually makes it so they cannot walk at all. And the lack of shoes prevents many children around the world from getting food, water, education or health care. Shoes protect feet on long walks, and in a lot of places, shoes are required to go to school.

We might not spend a lot of time thinking about other people’s shoes, but they can have a real impact on a life. What kind of shoes are in the classroom?

One Shoe, Two Shoes, Red Shoe, Blue Shoe!

Students will create a bar graph listing different characteristics of shoes according to different characteristics determined by students, ex. Graph shoes by color, type of



closure, and style, or as work shoes, play shoes, sandals, flip flops, shoes with laces, buckles, slip-on, Velcro, and so on.

Needed Materials

- pieces of posterboard, paper, or carstock with X and Y-axes drawn on them
- 2" x 12" strips of red, blue, yellow, and green construction paper or stickers in appropriate colors
- Glue
- scissors

1. Place students into groups of 4-5 students each.
2. Tell the class, that without looking at other students' shoes, they are going to predict how many of each type of shoe (sneakers, boots, sandals, other) are in the class.
3. Ask the students to write down an individual prediction as to how many of each type of shoe they think are in the classroom.
4. After writing down individual predictions, have students discuss as a group the predictions and come up with a prediction for each type of shoe. At this point, students may look at the shoes in their group. Using this sample, groups may adjust their predictions.
5. Give each group a strip of each color of paper for the chosen categories. Ex. Red could be for sneakers, blue for boots, yellow for sandals, and green is for any other types of shoes. 1" of paper represents one pair of shoes.
6. Students then create a bar graph on their poster board using their strips of paper for the bars.
7. Have students share their predictions with the class.
8. Now count the actual number of each type of shoe in the class. Option: Have everyone sit in a huge circle and take off one shoe and set it in the middle so all can see the collection. Using the same colors and scale, create a graph which describes the actual number of each type of shoe.
9. Compare the students' estimates to the actual numbers. Ask students to look at the shoe graph and tell you "Which kind of shoe do we have most of? Which kind of shoe do we have least of? Are there any lines that have the same or an equal amount?" Encourage them to summarize what they learned from the information on the graph.
10. Discuss how accurate their estimates were. Discuss how effective a sample may or may not be in determining actual amounts. Discuss how samples are used in our society (i.e. polls, census.)

Stretch! Writing Warm-Ups:

Just as you would stretch before you go running, students need to warm up before they start writing:

Sentence Mix-Up

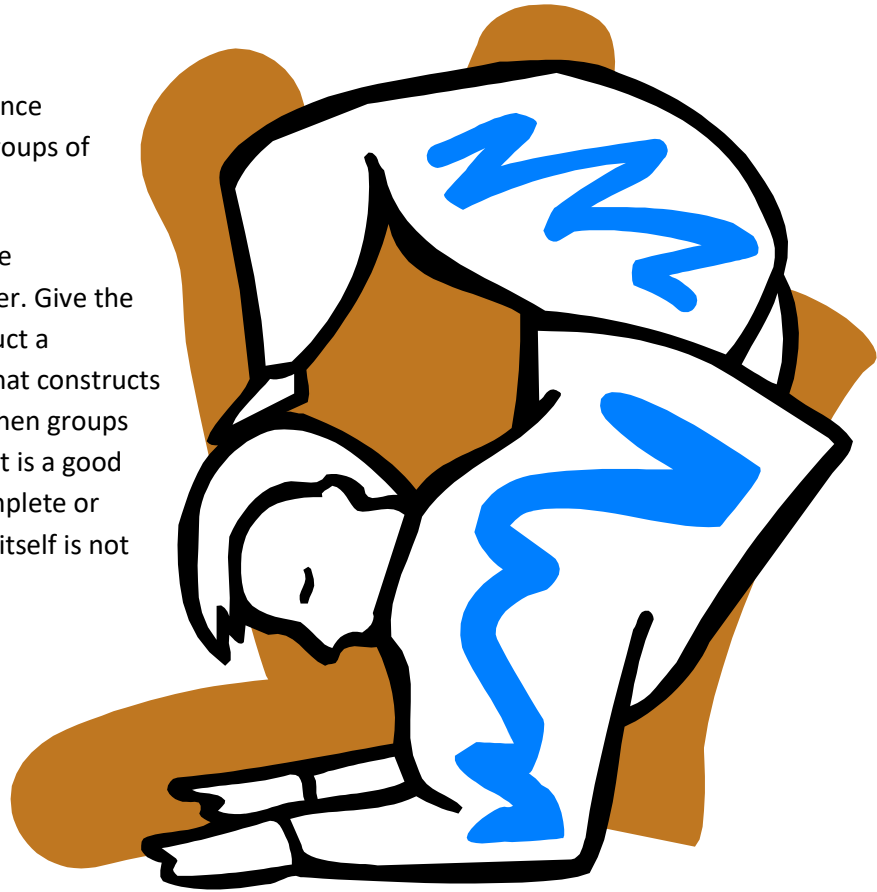
This game encourages an awareness of sentence structure and can be played successfully in groups of three or four.

Write ten words on the board. They should be interesting, though unconnected to each other. Give the class a set time limit, and ask them to construct a coherent sentence around them. The team that constructs the best sentence the fastest gets a point. When groups end up with run-on sentences or fragments, it is a good time to discuss what makes a sentence incomplete or run-on. They also cannot win if the sentence itself is not correctly structured.

An example of a successful sentence follows:

jewelry	shattering	ruffled
hurtled	dashing	rain
coffee	clumsy	hippopotamus

Dashing through the rain, the clumsy hippopotamus tripped and was hurtled through the jewelry store window, shattering the porcelain coffee cups and scaring the ruffled salesman.

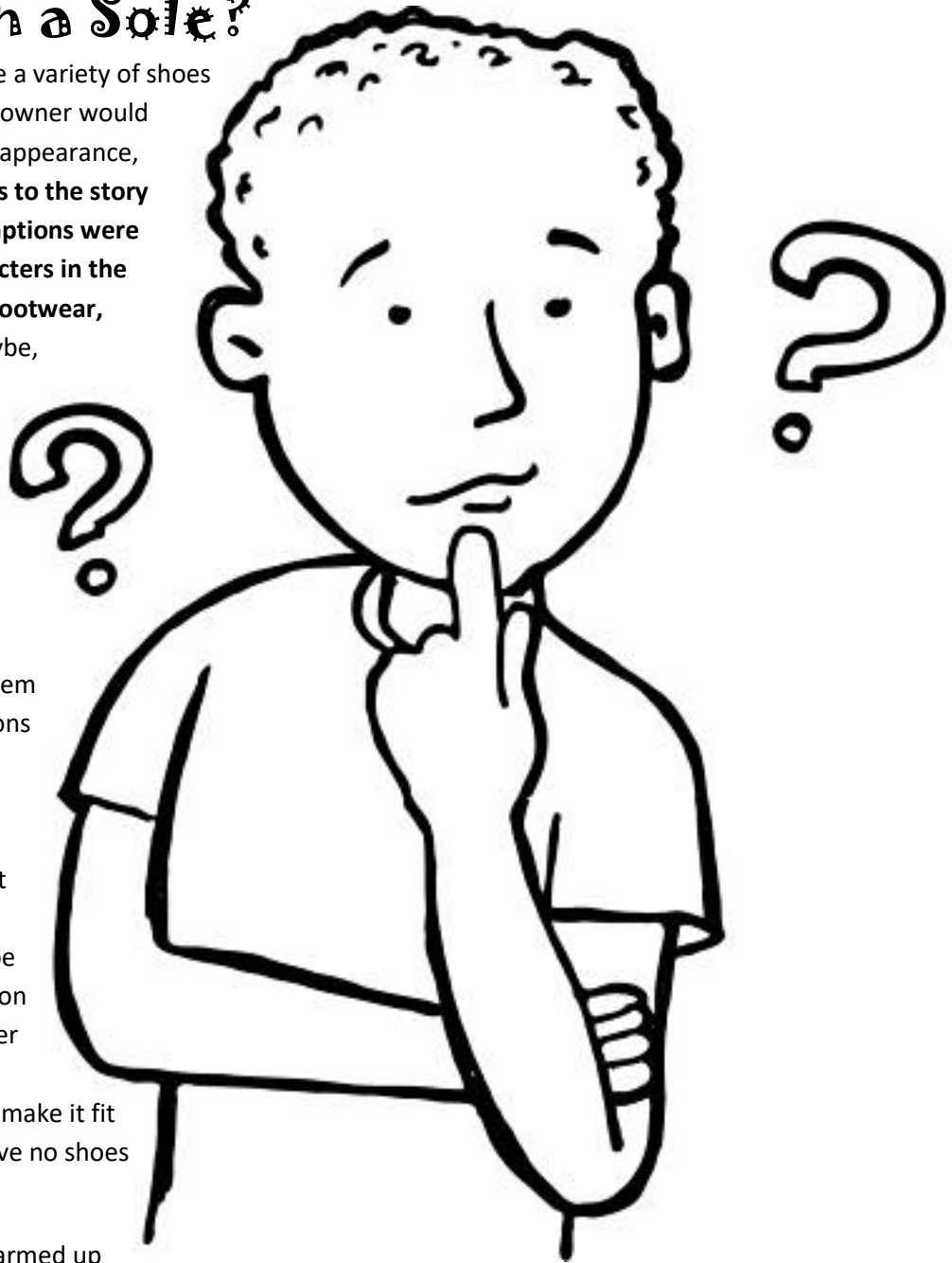


What's in a Sole?

Have students examine a variety of shoes and envision what the owner would look like, such as their appearance, actions, etc. **Relate this to the story you read. What assumptions were made about the characters in the book related to their footwear, about Cinderella?** Maybe, there's a story to tell here, too. Maybe, there are assumptions we make about the person who walked in these shoes.

Have students write them down. What assumptions do they automatically have, ex. is it really a man's shoe? Could a woman have worn that shoe? Why might she have? Does a large shoe mean that a large person wore it? Might a smaller person have worn it? Why? How might they make it fit them? What if they have no shoes at all?

Once students have warmed up and have successfully practiced structure have students begin the process of writing a narrative.



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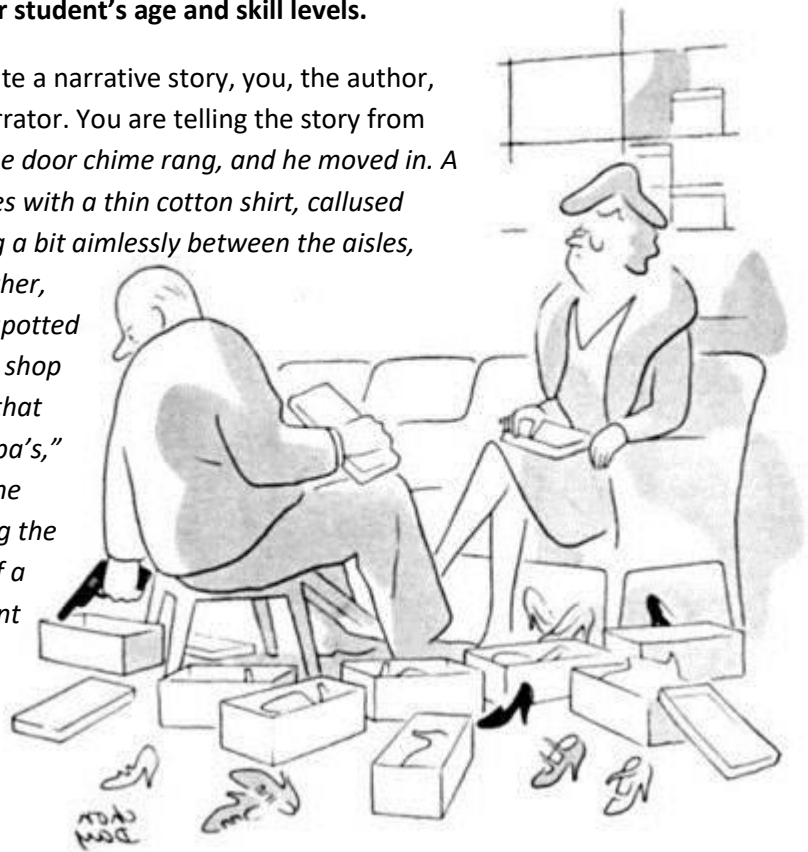


There Was an Old Woman Who Sold Me, her Shoe!

Have students imagine they are a used shoe store owner with many shoes on their shelves that they need to sell. Have students look at images like the included pictures (or many possible others you may choose from, available through clip

art and search engines) and match shoes with a person. Why did they choose that person? What is the connection they see between the person and the pair of shoes? The students will tell the story of where those shoes will go, and what those shoes will see during a day in their shoe owner's life. Note: With younger students this can be a class/group storytelling project. **Practice grade level appropriate writing skills as guided by the standards for your student's age and skill levels.**

Discuss with students that in order to write a narrative story, you, the author, should take on the perspective of the narrator. You are telling the story from the eyes of an outsider looking in. (ex. *The door chime rang, and he moved in. A young man, a little worn around the edges with a thin cotton shirt, callused hands, and a hole in his jeans. Wandering a bit aimlessly between the aisles, looking and rejecting one shoe after another, finally the young man's eyes lit up as he spotted an old tattered leather pair of loafers the shop owner had moved off the back shelf just that morning in order to dust. "Just like Grampa's," he whispered, carefully lifting one from the shelf and running his callused finger along the thin sole, nails picking at the beginning of a hole in the well-worn leather. "Oh! I meant to put those in the garbage bin," the shop owner said, "sorry, they're not for sale."*), as opposed to a first-person



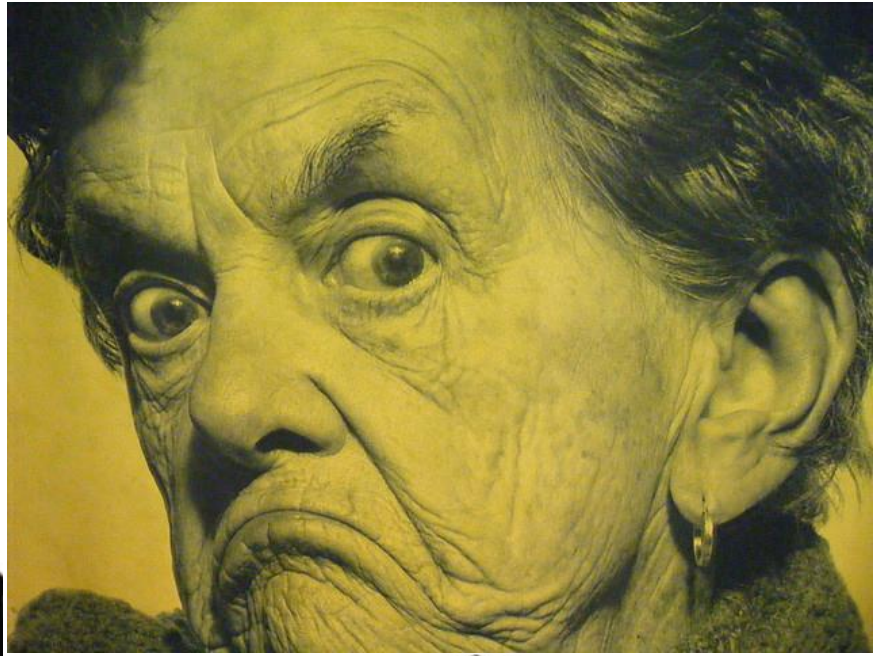
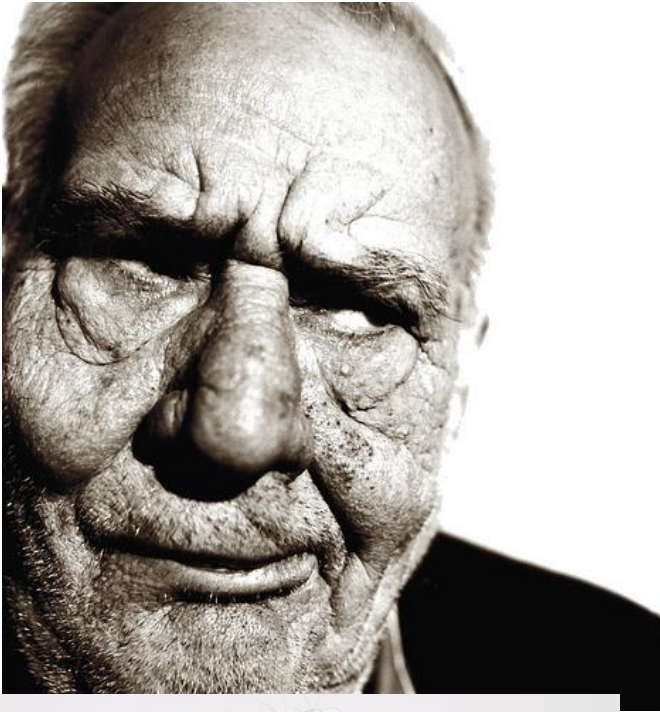
story, where you, the author, would be the main character (the shoes or the person who bought them) telling it from your own eyes, your own perspective (ex. *"I had been waiting on the shelf for years, lost in my memories of crooked toes with swollen joints slipping out through a thin cotton sock, the thump of my soles as he'd hit the pavement, the ache from my laces being stretched too tight over swelling feet at the end of a long day. I saw him come in with a ring of bells, that face I knew so well, but it was younger than I remembered. The leather of his skin was soft and shiny, not cracked and stretched until it bagged, like I remembered him the last time he put me on. But when he picked me up, the eyes were the same as always, and his hands felt familiar."*) **Give examples of the two perspectives and brainstorm some more ideas, put short notes on the board.** Rather than summing things up for their reader, encourage students to present the experience and allow their audience to draw their own conclusions. **How do you do that?** The narrative essay makes its point by subtly guiding the reader, rather than battering them the way another type of essay, like a rhetorical, might.

Editing for Content & Clarity:

Practice grade level appropriate editing skills as guided by the standards for your students' ages and skill levels. Encourage and guide students to develop their stories using effective technique, descriptive details, and clear event sequences. It helps to orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.

During discussion, revision and editing process, and through explicit support, as is grade level appropriate, guide students to use narrative techniques, such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations. As appropriate to skill and grade level, students should use a variety of transitional words, phrases, and clauses to manage the sequence of events. Use concrete words and phrases, precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and precisely. Students should provide a conclusion to their story that follows from the narrated experiences or events.









That's No Brain Cloud! It's Raining Ideas!

After your group brainstorming session, pass out the graphic organizer sheet. Have students brainstorm their own ideas and write down their thoughts on the graphic organizer and continue to develop their ideas on the worksheet.

Encourage students to narrow down the topic of their story to just one short episode in their character's life that illustrate the main point that they want to make in their story. Model how to do this (and the following techniques) by quickly creating a sample class story.

Practice crafting an introduction that captures the reader's attention. Discuss with students that when telling a personal narrative, they can bypass the traditional mode of essay writing, in which they compose an introduction that tells the reader exactly what the essay is going to contain. Instead, they can begin right in the middle of your story or at the end of the story, flashing back to the beginning if they wish. Personal narrative stories give creative license that they don't have with other types of essay writing.

Have students complete their narrative by telling the remainder of their story. Things for students to consider as they write their essay include the tense (are you writing about the past or is it happening right now, in the present), the tone of the writing (what feelings they want to evoke) and how characters other than the main one will be allowed to speak within the narrative. Dialogue between characters can be a really entertaining way to



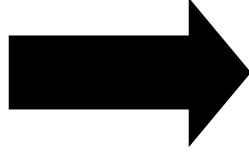
construct their narrative. This can be like the audience is

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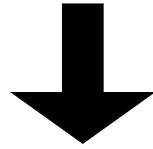
What is the **main idea** of your experience or story?

Who is your main character?

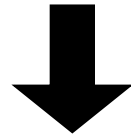
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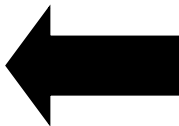
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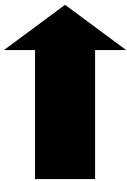
What does your character **see** during this experience?



Describe how your character **feels** during this experience:



What do they **hear** during this experience?



Closing Sentence:

After they finish their first draft, have students do their revisions according to their grade level skills, those listed in the SPIs, looking up synonyms for words they used frequently, checking grammar and punctuation, editing for conciseness, etc.

5 Things to Think about When Writing & Editing:

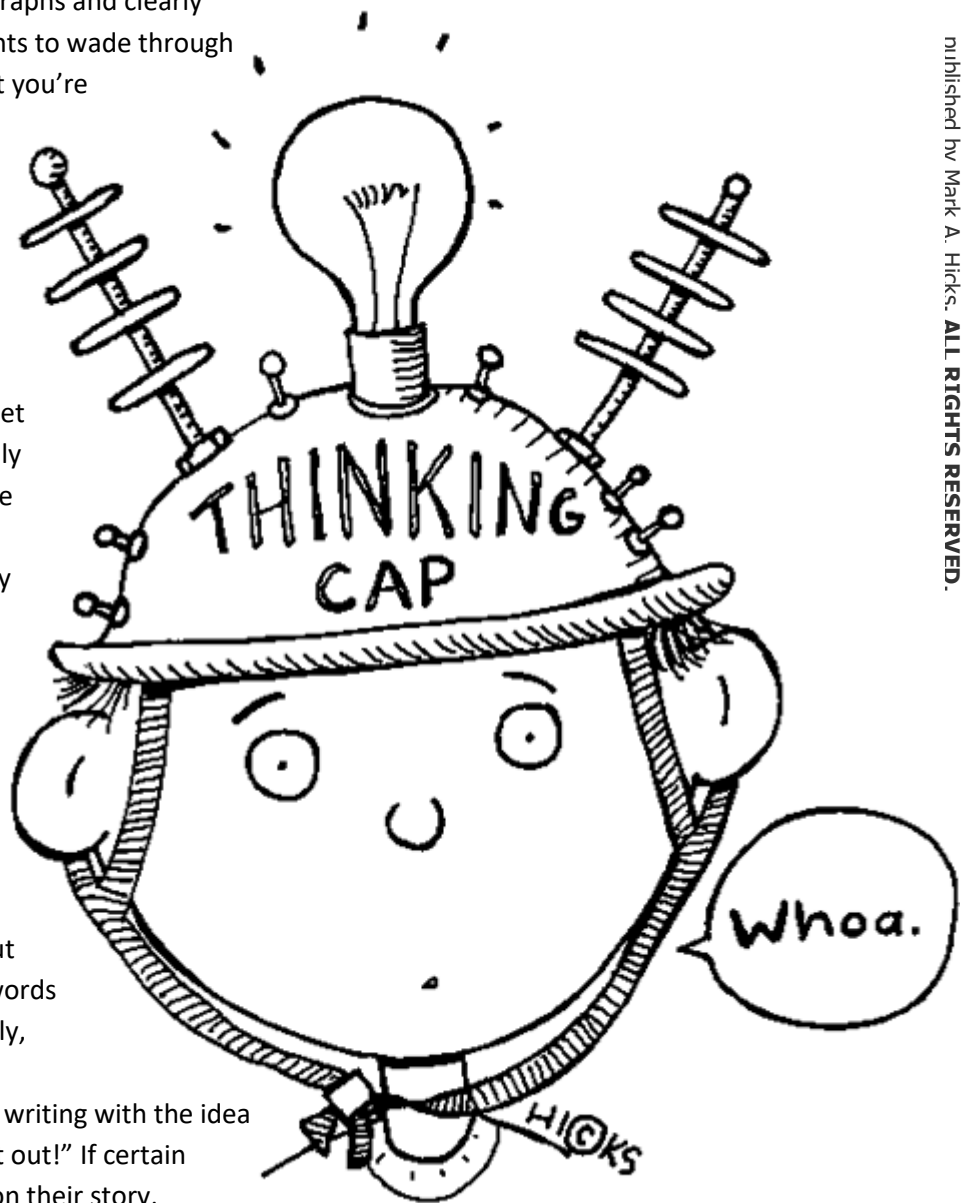
1. Clarity. Overly fancy complex words and sentence styles with extra fluff can be a hindrance to clarity and should be avoided. Ideas should be clearly distributed between sentences and paragraphs and clearly illustrated as well. No one wants to wade through a lot of words to find out what you're trying to get at.

And, if what you've written isn't clear, you might as well have written it in a foreign language that your audience can't read. So how do students determine whether their writing is clear? Simple: let someone else read it. Don't rely on your own intuition. Because you know what you meant to say, you'll likely be blind to any ambiguity that has crept in. What you meant to say doesn't matter—all that matters is what you wrote.

2. Less is More: Teach students to throw out the worthless intensifiers, such as very, totally and really, without remorse. Cut down on extra words like so, just, that, also, seriously, because, usually, and this.

Teach them to approach their writing with the idea that "...when in doubt, leave it out!" If certain words don't make an impact on their story,

they're just sitting there taking up space, take them out or replace them. It's better to have a short and well written piece with, clarity, accuracy, brevity, and vivid words instead of one filled with rubbish! Let



the verbs do their job and show the action!

Example: Although I have really never been to the races before, I was seriously excited to behold them, yet also somewhat nervous, because of the type of people who go there.

Improved: I'd never been to a horse race. I was excited to go, but also a little nervous, since I wasn't sure about the people at the track.

It's important to remember, though, that words only count as rubbish if they do not convey any useful meaning. Getting rid of the trash doesn't mean they have to strip everything down to the bare bones, it means we are wanting students to write with accuracy and clarity and make sure every word is important. Sometimes getting rid of the rubbish forces them to reconsider their whole sentence, and they end up with more words.

3. Show Not Tell: It's always best to *show* the audience what's happening and have them reach the conclusion, not simply tell them that a man is peculiar. Show them through description and let the audience reach their own conclusion. But you don't want to tell each and every little movement.

Example: The apartment was rather messy and everyone was watching TV when I came over. I knew it would be hard to get their attention.

Improved: Peeking through the open door, I noticed the tattered posters tacked up on the walls and the stacks of crusty dishes congealed by the sink. I knocked, but everyone's eyes stayed riveted to a TV where M*A*S*H boomed, even when I hollered "Hello!"

Which sentence gives a better mental picture?


4. To interest the reader, vivid writing and dynamic word choice is key. Have students look in a thesaurus for vivid synonyms to those words that could be used instead, to spice up their stories. Have students create word banks to help write their stories.

5. Avoid sounding too stuffy. When telling a story, it's always best to write as though *you* are *telling* a story. Write how you, or your character, would actually speak.

Example: I am presented a book containing a wide array of unpleasant photos in which many casualties are shown after automobile accidents and I found it rather distasteful.

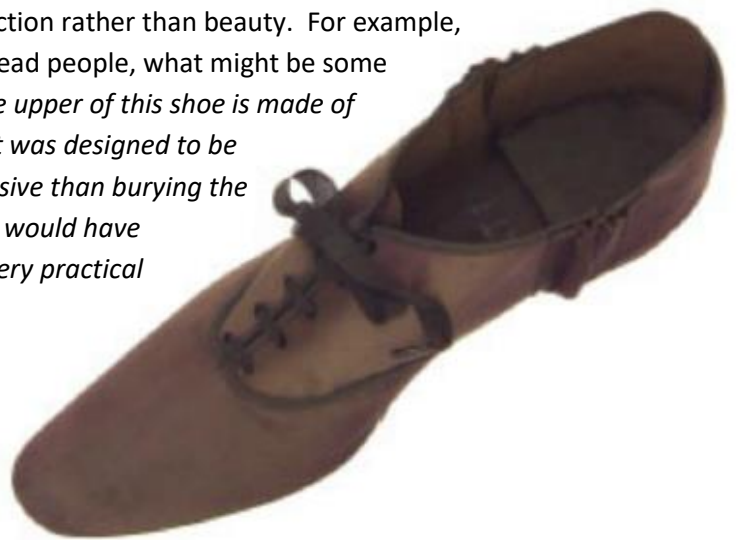
Improved: They handed me a book stuffed with gruesome pictures of people who'd been in car wrecks and I had to close my eyes or I'd be sick.

Function Over Form?



Although the human foot has remained unchanged for thousands of years, what people have worn on their feet shows incredible diversity. It is in this diversity that some of the most interesting aspects of culture are revealed. Shoes have been woven through stories and tales and trails all around the world as long as humans have existed. **(What stories can the students think of? ex. Cinderella is the obvious first...then there's Anderson's "Little Match Seller", who has her shoes stolen by ragamuffins. There's Inge, "The Girl Who Trod on a Loaf," who uses some bread to protect her precious shoes from water. There's also the girl from "The Red Shoes", which is quite a creepy and wonderful story where the shoes are in control. The mermaid from "The Little Mermaid" feels as if she's walking on knives all the time when she gets human legs, though that isn't really shoes, but definitely a story about feet! There's the little sister in "The Almond Tree" who gets a pair of shoes from her dead brother. There's "The Shoemaker and the Elves, the 12 Dancing Princesses, there was even an old woman who lived in a shoe! All those fairy tales where the hero or heroine has to journey until they wear out seven pairs of iron shoes, and, in the Grimm version of Snow White the queen was forced to dance in iron shoes that were heated until they were red hot at the "happy ending" wedding until she dropped down dead.)**

What exactly is a shoe? It seems simple. A shoe is an item of footwear intended to protect and comfort the human foot while doing various activities. Shoes are also used as an item of decoration. The design of shoes and purpose for shoes has varied enormously through time and from culture to culture, with appearance and materials originally being tied to function rather than beauty. For example, with these cadaver shoes from 1900, yes, shoes for dead people, what might be some of the considerations to take into mind? *Although the upper of this shoe is made of silk, the sole is made of flimsy paper and felt. Why? It was designed to be placed on a cadaver, and would have been less expensive than burying the deceased in a useful pair of shoes. The gusseted sides would have allowed the shoe to be easily slipped on the corpse. Very practical and cost effective!*





What about this beautiful French clog? What might be its purpose? *Clogs like these were used in 19th century France to de-shell acorns and chestnuts. The meat from the nuts could be ground into flour and used as pig feed.*

Or this fabulous boot from Japan?

Japanese snowfall can average up to twenty centimeters in a winter season; this special boot was developed to deal with the accumulation. This tall boot called fumidawara is made of rice straw and is used to tread paths through the snow around the house.



Or, Form Over Function?

Throughout history, form not function has had a big influence as well. Fashion has often dictated many design elements, such as whether shoes have very high heels or flat ones. Contemporary footwear varies widely in style, complexity and cost. Basic sandals may consist of only a thin sole and simple strap. High fashion shoes may be made of very expensive materials in complex construction and sell for thousands of dollars a pair. Other shoes are for very specific purposes, such as boots specially designed for mountaineering or skiing.

Shoes have traditionally been made from leather, wood or canvas, but are increasingly made from rubber, plastics, and other petrochemical-derived materials in modern times.

The foot contains more bones than any other single part of the body. Though it has evolved over hundreds of thousands of years in relation to vastly varied terrain and climate conditions, the foot is still vulnerable to environmental hazards such as sharp rocks and hot ground, against which shoes can protect. And help you look good while doing it!

Shoes have a rich history of being the focus of many auspicious practices and while there are many many stories to explore and histories to unravel (<http://www.allaboutshoes.ca/en/>) let's follow the history of the shoe through some of its greatest highs and lows!

Information is Beautiful

Help students understand how important events connect to each other and progress, thereby allowing students the opportunity to comprehend why history is important to the present and points out the cause and effect relationship between historical events. Have students mark out the moments in shoe history using one of the following methods:

Classroom Clothesline Timeline

A clothesline serves as the base of the timeline, which can be easily changed and reused for other periods in history. Stretch a clothesline or string across the room, pulling the string tight so it doesn't sag. Clothespins are used to hold cards or pictures of the shoes representing the events on the timeline.

Giant Timeline: Use a roll of butcher paper or strips of chart paper to create a long timeline. Tape it along one or more walls in the classroom, create pictures and dates to represent the eras and information. Use drawings, photographs, pictures cut from magazines, and other materials to illustrate it. Use Post-it notes for labels or written information, or simply write directly on the timeline.

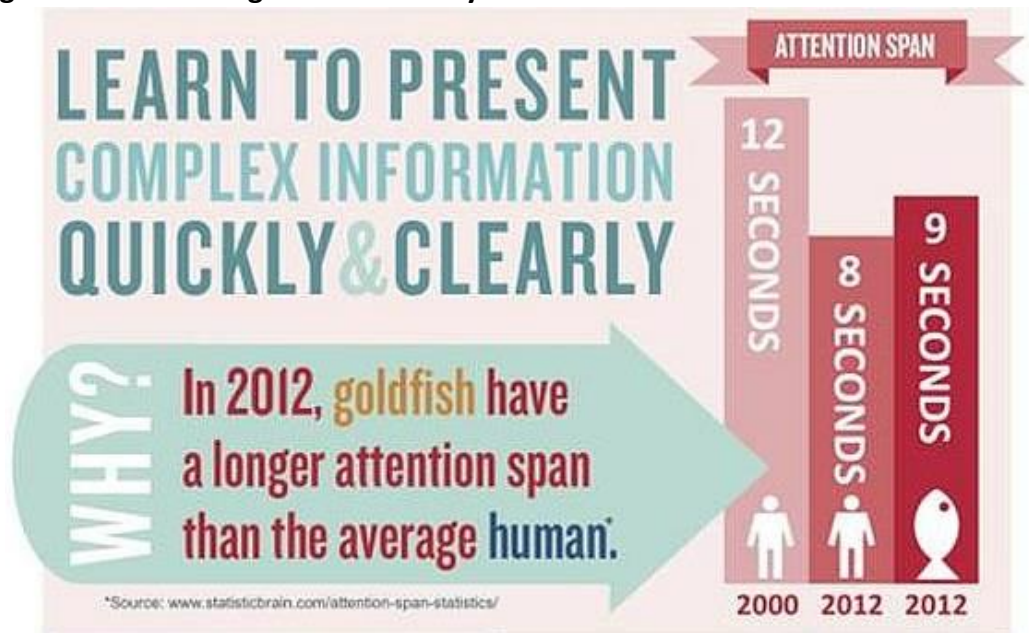
Infographic Timeline: People love to learn by examining visual representations of data. Ask students to design their own timelines by selecting events from the following or from their own research that demonstrate how their favorite shoes developed. Infographic timelines visually represent a sequence of events that happen over time, allowing the user to understand the visualized data quickly and effectively. See a full size example @ <http://blog.shoestores.com/files/2011/02/history-shoes-rev.jpg>

And/or <http://visual.ly/history-shoes-0>



As you conduct the following discussion, have students read along, listen for information, and fill in the missing details on their own student timeline sheets.

Incorporate a world map and included sheets as an active part of your discussion by having students work together to identify and locate the different countries, identify WHO did it, WHAT they did, WHERE they were located, WHEN it happened and mark the appropriate places on the map.



Pair 'em Up!

Write the letter that matches in the space provided.

1. Thought to have come from Turkey, and worn by Venetians, these shoes were approximately 10 inches high, though brides wore some 24 inches tall. What are they called? _____
 2. These were invented to create a flat surface between the sole and the high heel, reducing the chance that the heel would sink into the mud. _____
 3. What has often dictated many design elements of shoes, such as whether shoes have very high heels or flat ones? _____
 4. Even during war times and bad economies high heels stay what? _____
 5. Shoes can be useful but they are also used as an item of what? _____
 6. Today shoe designers like Blahnik, Jimmy Choo, etc are what for their expensive shoes? _____
 7. Who had a thing for red high heels? _____
 8. What contains more bones than any other single part of the body? _____
 9. By the 1590s men, women, and children in wealthy families were wearing what? _____
 10. What is the name of the inexpensive overshoes made of wood with attached instep straps under which a shoe could be slipped? _____
 11. Women used high heels during the 20th century (1800s) as part of what protest movement? _____
 12. Who "banished" the heel from French society and made it treasonous to wear them? _____
 13. High heels have been around for how long? _____
 14. What is an item of footwear intended to protect and comfort the human foot while doing various activities? _____
- a. Pattens
 - b. 500 years
 - c. Clog
 - d. Popular
 - e. Shoe
 - f. Napoleon
 - g. Fashion
 - h. Human Foot
 - i. Suffrage
 - j. Famous
 - k. Chopine
 - l. King Louis XIV
 - m. high heels
 - n. Decoration

A History of the Elevated Foot



Throughout its history in Western fashion, the high heel has been used to enhance stature, status, and beauty. Though some had a practical purpose of lifting people above the muck and mud, the patten dates to the 1400s. Pattens were inexpensive overshoes made of wood with attached instep straps under which a shoe could be slipped. Early pattens were simply wooden platforms while later ones sometimes featured metal rings on the bottom to elevate the wearer above the dirt. Pattens were in use from at least the 12th century and continued to be worn until the late 19th century (1800s)

Simultaneously impractical, proper, demure, and daring, the high heel of today bears the imprint of its complex 500-year evolution. From the extravagant chopines of the 16th century to the elegant stilettos of the 20th century, influences as varied as politics to pavement have contributed to the enduring success of elevating shoes.

The Rise of the Chopine

Throughout history, people all over the world have sought to elevate themselves using footwear, sometimes literally. In Europe, chopines from the 16th and 17th centuries stand out as the most extravagant examples of early elevating shoes. Although 5-inch high heels are considered killer heels, they are nothing compared to Venetian chopines, which are approximately 10 inches high.



*Turkish Woman with Slave, late 18th century
Jean-Etienne Liotard*

Thought to have been inspired by exotic footwear from Turkey, these impractical platforms were extremely extravagant and expensive.

They were first embraced by the women of Venice. Before long, fashionable women of wealth throughout Europe were seen struggling to walk in chopines often over 60 centimeters tall! **(Have students measure it)** while supported by servants or chivalrous men.



For special occasions, like a wedding, the wooden stilts were entirely covered with intricately decorated silver, or with small silver ornaments. Many times brides were very young girls and, therefore, small in stature. To compensate this, bridal chopines were sometimes made as high as two feet. Socially, chopines were only worn by women. In bathhouses, however, simple ones, sometimes with a little carving only and a leather-strap upper, were also worn by men.

Walk Like a Venetian!

Have students give your favorite shoes a boost (and experience life like a Venetian) with a pair of classic tin can stilts, aka. chopines. The following design allows an option for you to empty the can while keeping its top and bottom sealed for safety and stability.

What you'll need

- Puncture-style can opener
- 2 (29-ounce) cans of tomato sauce (or coffee cans)
- Tape
- lengths of cotton or nylon clothesline
- Skewer

Instructions:

1. To keep the structure intact on the tomato cans: Puncture a can in opposite spots on its side, as shown. Drain it by blowing into one hole to force the sauce out of the other. Repeat with the second can. Wash both cans under running water to clean them, inside and out. Remove their labels and let them dry.
2. For the foot straps, tape one end of a length of clothesline to a skewer. Push it through one hole and out the other, as shown. Knot the line at the appropriate place and trim. Repeat for the other stilt.

3. **With help and balance support from an adult, have students** test their coordination and gross motor skills and have students practice walking like Venetians!

How tall are their stilts? How much taller would they have to be to really mimic the height of the tallest of chopines? Would students want to walk on shoes that tall every day, all day?

Privilege and the High Heel

The status gained by wearing chopines was matched only by the loss of mobility. The invention of the high heel, sometime at the end of the 16th century, provided a more workable solution.

By the late 1590s, both men and women (and children) of wealth throughout Europe were quickly adopting this new style of shoe. Costly and impractical for hard labour and made from expensive materials like gold thread and velvet, the new heels were consigned to upper-class use only.

For women, the style was combined with an increased interest in making the foot appear small and dainty. For men, the high heel had the added benefit of enabling the foot to be secured in the stirrup while horseback riding.

That Sinking Feeling: The High Heel Before Pavement

Although the high heel was an improvement over the chopine in terms of increased mobility, problems remained. The debris of daily life was unavoidable before

paved streets, garbage collection and sewers

became the norm. Although the heel could

lift a wearer's garments above the filth,

it was also susceptible to sinking

down into the muck. Inventive

solutions to this problem, like

the patten mentioned

earlier, and the clogs

seen in the image,

were varied in

shape, and

success.

Clogs were

invented to

create a flat

surface between the sole and the high heel, reducing the chance that the heel would sink into the filth. The side straps of

the clog were often made of the same

material as the shoe and were secured

across the instep with a bow of complementary color



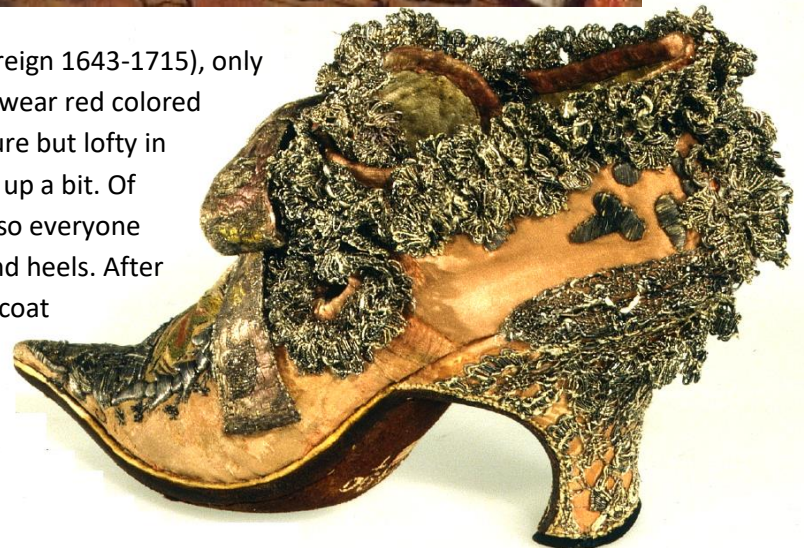
These graceful early 18th century high-heeled shoes still retain the original clogs made for them. Shoes from the early 18th century tend to have heels that are quite high

A Very Manly Height

Women weren't the only ones in heels! Shoes and stockings became very important for men in the 1700's, when the tailored coat and breeches came into fashion and the focus shifted to the lower body. Suddenly, it was all about the shapely legs, and men wanted to wear flattering, fanciful hose and shoes to accentuate them.

Throughout Europe in the 17th and 18th centuries, heels were an indicator of wealth and status for both men and women. In France, the wearing of heels even became a regulated expression of political privilege. Louis XIV also had a thing for high heels with red soles and

heels. In the 17th century court of King Louis XIV (reign 1643-1715), only those granted access to his court were allowed to wear red colored heels. It must have been tough being short in stature but lofty in power, so apparently he thought he would even it up a bit. Of course, what the king does, everyone else copies, so everyone who was anyone wore high heels with red soles and heels. After all, what would be more proper to wear with Petticoat breeches, than high-heeled shoes? Boots went completely out of style in favor of these new elegant heels, now elaborately decorated with ribbons, rosettes or buckles.



Louis XVI's adoption of the high-heeled shoe (for himself and those at his court) was notoriously spectacular. He ordered intricate, ornate shoes made, which would often include entire battle scenes carved into the heel. Declarations in regards to high heel decorum (only the aristocracy were permitted to wear red heels, no heel was to be higher than the King's) were frequent occurrences at court.



The Louis Heel

Following in the footsteps of his predecessor, King Louis XV (reign 1715-1774) also left his mark on high heel history. Although men began abandoning high heels by the 1730s, heels remained important in women's fashion. During the reign of Louis XV, fashionable heels for women were curved through the waist and splayed at the base to increase stability. The French favored a delicate interpretation of this style, while the English preferred heels that were a bit stouter.

The eventual backlash against the high-heel in its aristocratic incarnation occurred during the French Revolution (in a somewhat telling gesture, Marie Antoinette ascended the scaffold wearing 2-inch heels). In favor of pursuing equality under his reign, Napoleon "banished" the heel from French society and it became treasonous to wear them.



After the French Revolution, heels quickly went out of style. By the early 1800s, flats were the fashion. High heels would not be seen again in Western fashion for another fifty years. But, this combination of graceful shape and sturdy construction was revived and revamped in the 1860s.

Apparently feeling tall enough, men began to give up the high heel by the 1730s. Although this man's shoe of brocaded silk features a very low heel, the heel remains highlighted by the choice of bright pink fabric used to cover it

High Stepping



By the mid-1800s, the creation of wide paved boulevards in cities such as Paris and New York ushered in an age of promenading, café-going, and window-shopping. As wealthy women availed themselves of these new pastimes, fashionable footwear became sturdier. The high heel, which reappeared at this time, was now seen as a distinctly feminine form of footwear.

Suffragettes, Sports and Smoky Nightclubs

New Heights for Women

By the turn of the 20th century, the social and political opportunities for women increased dramatically and women began to participate in what had previously been masculine privilege. They did so, however, wearing heels. As clear signifiers of female gender, high heels helped to counter arguments that new freedoms could only be gained at the loss of femininity.



Suffragettes pounded the pavement in high-heeled button boots, while women of leisure enjoyed athletics, such as tennis, in high-heeled sports shoes. By the 1920s, the heels and hemlines had reached new heights, as had the opportunities available to women.

What do students think? Does wearing high heels during protests, sports, and at work prove something, that women can do the same things that men can do and still be women? Why or why not?



Shoes for sports, ex. tennis

High Heels in War Time

Even during war times and bad economies high heels stay popular. **Why might that be?** For example, excessively high shoes were fashionable in the 1940s. Using materials that were not rationed (restricted by the government), such as wood straw, and snakeskin, shoemakers were able to create shoes that were both uplifting and playful during the darker years of the forties. **Do high-heeled shoes convey a sense of luxury despite the deprivations of war? How and why?**



For example: This wood and straw platform dates from the height of the war period. Purchased by a soldier in France for his sweetheart in Canada, they were fashionable yet frugal. **How might these shoes made the soldier feel? How about his sweetheart ?**

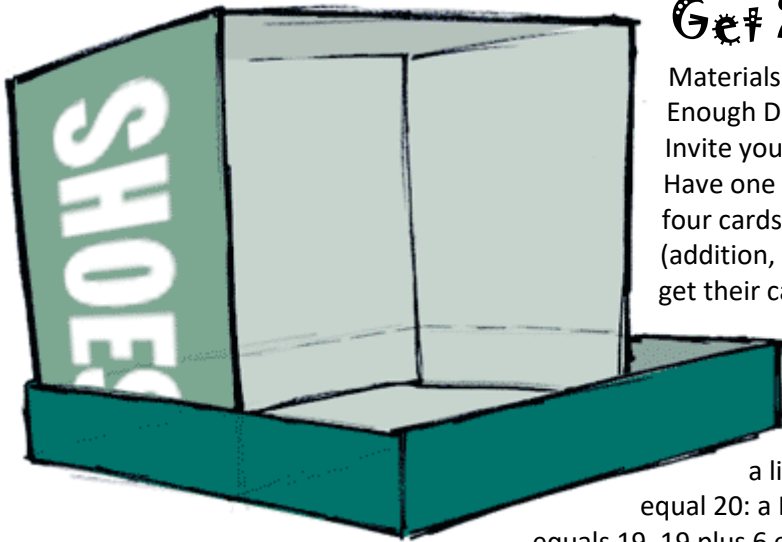
The High Heel Prevails

Today, the catwalks are replete with high heels. Famous shoe designers like Blahnik, Choo and Clergerie conjure up images of privilege and luxury. Despite the success of the flat-soled status sneaker, high heels remain, after five hundred years, as enhancements of stature, status, and personal appeal.

So, what do students think? Are modern heels practical like the ones in the past? Do they have any special meaning like the ones during Louis XVI's court? What are they good for?



Out of the Box! Math Skill Practice



Get 20!

Materials:

Enough Decks of Cards for your students
Invite your participants to get into groups of 4 or 5.
Have one person in each group deal each participant four cards. Ask them to use any math function (addition, subtraction, multiplication and division) to get their cards into a sequence that would equal the number 20. For example, if one student had a cluster of cards that are these values: a King(10), Ace (1 or 11), 5, 6 and 8, the student would put them into a line and explain to the group how they equal 20: a King plus an Ace would be 11, 11 plus 8 equals 19, 19 plus 6 equals 25. 25 minus 5 equals 20.

The student that **correctly** calculates their cards to 20 first keeps those cards. The deck is reshuffled and play starts again.

Alternate Versions: 15!

To play the game

The cards are placed on the table (or floor) between the two or more players.

Players take turns to choose a card (any card they like) from the pile.

The winner is the first to have a set of three cards that add to 15.

For example, if you drew 1,5,6 and 8, then you would win, because $1+6+8$ is 15. Unless of course, I had my set of three first!

For younger students

For younger students, place the cards face down. Then they can concentrate on the arithmetic, since they can't see the numbers before they choose them. For older kids, it makes a more exciting game if the cards are face up.

Extra exciting!

To make it extra exciting for an older group, you could have a "15 game" class tournament! You could even make it span a whole semester, with league charts and so on pinned to the wall of the class.

Slapdash

A deck of cards will do the trick for this game (you don't need flash cards and parents appreciate the idea for home use).

Divide the deck in half and assign values to the Jack (11), Queen (12), King (0), Ace (1) and all other cards have face value.

Two students oppose each other and alternate turning two cards over at a time which they then each have to add, subtract, multiply or divide within a certain time limit (say 5 seconds). The student who correctly answers gets to keep the cards.

They each create two piles of cards, one pile for those they got right and one pile for those they got wrong. The first student to get rid of his "wrong" pile wins the game.

This game is a lot of fun for practicing basic mental math facts. Several students can play together or you can have a few games going on at the same time (using a few decks of cards). Use your imagination and vary the game as you see fit to best serve your student's needs.



Running: it does a body good.

Like any other bodily exercise, it can do wonders for both our physical and mental well being. Perhaps that is why in the past several years the athletic world has experienced a resurgence of runners. Almost simultaneously, the running shoe industry has undergone a similarly dramatic growth.

But amidst this exponentially growing 'natural' sport, there is a major concern for all those ground-pounding die-hards: according to modern times you gotta have the shoes. Shoes affect your entire body, and consequently, for runners and other athletes, are considered their most valuable piece of equipment. It is essential to find the 'right' shoes. Small variations in shoe design have been found to cause ankle pain, back pain, and even headaches.

Not everyone has always believed that runners need good shoes. many people in ancient times, such as the Egyptians, Hindu and Greeks, saw little need for footwear, and most of the time, preferred being barefoot. The ancient Greeks largely viewed footwear as self-indulgent, unaesthetic and unnecessary. Shoes were primarily worn in the theater, as a means of increasing stature, and many preferred to go barefoot. Athletes in the Ancient Olympic Games participated barefoot – and naked. Even the gods and heroes were primarily depicted barefoot, and the hoplite warriors fought battles in bare feet and Alexander the Great conquered his vast empire with barefoot armies. The runners of Ancient Greece are also believed to have run barefoot. Pheidippides, the first marathoner, ran from Athens to Sparta (132.4 mi) in less than 36 hours. After the Battle of Marathon, he ran straight from



the battlefield to Athens to inform the Athenians of the news. He was one speedy long distance runner! **Have students calculate how many miles he averaged per hour.**

The Romans, who eventually conquered the Greeks, and adopted many aspects of their culture, did not adopt the Greek perception of footwear and clothing. For Romans, clothing was seen as a sign of power, and footwear was seen as a necessity of living in a civilized world, although the slaves and paupers usually went barefoot.

The most practical reasons for donning specialized footwear are to protect feet from injury, permit us to do a better or easier job, and improve our performance. Around the world and throughout history footwear has been designed in unique ways to satisfy these needs.

Cobbling Something

Together: Shoe Engineers

The primary goal of modern shoe engineers is to achieve an optimal shoe design for the "average" athlete or person. **Why?** Average, in terms of human biomechanics, is a very tricky concept, since all people are anatomically and functionally different, even down to their footprints. Each individual is unique; differences in structure, movement, and gait pattern require footwear to vary from person to person. Efforts to meet this concern are further multiplied by the critical factors to be considered in the design of each shoe: shock absorption, flexibility, fit, traction, sole wear, breathability, weight, etc. Due to the diversity of the human form, it is impossible to provide for the needs of every runner on the planet. Shoe designers manage this overwhelming demand by supplying some standard, user-defined, foot-ground interface

It is important to differentiate between shoe design and shoe fabrication. Shoe design involves the complicated task of finding the most versatile specifications to cover a broad spectrum of biomechanical requirements. In contrast, putting a shoe together once the specifications have been set is a very straightforward process. A typical shoe consists of three basic components:

- the outsole,
- the midsole,
- and the upper.

Each of these components is comprised of materials that vary greatly in weight and density. A shoe's durability is often determined by the hardness of the outsole rubber, the density and firmness of the midsole foam, and the strength of the upper materials.

As simple as the parts may seem, however, running shoe design requires the efforts of several academic fields. It is a very detailed application of podiatry, the study of human feet, and biomechanics, the study of the human body in motion. As Peter Cavanagh puts it, "Running shoes are worn on running feet, and running feet are attached to running legs. Trying to understand the design and construction of running shoes without a clear knowledge of what goes inside and above them would be difficult". Hence, a comprehensive knowledge of human anatomy is key. The goal of biomechanists is to study complex forces as they act on the body, primarily by applying principles from mechanics and engineering. Applications to running include measuring the movements of limb segments, measuring the forces and pressures underneath the foot and the shoe, and calculating what muscle forces create the observed movements.

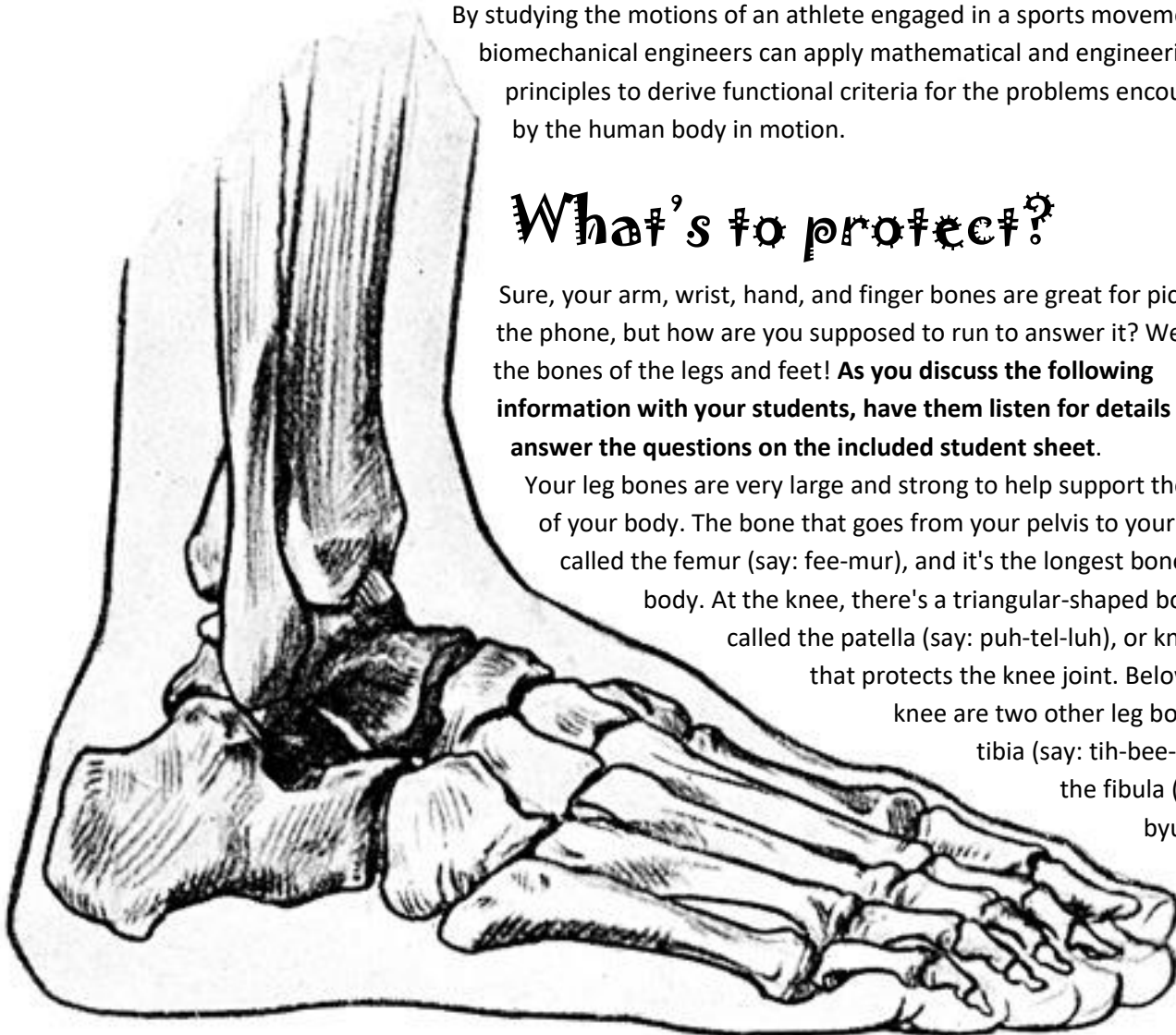
By studying the motions of an athlete engaged in a sports movement, biomechanical engineers can apply mathematical and engineering principles to derive functional criteria for the problems encountered by the human body in motion.

What's to protect?

Sure, your arm, wrist, hand, and finger bones are great for picking up the phone, but how are you supposed to run to answer it? Well, with the bones of the legs and feet! **As you discuss the following information with your students, have them listen for details and answer the questions on the included student sheet.**

Your leg bones are very large and strong to help support the weight of your body. The bone that goes from your pelvis to your knee is called the femur (say: fee-mur), and it's the longest bone in your body. At the knee, there's a triangular-shaped bone called the patella (say: puh-tel-luh), or kneecap, that protects the knee joint. Below the knee are two other leg bones: the tibia (say: tih-bee-uh) and the fibula (say: fi-
byuh-luh).

Just
like
the



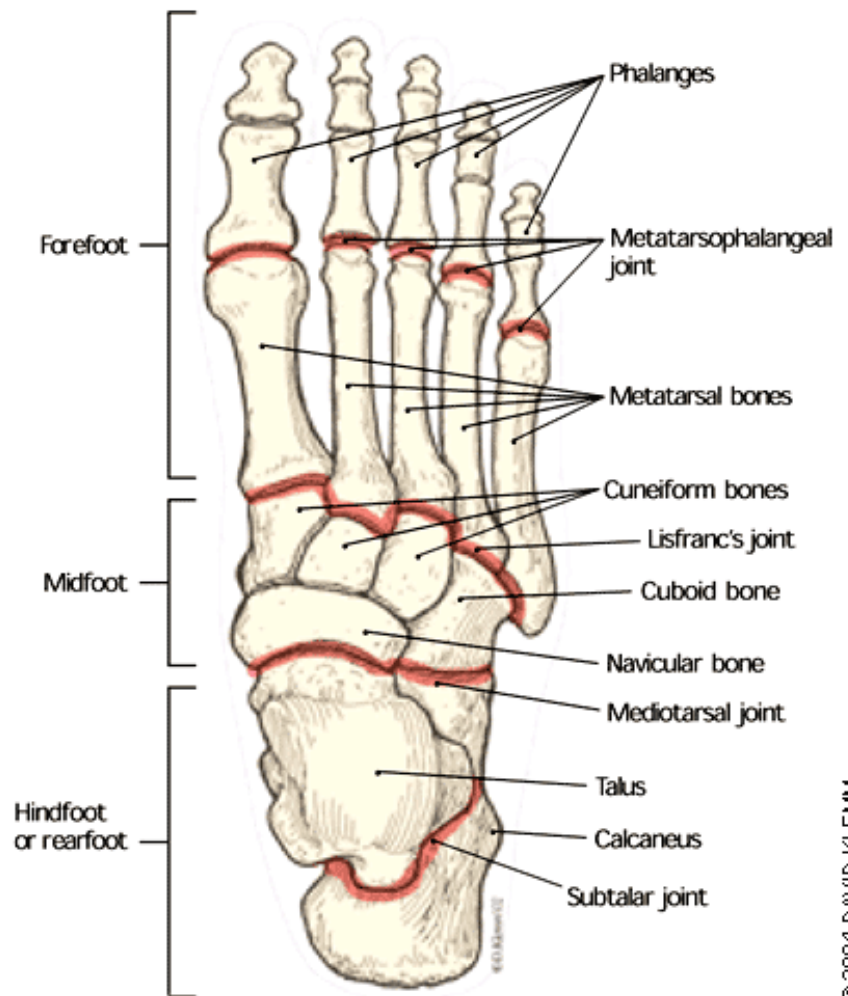
three bones in the arm, the three bones in the leg are wider at the ends than in the middle to give them strength.

The ankle is a bit different from the wrist; it is where the lower leg bones connect to a large bone in the foot called the **talus** (say:**tal**-iss). Next to the talus are six other bones. But the main part of the foot is similar to the hand, with five bones. Each toe has three tiny bones, except for your big toe, which has just two. This brings the bone total in both feet and ankles to 52!

The feet are divided into three sections:

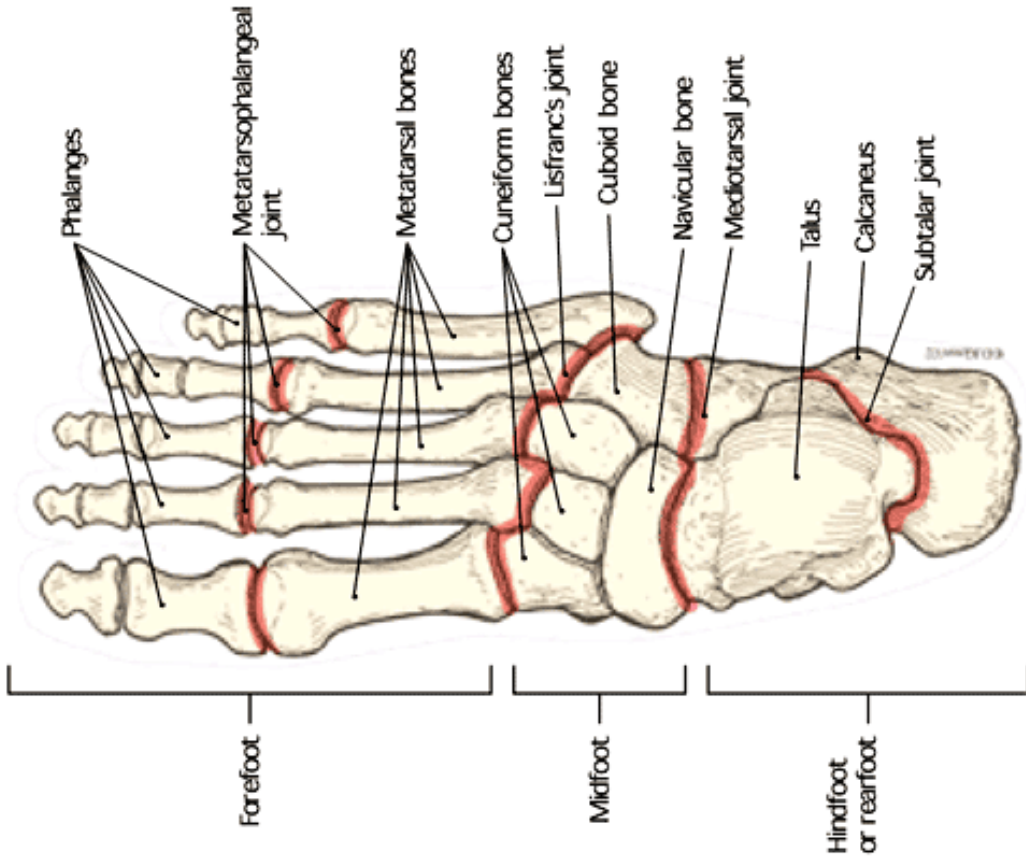
- The forefoot contains the five toes (phalanges) and the five longer bones (metatarsals). It bears more than half of the body weight.
- The midfoot is a pyramid-like collection of bones that form the arches of the feet. These include the three cuneiform bones, the cuboid bone, and the navicular bone. This segment functions like a shock absorber.
- The hindfoot forms the heel and ankle. The talus bone supports the leg bones (tibia and fibula), forming the ankle. The calcaneus (heel bone) is the largest bone in the foot. This structure enables the up and down movement of the foot.

Muscles, tendons, and ligaments run along the surfaces of the feet, allowing the complex movements needed for motion and balance. Without all the bones of the foot working together, it would be impossible to balance properly. The bones in the feet are arranged so the foot is almost flat and a bit wide, to help you stay upright. The Achilles tendon connects the heel to the calf muscle and is essential for running, jumping, and standing on the toes.



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Put Your Best Phalange Forward

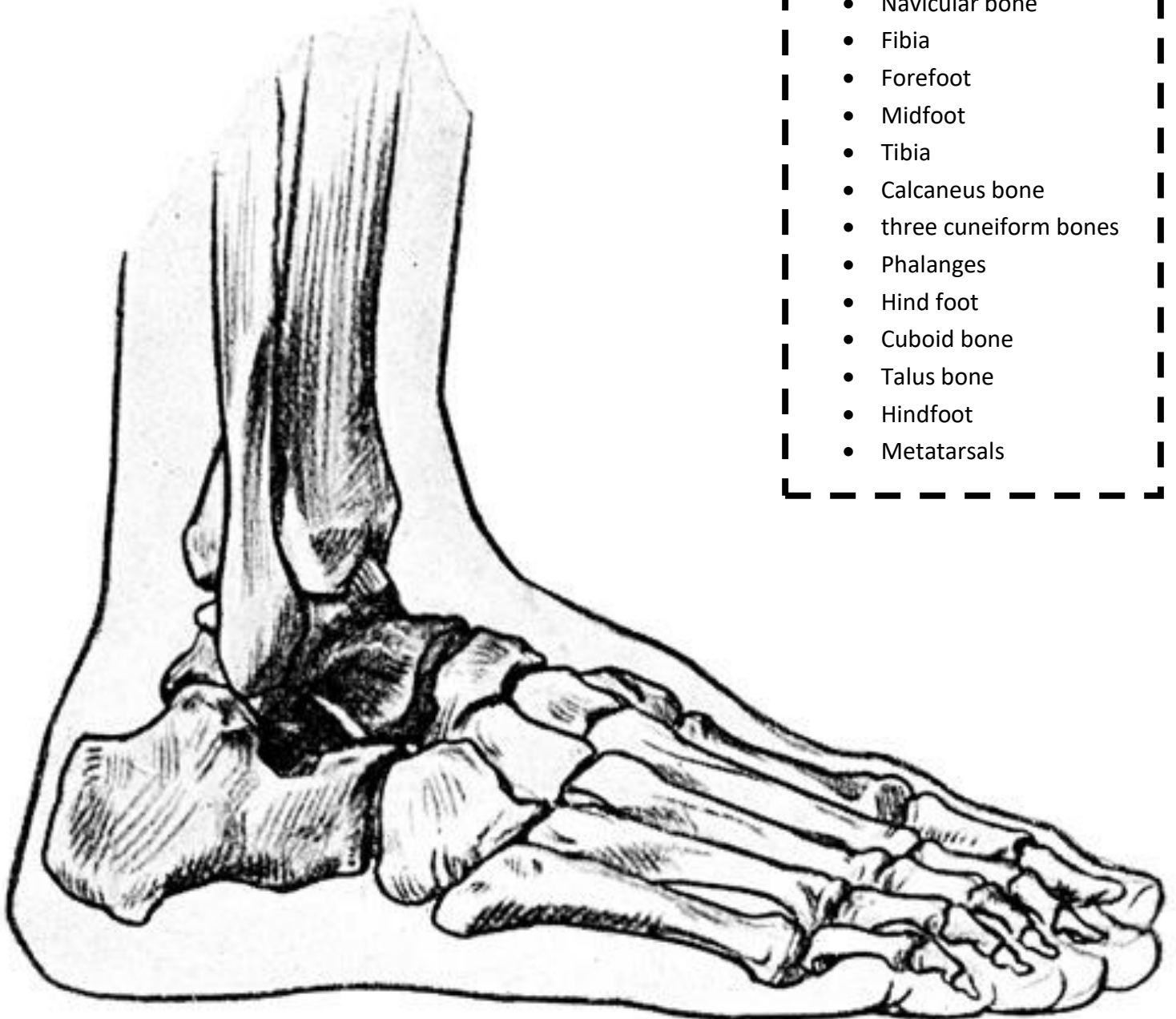


1. The feet are divided into how many sections?
2. Which part contains the five toes and five longer bones?
3. The five toes are called:
4. The five longer bones are called:
5. The midfoot has collection of bones shaped like what?
6. The midfoot includes which five bones?
7. What section forms the heel and ankle?
8. Which bone supports the leg bones (tibia and fibula), forming the ankle?
9. Which is the largest bone in the foot?
10. What kind of movement does the hind foot allow?
11. How many bones are in your feet?

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Foot Race!

Can you correctly label each part of the diagram, using the words from the Word Bank before the time runs out?



Word Bank

- Navicular bone
- Fibia
- Forefoot
- Midfoot
- Tibia
- Calcaneus bone
- three cuneiform bones
- Phalanges
- Hind foot
- Cuboid bone
- Talus bone
- Hindfoot
- Metatarsals

Shoe Fabrication

The initial step in actual shoe fabrication involves the construction of the 'last. The last is a model of the foot, or more importantly, a model of the inside of the shoe. This form is used to shape the shoe, usually by stretching the leather over it. Last were made of different materials throughout history. Clay was known to be used during the Roman period. Iron lasts are also mentioned in some sources, and most commonly wood.



The last is what gives a shoe its shape (and the individual his desired fit). It is the form over which the upper is pulled and molded over during manufacture . You may have seen Keen shoes.

They're big and wide and comfy and funny looking. Martin Keen, who started it apparently started out with a block of wood and whittled his own last, with that crazy wide toe area.

The last is very important in making your shoe comfortable or not. At the beginning of the design process, the manufacturer sends his specifications to the model maker, who then constructs a three-dimensional wooden model: the last. In shaping the last, the experienced designer is guided by six measurements.

- Ball Girth
- Waist Girth
- Instep Girth
- Long Heel Girth
- Short Heel Girth
- Stick Length (Overall heel-toe measurement on the last)

Most model shops contain tables that list the approximate values of these measurements for each shoe size. The model maker shapes, files, sands, and smooths until these measurements match and the product subjectively reflects the right appearance.

The first step in building a last is creating a pattern, by tracing the foot.

Materials:

- Pencils
- White Cardstock or posterboard

Below are some pictures and explanations of this process.

First step in making a pattern in which to guide your last making efforts is to have students work in partners to trace the profile of their foot.

Place the poster board on a vertical surface, like the floor, and have the student place their bare right foot against it and stand straight up (having all students trace the same foot will be helpful later) . The toe of the profile view will have to be adjusted to the shape of the desired shoe, ex. pointy, round, boxy, etc.

The first tracing around the outside of the foot should be done with the pencil held straight up and down. Have the partner who is tracing trace the foot again with the pencil angled to reach as far under the foot as possible.

After the tracing is complete, before removing their foot some reference marks need to be made. One should be made at the center of the heel, one at the ball of the foot, and one between the big and second toe.

Later, the tracings will be used to generate a pattern based on the desired shape of their shoe. Below is an example of how the shoes shape around the toes when creating the pattern.



it is of interest to examine foot sizes of people. More specifically, a statistical study can be conducted to study foot sizes of students in the class. This information can be very important to a shoe manufacturer. Information obtained from these types of investigations can help companies determine what sizes of shoes they should manufacture for students.

Ask students to write some questions that they would be interested in investigating about students' foot lengths. Some possible questions might be:

1. What is the mean (representative) foot size of the class? What is the median (typical) foot size of the class? What is the shortest foot size in the class? What is the longest foot size in the class?
2. Are there differences in foot sizes for boys and girls? If so, what are the differences?
3. Are foot sizes related to any other variables? (ex. age)

Have Students Design and Implement a Plan to Collect the Data:

In the data collection phase ask students what kind of measurements should be made? Make sure that students talk about how to make the measurements accurately and with precision. Ask the class who should measure the students' feet. More than one person might be helpful in the data collection phase, or all students can report individually after measuring their patterns. It might be a good idea for one person to record their foot sizes and gender. Before collecting data ask students to decide which foot should be measured? This will be affected if not all students made patterns of the same foot. Also tell students to round measurements to the nearest centimeter. This way a protocol for measurements can be developed and it will ensure consistency from measurement to measurement.

Measure all students and record their foot sizes (in cm) and gender in a data table. **Ask the students to explain why this is an observational study and not an experimental study.** Guide students to see that their data values are recorded from direct observation and measurements. Nothing has been done deliberately to the students in order to collect data.

Different statistical tools are used for analysis of different questions. For example, the class can calculate the mean and spread from the collected data. A graph can be constructed from the same data set. The same analyses can be repeated separately for the boys and girls in class. Ask students to suggest graphs that might be useful to compare the foot length data distributions for boys and girls. Can other factors, ex. age, be added in?

Discussion/Discovery Points:

- What is the mean foot size? What is the median foot size? What are the shortest and longest foot sizes? Give two numbers that cover the middle 50% of the distribution of the foot sizes. What is the range of the most common foot sizes?
- What is the mean foot size for boys? What is the median foot size for boys? What are the shortest and longest foot sizes for boys? Give two numbers that cover the middle 50% of the distribution of the foot sizes of the boys. What is the range of the most common foot sizes for boys?
- What is the mean foot size for girls? What is the typical foot size for girls? What are the shortest and longest foot sizes for girls? Give two numbers that cover the middle 50% of the distribution of the foot sizes of the girls. What is the range of the most common foot sizes for girls?
- Using appropriate technology (graphing calculator, Excel, statistical software) construct a comparative graph or plot. Do boys or girls generally have bigger feet? Is there any outlier either of boys or girls?
- **How would information such as this help a shoe manufacturer?**

Measuring the rest of the foot

Students will want to make accurate measurements of the foot. Have students compare these measurements frequently for accuracy. Below is a drawing which will help guide them in this process.

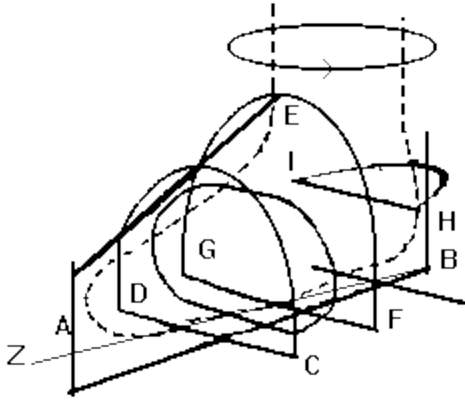


Image Credit:

<http://timurborte.blogspot.com/2011/06/makeing-basic-shoe-last.html>

Once complete, a shoe designers handmade model is then placed onto a 'copy lathe,' which generates exact replicas of the same or different size. This device does complete size runs on the model (ex. sizes 6-12) and, in turn, generates plastic versions of the model onto which the shoes are actually made.

Making a Last

Now, that we have our pattern, we need to make a last. A "last" is a hard, usually wooden, object that shoemakers build their shoes around. Lasts look like feet, with extra space in front of the toes to accommodate the sleek pointed style common in shoes.

Lasts are important because they allow you to accurately draw your patterns, give you a harder surface to work with, and they also provide a quick context when you are unsure.

Here you have two options:

1) Buy a last: ask a shoemaker or do an Internet search (these are not expensive)

Have students make a simple last of their foot by wrapping it with using paper and shaping it using masking tape. It needs to match the measurements of their pattern.

What's in your Mind?

Thought Process:

The most important step in any project is the design phase. Design can be complicated and design can be simple. Have students think about the type of shoe they want to make. What story do they want to tell? Creating a shoe is creating a sculpture with a purpose.

images to further spur creative thinking.

Sketchy

Making a shoe design is both an aesthetic and technical challenge. Designing an appealing shoe (boot, high heel, sandal, or whatever type) will be important from a marketing standpoint and from a storytelling standpoint as well. You want to be able to design a shoe that other people will want to buy.

Have students search and use their Mind Map and other sources for inspiration, and do some sketches and incorporate color swatches.

Have students look for fabrics, memories, textures, colors, objects or people who inspire them to create a new piece of clothing. Search online or in magazines for current or retro trends that they might want to incorporate into their designs. Ex: If a student wanted to create a collection of racecar shoes, they may spend a lot of time looking at rare sports car magazines for inspiration of colors or shapes to incorporate into their prototype shoe. Encourage students to use a variety of materials, explore many options and ideas before settling on one idea.

The word “prototype” comes from the Greek, *protos* meaning “first” and *typo* meaning “impression.” Like many words, its meaning has



changed over time, so that a single finished product can be preceded by a number of “first impressions.” And while we’re often told the importance of making a great first impression, not all prototypes need to be great; some need only be adequate for a specific task. (Of course before committing to production, they might want at least *one* great first impression.)

Have students consider the following while creating their designs:

Form: Appearance, including overall shape, surface texture, and color.

Fit: The ability to comfortably serve its purpose and fits their measurements they’ve taken. Not many people want to wear a shoe that doesn’t fit!



Function: The ability to withstand various kinds of stress under varying conditions, such as rain, snow, mud, long wear. How long will it last? Is it made of durable materials (rubber, canvas), or ones that will have to be treated carefully (lace, silk, velvet).

Manufacturability: The ability to be made using standard high volume production methods or will each pair have to be hand-made? **What will that do to the price?** Is it going to be too expensive to make?

Viability: The ability to appeal to the market. Will very many people want to wear their shoe? How will they make sure? That's why companies do surveys and send out sample products, to get an idea of how well they'll sell and responses and feedback on what changes might need to be made.

Make a portfolio: Have students keep their designs and inspirations in a folder or notebook for future inspiration and reference when they'll need to create their final layout and full color rendering. Encourage them to consider carrying a sketchbook with them, so that they can take down ideas whenever they strike.

Add color! A lot of the success of their design can depend on what colors they use. Have students think about the shoes intended purpose (is it a street shoe, a western boot, an athletic shoe, a formal or party shoe?), the story they're trying to tell, and how they imagine someone wearing it. Then have them choose their colors accordingly. Encourage students to try to blend unexpected color combinations to add an element of surprise to their design.

Creating 3D Models

Students create a 3D copy of their design using ONLY masking tape.

Materials:

- Masking Tape
- Newspaper
- Cardboard
- Other support and construction materials as available, ex. putty, styrofoam, clay or other materials
- Measuring devices
- Previously created shoe designs.
- Student patterns and foot measurements
- Scissors



Ask students to recreate their design using only masking tape around their paper and tape last and keeping their measurements and foot pattern in mind. The model needs to be to accurate scale.

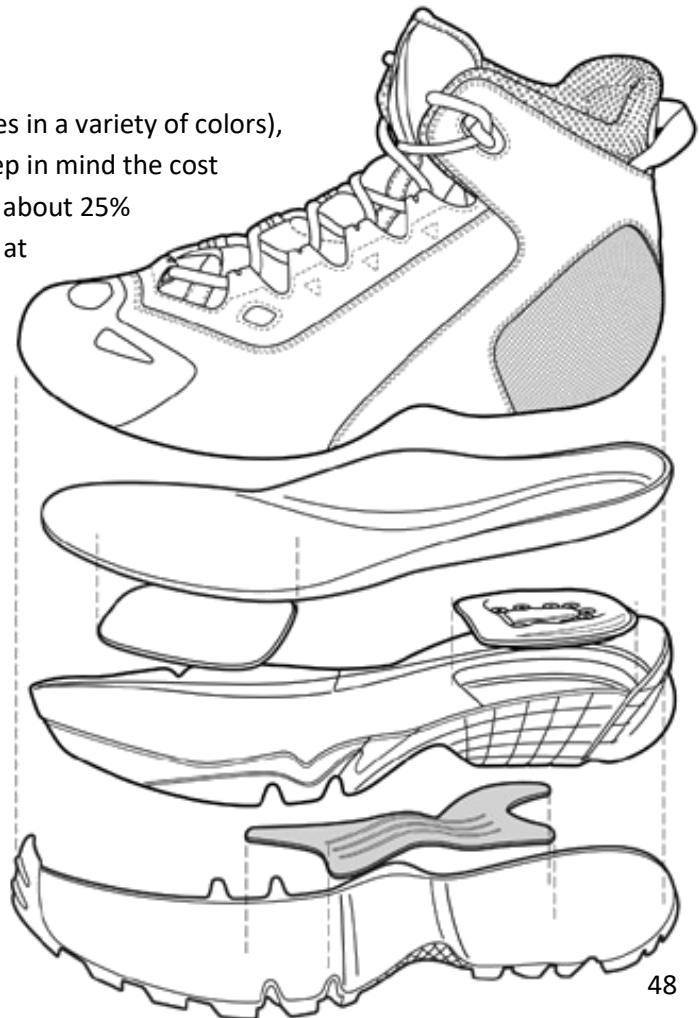
The goal is to duplicate every detail paying close attention to the planes that create the structure of the shoe, as well as texture, weight, and scale. This is a fun project to start the semester. It emphasizes problem-solving skills using a relatively forgiving medium. It asks students to examine the qualities, limitations, and advantages of the given material.

Option: Allow students to use duct tape (it comes in a variety of colors), or colored masking tape if you wish. Though keep in mind the cost is greater as masking tape can be purchased for about 25% of the price of duct tape. And, if they mess it up at the very end, duct tape is very very sticky!

Challenge: Can students find a way to light their shoes up? LED lights.

Selling Soles

When the big Chinese factory asks for your design prototype, is it really possible to just send them a cute mock-up of a shoe? Factories obviously aren't used to getting masking tape shoes. For their final product have students put together a "tech pack" storyboard layout of their shoe that shows each component of the upper and what it is made of. They'll need to create sketches of

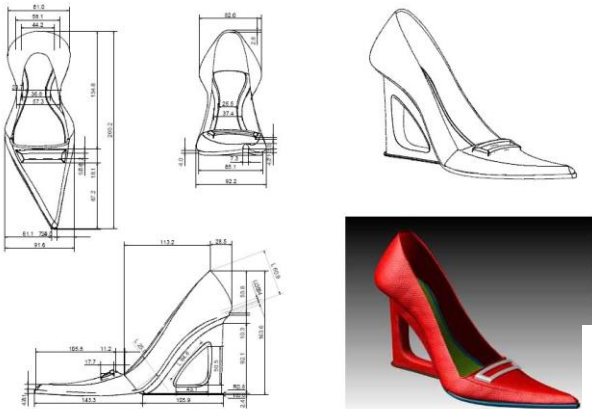


The Anatomy of a Nike trainer' ... simple vector outlines stroke and no fill color works really well for this heavily-diagrammatic illustrative exploded diagram design- simple, clean cut and crisp.

different perspectives of their shoe. Ex. what does the sole look like? The back. The top?

Have them include full color technical drawings (from multiple perspectives if possible), color swatches, materials listing, measurements, purpose, and layouts. How much do they want to charge for their shoe? How much do they think it will cost to make it? Their tech pack should include all the materials that will be used for each part of the shoe, the colors of your design and all your measurements for each shoe component. The technical pack is what the "factory" will require before they would produce a prototype or "pullover" based on students' shoe design.

Also, have students include their inspirations and tell the story of their shoe and what story they want it to tell. Where did their inspiration come from?



For real shoes: The design is now sent to the pattern maker, who measures the exact shapes of the various pieces of material comprising the shoe upper. This process begins with the sewing on of a 'skin,' or tightly fitting layer of material, which is sliced off according to the way the shoe will be made. He then makes precise drawings of these parts, including a little more space to accommodate seams. His drawings are sent to the manufacturer for use in cutting dies for the finished product.

Shoe design is a very precise and complicated process. It is also paramount to the overall health of the end user. The shoes will be used under a broad variety of conditions, by an infinite variation of body types. Who would have thought such a great responsibility would fall on the shabby and smelly old sneaker?



Sources and Resources

This lesson plan is a small peek at the long history of humans and their shoes. We hope it will stimulate further focus on just what's on their feet by students, and instructors, and a deeper delving into the world of engineering, expand our view of why we wear what we wear, make students laugh, and make them think, make us more observant, and stimulate our imaginations. In the construction of this lesson plan we have been guided by, and recommend the following resources among many others:

- <http://www.allaboutshoes.ca/en/>
- <http://en.wikipedia.org/wiki/Shoe>
- <http://listverse.com/top-10-most-bizarre-shoes-in-history/>
- <http://illuminate.usc.edu/72/the-engineering-behind-shoe-design/>
- <http://www.allaboutshoes.ca/en/>
- http://www.swe.org/iac/lp/triathlete_01.html