UNIT 1

Riding through History

In this unit, you will

- learn about the changes in technology that led to creating the modern bicycle.
- read about a very different vehicle and how it compares to a bicycle.
- increase your understanding of the target academic words for this unit.

READING SKILL Previewing

Self-Assessment

Think about how well you know each target word, and check (✓) the appropriate column. I have...

TARGET WORDS	never seen the word before	seen the word but am not sure what it means	seen the word and understand what it means	used the word, but am not sure if correctly	used the word confidently in *either* speaking *or* writing	used the word confidently in *both* speaking *and* writing
AWL						
alter						
design						
fee						
framework						
individual						
inherent						
injure						
job						
minimize						
overseas						
primary						
revolution						
subsequent						
substitute						

Oxford 3000™ keywords

Outside the Reading What do you know about biking?
Watch the video on the student website to find out more.

READING 1

Before You Read

Read these questions. Discuss your answers in a small group.

1. Do you know how to ride a bicycle? Who taught you to ride? What was the hardest thing to learn?
2. What are some reasons that people ride bicycles?
3. If you could change or improve bicycles, what would you want to do?

READING SKILL Previewing

Most good readers spend a few minutes *previewing* before they begin to read. Previewing a book or article means looking it over to get a general idea of what it will be about. It allows you to recall what you already know about a topic, and think about what you are going to learn.

Preview Reading 1, below, by answering these questions. Discuss your answers with a partner.

1. Read the summary printed above the article. In a few words, it tells what the article will be about. What do you expect to learn about in the article?
2. Look at the pictures and captions. What information do they give you about the topic?
3. Read the title. You already know that the article will be about bicycles, but what does the word "history" suggest? Read the bold print subheadings at the beginnings of many paragraphs. What information do they give you about the topic? Check (✓) the kind of information that *might* be in the article.

___ when the bicycle was invented
___ a description of the first bicycle
___ changes in the bicycle over time
___ famous bicycle races
___ how to use bicycles for exercise
___ who invented the bicycle
___ how people reacted to the invention
___ how bicycle tires are made

Read

This article from a popular technology magazine tells about the many changes in bicycles during the past 200 years.

The History of Bicycles

The bicycle was not invented by one **individual** or in one country. The creation of the modern bicycle took nearly 100 years and the work of many **individuals**. By the end of those 100 years, bicycles had **revolutionized** the way people traveled from place to place.

EARLY BICYCLES

Bicycles first appeared in Scotland in the early 1800s, and were called velocipedes. These early bicycles had two wheels, but they had no pedals. A rider sat on a pillow and walked his feet along the ground to move his velocipede forward.

Soon a French inventor added pedals to the front wheel. Instead of walking their vehicles, riders used their feet to turn the pedals. However, pedaling was hard because velocipedes were very heavy. The **frameworks** were made of solid steel tubes, and the wooden wheels were covered with steel. Even so, velocipedes were popular among rich young men, who raced them in Paris parks.

Because velocipedes were so hard to ride, no one thought about using them for transportation. People didn't ride velocipedes to the market or to their **jobs**. Instead, people thought velocipedes were just toys.

SOME CHANGES ARE MADE

Around 1870, American manufacturers saw that velocipedes were very popular **overseas.** They began building velocipedes, too, but with one difference. They made the **frameworks** from hollow steel tubes. This **alteration** made velocipedes much lighter, but riders still had to work hard to pedal just a short distance. In addition, roads were bumpy, so steering was difficult. In fact, most riders preferred indoor tracks where they could rent a velocipede for a small **fee** and take riding lessons.

THE HIGH WHEELER

A **subsequent** change by British engineers **altered** the wheels to make pedaling more efficient. They saw that when a rider turned

the pedals once, the front wheel turned once. If the front wheel was small, the bicycle traveled just a small distance with each turn. They reasoned that if the front wheel were larger, the bicycle would travel a greater distance with each turn of the pedals. So they **designed** a bicycle with a giant front wheel. They made the rear wheel small. Its **primary** purpose was to help the rider balance. Balancing was hard because riders had to sit high above the giant front wheel in order to reach the pedals. This meant they were in danger of falling off the bicycle and **injuring** themselves if they lost their balance. Despite this **inherent** danger, "high wheelers" became very popular in England.

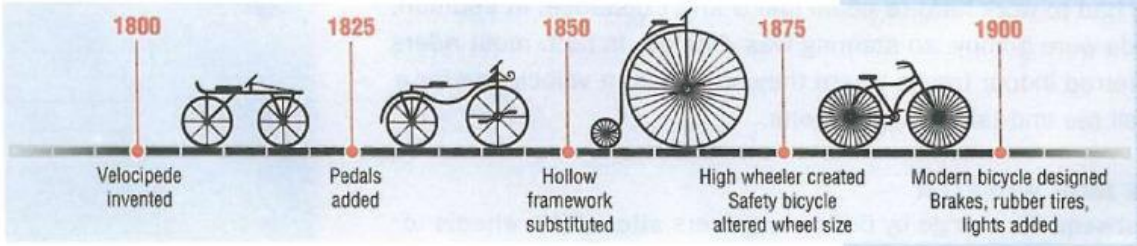
A SAFER BICYCLE

American manufacturers once again tried to **design** a better bicycle. Their goal was to make a safer bicycle. They **substituted** a small wheel for the giant front wheel and put the driving mechanism in a larger rear wheel. It would be impossible for a rider to pedal the rear wheel, so engineers **designed** a system of foot levers. By pressing first the right one and then the left, the rider moved a long metal bar up and down. This turned the rear wheel, and the bicycle moved forward. Because the new safety bicycle **minimized** the dangers **inherent** in bicycle riding, more and more people began using bicycles in their daily activities.

THE MODERN BICYCLE IS BORN

The British **altered** the **design** one last time. They made the two wheels equal in size and created a mechanism that used a chain to turn the rear wheel. With this final change the modern bicycle was born.

Subsequent improvements, such as brakes, rubber tires, and lights, were added to make bicycles more comfortable to ride. By 1900, bicycle riding had become very popular with men and women of all ages. Bicycles **revolutionized** the way people traveled. Today, millions of people worldwide ride bicycles for transportation, enjoyment, sport, and exercise.



Reading Comprehension

Mark each statement as *T* (True) or *F* (False) according to the information in Reading 1. Use your dictionary to check the meaning of new words.

___ 1. Many individuals took part in creating the modern bicycle.

___ 2. The first bicycle revolutionized travel in Scotland and overseas.

___ 3. Early velocipedes had frameworks made of solid steel tubes.

___ 4. American manufacturers substituted hollow steel tubes for the solid tubes.

___ 5. People in Paris paid a fee to ride velocipedes to their jobs.

___ 6. The primary purpose of the giant front wheel was to help the rider balance.

___ 7. American manufacturers designed a bicycle with a small rear wheel that was inherently safer.

___ 8. The modern bicycle was born when British engineers subsequently altered the wheels again and made them equal in size.

Vocabulary Activities STEP I: Word Level

A. Read this passage about the Tour de France, a world-famous bicycle race. In each sentence, circle the one word or phrase in parentheses ( ) that has the same meaning as the underlined word in the sentence. Compare your answers with a partner. Then take turns reading the sentences to each other using the circled words.

1. The course for the Tour de France is altered (*measured / changed / marked*) every year, but it is always about 4,000 kilometers, or 2,500 miles.
2. The course is designed (*located / expected / planned*) to travel through towns, up steep mountains, and across flat lands.
3. Riders come from all over Europe as well as from overseas (*islands / abroad / oceans*) to take part in the 22-day race.
4. The race is divided into 20 stages, or parts. The rider who wins one stage has the honor of wearing a yellow Tour shirt in the subsequent (*final / longest / next*) stage.
5. The rider who has the fastest race time in all of the stages is the overall winner. Lance Armstrong is the only individual (*person / man / foreigner*) to win seven Tour de France competitions.
6. The framework (*mechanism / structure / wheel*) of modern racing bicycles is made of lightweight steel, aluminum, titanium, and carbon fiber tubes.
7. The recent use of lightweight frameworks brought about revolutionary (*unwanted / unfair / great*) changes in the 100-year-old race.
8. Teams pay an entrance fee (*payment / tax / salary*) to join the Tour de France. The fees create the prize money paid to the winning teams.
9. Riders must be good athletes to meet the physical demands that are an inherent (*unexpected / natural / dangerous*) part of a long race.
10. If a rider is injured (*sick / tired / hurt*), he tries to minimize (*lessen / hide / endure*) the pain so he can stay in the race.

11. If the pain is too bad, the coach can assign a teammate to substitute for (*help / take out / replace*) the injured rider.
12. The primary (*main / total / easiest*) job (*purpose / employment / task*) of a Tour coach is to help his team win.

B. **To *minimize* something is to make it less or to reduce its importance. Think about the problems that racing cyclists can have. With a partner, match the problem on the right with the item that can minimize it on the left. Then take turns creating sentences with the information.**

a 1. knee braces — a. stress on knees

*Knee braces can **minimize** stress on knees.*

___ 2. low handle bars — b. thirst
___ 3. a helmet — c. sunburn
___ 4. long sleeves — d. sprains
___ 5. water — e. head injuries
___ 6. ice — f. air drag

The adjective *inherent* refers to a natural, built-in quality of a person, object, or activity. *Inherently* is the adverb form.

*Staying balanced is an **inherent** challenge for bicycle riders.*

*Bicycle racing is **inherently** dangerous.*

C. **With a partner, check (✓) the sports you think are inherently dangerous. Add one more. Then discuss the reasons for your choices in a small group.**

___ snow skiing
___ golf
___ soccer
___ basketball
___ long-distance running
___ tennis
___ race-car driving
___ horseback riding
___ motorcycle racing
___ swimming
___ mountain climbing
___ other: _____

Primary refers to something that is first, main, or basic. Here are some examples of collocations (words that go together) using the word *primary*:

primary colors — primary elections
primary school — primary care physician

D. **With a partner, match the worker on the left with his or her primary job on the right. Take turns creating sentences with the information.**

a 1. tailor — a. altering clothing to fit individuals

*A tailor's **primary** job is altering clothing to fit individuals.*

___ 2. architect — b. teaching the classes of a teacher who is absent
___ 3. taxi driver — c. driving people from place to place for a fee
___ 4. international airline pilot — d. designing buildings

___ 5. doctor
___ 6. substitute teacher
___ 7. janitor

e. cleaning and taking care of buildings
f. helping individuals who are injured or sick
g. flying airplanes overseas

Which of the workers in activity D do their jobs primarily during the day? Which of the workers might also work at night?

Vocabulary Activities STEP II: Sentence Level

Word Form Chart			
Noun	**Verb**	**Adjective**	**Adverb**
revolution	revolutionize	revolutionary	_____

The central meaning of *revolution* is "turning" or "changing." It can refer to one thing rotating around a central point, like the Earth's revolution around the sun. It can also mean "changing or trying to change the political system by violent action."

In this unit, *revolution* is used to mean "a complete change in methods, opinions, etc., often as a result of progress."

*Bicycles led to a **revolution** in transportation.*

*Bicycles **revolutionized** the way people traveled from place to place.*

*Bicycles were a **revolutionary** idea.*

E. **In your notebook, rewrite these sentences two ways. Use a different form of *revolution* in each sentence.**

1. The addition of sound changed the way motion pictures told stories. (noun, verb)

   *The sound **revolution** changed the way motion pictures told stories. (noun)*

   *The addition of sound **revolutionized** the way motion pictures told a story. (verb)*

2. The jet engine caused a change in air travel. (verb, adj.)
3. Alfred Nobel created a new substance that he called "dynamite." (noun, adj.)
4. The discovery of X-rays changed medical science. (noun, adj.)

The verb *substitute* means to replace one thing for something different. The noun form *substitution* refers to the process of making a replacement. The noun form *substitute* refers to the person or thing that will be used to replace something.

The team captain ***substituted*** *Ernesto for the injured player.*

He made the ***substitution*** *because the injured player was in pain.*

The ***substitute*** *went on to win the game.*

The word *substitute* is commonly used for a teacher or player who takes someone else's place.

We had a ***substitute*** *in math class today.*

CORPUS

F. **Make words related to bicycles. Remove one letter from each word and substitute the given letter to make a new word. Tell a partner how to make the new words.**

1. chair/n ***Substitute*** *an N for the R to make chain.*
2. steel/r: _____
3. time/r _____
4. broke/a _____
5. hide/r _____
6. petal/d _____

Subsequent is an adjective that refers to something that is later than or follows something else. The adverb form is *subsequently*.

Henry Ford's first car was called the Model T. The ***subsequent*** *Model A was introduced in 1927.*

Henry Ford created the Model T in 1908. ***Subsequently,*** *he built the Model A.*

CORPUS

G. **Complete each sentence with forms of *subsequent* AND *substitute*. Be sure to use the correct form of each word.**

1. The wheels of the first velocipedes had no pedals, but a French inventor _____ _____wheels that had pedals.
2. European velocipedes were heavy because the framework was made of solid steel tubes. The_____ _____of hollow steel tubes by American manufacturers made the vehicles much lighter.
3. The high wheeler had a small rear wheel. A_____ change by American manufacturers_____ the larger rear wheel for the smaller one.

READING 2

Before You Read

Read these questions. Discuss your answers in a small group.

1. How much do you walk in your daily activities? Do you sometimes wish you could walk less? When?
2. How do you decide if you should walk, ride a bicycle, or drive when you go somewhere?
3. Have you ever seen a Segway? Describe where you saw it and what it looked like.

READING SKILL Previewing

APPLY

Preview Reading 2 by answering these questions. Discuss your answers with a partner.

1. Look at the title of the article. Does the title tell you what it will be about? What does the word *future* in the title suggest about the article? How do you think this article will be different from the previous reading in this unit?
2. Look at the picture in the article. Does it help explain what a Segway is?
3. Read the bold type subheadings. What information do they give about the topic? Check (✓) the questions that *might* be answered in the article.

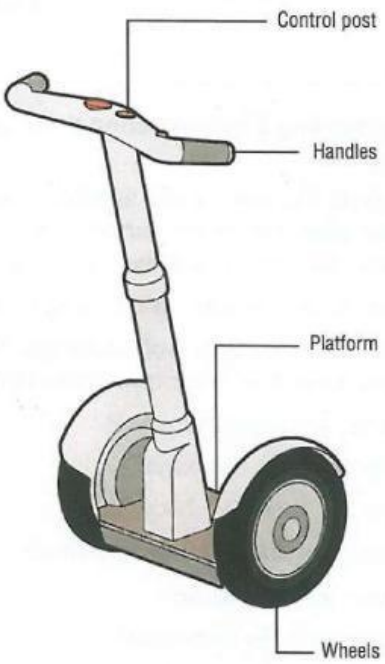
___ Where are Segways used?
___ Who will ride Segways?
___ How are they like bicycles?
___ When was the Segway invented?
___ Where is the engine?
___ How much do they cost?
___ What are they used for?
___ How many Segways are there in Paris?

Read

This newspaper article poses questions about the future of personal transport.

Segway Into the Future

For nearly two hundred years, **individuals** worldwide have been riding bicycles for transportation, enjoyment, sport, and exercise. In 2001, the Segway, a **revolutionary** new vehicle, was introduced. The inventor imagined that the Segway might someday replace bicycles. Would this be possible? How does a Segway compare to a bicycle?



WHAT IS A SEGWAY?

Both Segways and bicycles are **designed** to carry one rider. However, Segway riders do not sit on a seat. Instead, they stand on a platform while they are riding. The platform is the floor of a strong metal **framework.** A post with handles for the rider to hold is attached to the front of the platform. A wide rubber wheel is attached to each side of the platform. Except for these two wheels, there are no mechanical parts on a Segway. Like a bicycle, it has no engine. However, unlike a bicycle, a Segway has no brakes, no pedals, no gears, and no steering mechanism.

HOW A SEGWAY MOVES

A Segway uses a computer system that is **designed** to respond to the **inherent** ability of riders to maintain their balance. For example, without thinking about it, a rider actually leans his body slightly forward when he expects to move forward. When the rider expects to stop, he leans his body slightly back. When the rider thinks about moving left or right, he leans left or right. The computer system checks the rider's body movements about 100 times every second. Instantly, the Segway moves forward, stops, or turns in response to every slight change in the rider's balance. It is easy to learn to ride a Segway because it responds to the rider's natural movements.

HOW A BICYCLE MOVES

In contrast, it is hard to learn to ride a bicycle. The rider works constantly to stay balanced. She turns the pedals with her feet to make the bicycle move forward. She presses the brake levers to make the bicycle stop. To

alter her direction, the rider moves the handle bars left or right. If a bicycle rider leans too far to one side, the bicycle will **subsequently** fall over.

Riding a bicycle is also hard work. A bicycle can travel as far as a rider can keep pedaling. It can go very fast if the rider has enough energy to pedal hard. For example, in the annual Tour de France bicycle race, riders travel more than 100 miles a day at speeds greater than 30 miles per hour.

A Segway race would not be very interesting. A Segway can't go very far, and it can't go very fast. A Segway is powered by a battery that limits it to traveling 24 miles (39 kilometers) on one battery charge. And it can travel no faster than 12.5 miles (20 kilometers) per hour. Being battery-powered, not pedal-powered, the rider gets almost no exercise, but Segways are fun. **Overseas** and at home, they are popular with tourists. Visitors to over 200 cities, including London, Athens, and Bangkok, can pay a **fee** to take a guided city tour on a Segway.

BICYCLES AND SEGWAYS COMPARED

	Bicycles	Segways
Riders	One	One
Power	Pedaling	Battery
Top speed	30+ mph	12.5 mph
Range	Unlimited	24 miles per battery charge
Indoors/Outdoors	Outdoors	Indoors and outdoors
Easy to learn	No	Yes
Easy to balance	No	Yes
Provides exercise	Yes	No
Provides transportation	Yes	Limited

HOW SEGWAYS ARE USED

Segways can do things that bicycles cannot do. For instance, Segways are useful in **jobs** that normally require workers to do a lot of walking, such as delivering mail, inspecting farms, or patrolling buildings at night. An extra benefit is that **individuals** who cannot comfortably walk because of poor health or **injury** can **minimize** their walking but still be able to work if they can ride a Segway.

Segways are useful in other kinds of **jobs,** too. Pizza restaurants, pharmacies, and other small businesses have **substituted** Segways for trucks to make neighborhood deliveries. Police departments around the world have been putting officers on Segways instead of in cars or on motorcycles. The officers can patrol neighborhoods to keep them safe from crime. In many countries, security guards on Segways patrol airports, train stations, amusement parks, and other public places. Beijing public safety police patrolled on Segways during the 2008 Olympics.

WHY SEGWAYS ARE NOT USED MORE

However, few people are buying Segways for their own use. One reason may be that they are expensive. Another may be that people fear being laughed at for buying a "toy." A **primary** reason, however, may be that people do not understand what a Segway is, and they are afraid that it is dangerous. Some cities have even passed laws that allow Segways to travel only on sidewalks. The cities are concerned that Segway riders will cause accidents if they ride in the streets. Other cities allow Segways only in street bicycle lanes. They are concerned that people on the sidewalk might be **injured** by a Segway. Meanwhile, many cities are creating new bicycle paths and street traffic lanes to encourage people to ride bicycles.

Will Segways ever replace bicycles? Probably not, but they can do certain **jobs** that bicycles cannot do. Segways are hard-working vehicles that we are likely to see more of in the future. ■

Reading Comprehension

Mark each statement as *T* (True) or *F* (False) according to the information in Reading 2. Use your dictionary to check the meaning of new words.

___1. The Segway's framework consists of a platform and a post with handles.

___2. The driver can alter the direction of the Segway by leaning to the left or right.

___3. The Segway was primarily designed for individuals who cannot walk comfortably.

___4. Workers have been injured while riding Segways on their jobs.

___5. If the driver leans forward, the Segway subsequently slows down.

___6. People seem to have an inherent fear of electric vehicles.

___7. For a fee, people can take a tour on a Segway in some cities overseas.

___8. Segways can substitute for trucks to make neighborhood deliveries.

___9. Segways can minimize the walking that some jobs require.

Vocabulary Activities STEP I: Word Level

A. **Use the target vocabulary in the box to complete this story. Use the words in parentheses to help you.**

alter	individual	an inherent	revolutionized
designed	injured	minimize	subsequent
framework	had a job	primary	substituted

In 1901, Glenn Curtiss was 23 years old and _____ (1. worked at) manufacturing and selling bicycles. He had _____ (2. a natural) love of speed. He wanted to find a way to _____ (3. change) bicycles so they could go faster than a rider could pedal them. Glenn _____ (4. made the plans for) an engine that

_____ (5. replaced) a tomato can for a carburetor. He attached the engine to the drive mechanism of a bicycle. However, the engine did not make the bicycle go much faster, despite the loud noise it made. A _____ (6. later) engine that Glenn built was too heavy, and the bicycle was hard to balance. Riders often tipped over and _____ (7. hurt) themselves. The heavy weight of the engine was the _____ (8. main) problem he had to solve. After many tries to _____ (9. lessen) the weight, he solved the problem by making the _____ (10. structure) stronger. He began racing his "motorcycle." In 1907, Glenn set a speed record. He went 136 miles per hour, faster than any _____ (11. person) in the world had ever traveled. Glenn's invention _____ (12. created a big change in) bicycle riding.

A word analogy shows the relationship between two sets of words. To solve an analogy, you must identify how the words in the first set are related. Here are some examples.

apple : fruit	example	An *apple* is an example of a *fruit*.
pretty : lovely	synonym	*Pretty* and *lovely* have similar meanings.
young : old	antonym	*Young* and *old* have opposite meanings.
bicycle : ride	action	*Ride* is the action when you use a *bicycle*.
room : house	part	A *room* is part of a *house*.

To finish an analogy, think of a word to complete the second set of words that has the same relationship as the first set.

apple : fruit AS carrot : _____

An apple is an example of a fruit, so the missing word is *vegetable*. *Carrot* is an example of a *vegetable*.

You say an analogy like this: "*Apple* is to *fruit* as *carrot* is to *vegetable*."

B. **With a partner, use the target vocabulary in the box to complete these analogies. Then write the type of relationship each analogy has.**

	Relationship
1. garden : flower AS crowd : individual	part
2. car : damage AS person : _____	_____
3. save : spend AS increase : _____	_____
4. nation : country AS abroad : _____	_____
5. write : check AS pay : _____	_____
6. false : true AS last : _____	_____
7. bus : vehicle AS bus driver : _____	_____
8. before : after AS earlier : _____	_____

C. **With a partner, decide if these lines from advertisements were written before 1900 to sell early bicycles or after 2001 to sell modern Segways. Mark an advertisement *B* for bicycles or *S* for Segways.**

___ Hollow steel tubes substituted for solid tubes to minimize the weight.

___ Lean forward and watch this revolutionary vehicle go!

___ Individuals can alter their speed by just turning the pedals.

___ Used overseas to patrol the Beijing Olympics.

___ Avoid injuries. For a small fee, learn to ride on an indoor track.

___ Inherently easy to drive. Primary power is from batteries.

___ You thought high-wheelers were great? Try the subsequent design!

A *framework* is a structure upon which other parts are built or attached. On a bicycle, the wheels, pedals, and handlebars are attached to the steel framework. Sometimes, *framework* refers to the basis or foundation of something.

*The **frameworks** of early velocipedes were made of solid steel tubes.*

*A good education forms the **framework** for a successful career.*

CORPUS

D. **With a partner, match the frameworks on the right with the object or system that they support on the left. Take turns making sentences with the information.**

*The **framework** of a human body is the skeleton.*

___ 1. a human body	a. steel beams
___ 2. many governments	b. an interesting plot
___ 3. a skyscraper	c. the number 10
___ 4. the metric system	d. a constitution
___ 5. a good book	e. the skeleton

To *alter* something means "to make something different in some way, but without changing it completely." If you alter something, you have made an *alteration*.

Some things that you might alter include items of clothing, plans, or opinions.

CORPUS

E. **With a partner, imagine that you have borrowed a friend's bicycle for the weekend. Which things can be altered on a borrowed bicycle? Write *A* for each item you could alter.**

___ the speed of the bicycle	___ the size of the wheels
___ the color of the framework	___ the direction the bicycle turns
___ the height of the seat	___ the speed that the wheels turn
___ the design of the bicycle	___ the mirrors on the handlebars

Vocabulary Activities STEP II: Sentence Level

Word Form Chart			
Noun	**Verb**	**Adjective**	**Adverb**
design designer	design	designed	_____
individual individuality	individualize	individual individualized	individually

The noun *individual* means "person." The plural is *individuals.*

There were 200 ***individuals*** *in the research study.*

The adjective *individual* means something intended for one person.

Each bowl contained an ***individual*** *serving of rice.*

Individually means to perform an action one person or object at a time.

She washed each glass ***individually.***

To *individualize* something means to make it special for each person.

The teacher ***individualized*** *the assignment by giving each student a different topic to write about. We had* ***individualized*** *topics.*

Individuality refers to what makes a person unlike any other person.

Twins may show their ***individuality*** *by wearing different clothing.*

CORPUS

F. The Pinewood Derby is a car race sponsored by the Boy Scouts of America. The cars are small—just seven inches long. Rewrite these sentences about the Pinewood Derby to include the word in parentheses. Discuss your sentences with a partner.

1. Each boy works by himself to make his own cars. (*individually*)
2. First each boy makes a plan of his car on paper. (*design*, verb)
3. He wants to make his car look like no other cars in the derby, so it will be special. (*individualize*)
4. He can show his unique personality in many ways. Some boys plan their cars to look like a snake or a hot dog, for example. (*individuality, design*)
5. To build the car, the creator traces his plan on a block of wood and carves out the shape. Then he attaches the wheels and paints his car. (*designer, design*)
6. On the day of the race, the Boy Scouts roll their cars down a sloped board one at a time. The fastest car down the board wins a prize. (*individually*)
7. The judges give separate prizes for the funniest car, the scariest car, and other categories. (*individual*, adj.)
8. Every car is a winner. The contest is planned to show every boy's special qualities. (*designed*, verb; *individuality*)