UNIT 5

TRANSPORTATION ENGINEERING
MANAGING TRAFFIC FLOW

Unit Description

Content: This course is designed to familiarize the student with concepts in traffic management.

Skills: Synthesizing Information
- Recognizing the relationship between abstract concepts and concrete information
- Recognizing relationships between two spoken sources
- Recognizing the relationship between abstract concepts and concrete information in reading
- Elaborating on information from sources
- Synthesizing information

Unit Requirements

- Lecture: “Transportation Challenges”
  “Traffic Congestion in Markdale” (a report)
- Integrated Writing Task: Writing a conclusion to a report about a traffic challenge in the city of Markdale
- Assignments: www.MyAcademicConnectionsLab.com
Contents

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   Focused Writing
   Integrated Writing Task

GRAMMAR CHART: Present Unreal Conditional

UNIT 5 ANSWER KEY
1 PREVIEW

Go to www.MyAcademicConnectionsLab.com for Vocabulary Check.

Previewing the Academic Content, page 100

Transportation engineering is a branch of civil engineering that focuses on the safe and efficient movement of people and products. It involves both research about and construction of infrastructures that are essential for movement, such as railways, roads, bridges, and traffic signals. In this unit, students will examine:

• some of the challenges facing transportation engineers
• innovative transportation systems
• traffic challenges a city can face

Activating Background Knowledge

Before students read and study about traffic engineering, take some time to talk about various transportation systems in their home countries.

• What are the common means of transportation? Are they considered reliable or not? Why?
• What are some of the methods used to regulate large volumes of traffic? Are they effective or not? Why?

Examine the Key Words on page 100. This vocabulary will be helpful for comprehension of the exercises in this section and useful for the Integrated Writing Task.

Go to www.MyAcademicConnectionsLab.com for Key Words and Key Words: Practice.

Previewing the Academic Skills Focus, page 101

Highlight the purpose of this section, stated on the left. This unit focuses on strategies for:

• synthesizing information
• recognizing the relationship between abstract concepts and concrete information
• recognizing relationships between two spoken sources
• elaborating on information
• selecting and presenting related information from a variety of sources
Review the academic skills focus: Recognizing the Relationship between Abstract Concepts and Concrete Information.

After you have examined the information in the skills section and students have completed the Exercise, page 101, have students work in pairs or as a class to compare their answers.

Summary of the Text


1. Introduction
   a. The purpose of transportation is to move people and goods efficiently and safely, with minimal detriment to the environment.
   b. Transportation demand depends on the demand for goods or activities. Without a demand, there will be no transportation.
   c. A transportation system needs location utility, time utility, and cost utility to be effective.

2. Location utility
   a. Location utility refers to the primary purpose of transportation, moving people and goods from one place to another. It is directly connected to use of land and space.
   b. Example: The city of Ottawa in Canada has strong location utility.
      • It has city streets where people walk, drive, or ride the bus to get from home to school or work.
      • It has highways connecting Ottawa to nearby cities.
      • It has an airport that provides a way for people to travel long distances.
      • In addition, Ottawa is at the point where three major rivers meet, allowing for movement of lumber to the international market.

3. Time utility
   a. Time utility is connected to speed. Real trip speed is equivalent to the distance traveled divided by the total time the trip takes, including all stops, delays, and changes in vehicle.
   b. Example: A nonstop flight from China to New York with a trip time of 13 ½ hours would be preferable to a flight that stops once and takes 30 hours.
4. Cost utility
   a. Cost utility means that the transportation is cost effective. If transportation costs are too high, people will not travel.
   b. Example: A faster flight from China to New York costing $2,673 has a low cost utility, while the longer flight priced at $1,141 has better cost utility.

Go to www.MyAcademicConnectionsLab.com for Comprehension.

Go to www.MyAcademicConnectionsLab.com for Discussion Board.

2 BUILDING ACADEMIC LISTENING SKILLS

Go to www.MyAcademicConnectionsLab.com for Vocabulary Check.

Highlight the purpose of this section, stated on the left. Tell students that in this section, they will practice recognizing relationships between abstract concepts and concrete information and learn to identify the relationship between information in two spoken sources.

Before You Listen, page 103
In this section, students discuss traffic problems and possible solutions.

- Examine the Key Words. This vocabulary will be helpful for comprehension of the lecture and useful for the Integrated Writing Task.
- Point out that the noun and verb forms of carpool and shuttle have the same pronunciation.

Go to www.MyAcademicConnectionsLab.com for Key Words and Key Words: Practice.

Global Listening, page 104
Students listen to a lecture about transportation systems. They take notes about the challenges transportation engineers face and the solutions they devise.

Point out that in Exercise 1, page 104, students complete only the left-hand column of the chart. They will fill in the remaining columns in Exercises 2 and 3.
Summary of the Lecture

“Transportation Challenges, page 104 (For the complete audioscript, see Academic Connections 3, pages 184–185.)

Introduction
Efficient, cost effective, safe, and environmentally responsible transportation systems are essential to the economy and quality of life of a nation, but designing them is difficult. This lecture examines the challenges of transportation engineers as they attempt to design these networks.

Remainder of the lecture
1. Efficiency is connected to location and time utility.
   a. The peaks and lulls of traffic demands make vehicular use of roads inefficient. For just two hours in the morning and evening on weekdays wide roads are needed for all traffic, but the rest of the time, only a small portion of this capacity is necessary.
   b. When a city is growing, the problem is more complex because big cities need to think about their needs now and in the future.
2. Cost utility of transportation systems is another significant challenge.
   a. Building these systems is quite costly, and often the necessary funds are not available.
   b. Therefore we have to think about which projects are the most beneficial and consider compromises. If a city needs a bigger airport but the highway isn't big enough to handle the rush hour traffic, the money might be better spent on making a wider highway.
3. A third consideration is the impact on the environment.
   a. Land used for transportation systems could be used for farms, stores, homes, and recreation.
   b. Energy for vehicles comes mostly from fossil fuels that pollute the air.
   c. Transportation also creates noise, and people will fight against noise pollution in their neighborhoods.
   d. Environmental impact plans that consider noise and air pollution, traffic, wastewater, and even the movement of birds from an area are typically required. Balancing efficient and cost-effective transportation with concern for the environment is difficult.
4. Safety is another significant challenge.
   a. To be safe, transportation systems might need to be larger. Bigger roads, runways, and bridges are the safest, but are also most costly and take up more space.
   b. Compromises must be made between safety, cost, and the environment, and the safest projects may not be the cheapest or the friendliest to the environment.
   c. Safe, cost-effective transportation projects are possible, and transportation safety groups in many cities think about the best way to build safely and cost effectively. This is one of a transportation engineer’s primary goals.

5. Typical solutions to traffic problems have included:
   a. Building new roads
   b. Expanding existing roads
   c. Improving public transportation
   d. Promoting the use of high-occupancy vehicle lanes and carpooling
   e. Providing traffic reports
   f. These approaches have limited capability because traffic continues to increase.

6. More recent approaches to transportation problems make use of advanced electronic technology to develop Intelligent Transportation Systems (ITS), which is the subject of the next reading.


**Focused Listening, page 105**

Students listen to five other students discuss the lecture and take notes about the relationship between what the students say and the information in the lecture.

Review the academic skills focus: Recognizing Relationships between Two Spoken Sources.

After students have completed the Exercise, page 105, you may want to take some time to discuss their answers as a class to ensure that they completely understand the content of the student discussion.
Summary of the Student Discussion (used in item 2 of the Exercise, pages 105–106)

Student 1 says that it’s logical that environmental issues are a challenge because there is great concern about the environment today. Student 2 says he was so tired that he almost fell asleep. Student 3 says that the four challenges were thoroughly explained and noted that they are probably a challenge in all transportation projects. Student 4 says the four problems are hard to solve and that using electronic and communications technology will provide new ways to build and travel efficiently. Student 5 comments that there must be more than these four challenges—just four seems simple.

Go to www.MyAcademicConnectionsLab.com for Listening Activity 5.

Go to www.MyAcademicConnectionsLab.com for Checkpoint 1.

3 BUILDING ACADEMIC READING SKILLS

Go to www.MyAcademicConnectionsLab.com for Vocabulary Check.

Highlight the purpose of this section, stated on the left. Tell students that in this section, they will practice recognizing the relationships of various pieces of information and distinguishing between abstract concepts and concrete information.

Before You Read, page 106

Examine the key words in the box on page 106 and have students complete Exercise 1. This vocabulary will be helpful for comprehension of the text and useful for the Integrated Writing Task. Point out that the collocations here are content specific.

For Exercise 2, page 107:
• The purpose of this exercise is to provide an opportunity for students to use the new vocabulary. Accept reasonable answers, even if they are grammatically incorrect.
• You may want to use the students’ sentences as a basis for grammar instruction if you have the time.
Global Reading, page 108

Students read a text about intelligent transportation systems and analyze the information it presents. They also learn technical vocabulary on the topic of intelligent transportation systems.

After students have complete Exercise 1, page 108, discuss their answers as a class. This vocabulary will be helpful for comprehension of the lecture and useful for the Integrated Writing Task.

Note that the text in red font in the reading on pages 109–110 indicates that the information is a concrete example that illustrates the concept. Students will be asked to identify abstract concepts and concrete examples in the Focused Reading section.

Summary of the Text

“Intelligent Transportation Systems,” by J.D. Fricker and R.K Whitford, pages 109–110

Intelligent Transportation Systems (ITS) use road sensors, smart traffic signals, and message signs to improve efficiency of transportation systems by providing important information to people who use the system.

1. The challenge: Traffic volume changes during the day. Nearly all congestion happens in short periods, so building more roads may not be a cost-effective way to address traffic issues. These are three possible solutions:
   a. Take no action, because the congestion itself controls the traffic. More capacity would only create more traffic.
   b. Make the cost of using roads during peak times more expensive. By implementing tolls and increasing parking prices downtown, cities could discourage highway use.
   c. Use technology to encourage drivers to use roads when they are not crowded. Technology helps drivers better decide when and where to go. The creation of ITS results from the third alternative. ITS are intended to make existing systems more efficient, less costly, less harmful to the environment, and safer.
2. Technology used in ITS
   a. Road sensors
      • Underground road sensors send signals to traffic lights that change the timing of lights as traffic flow increases. Vehicles can move quickly in downtown areas because traffic signals are green.
      • Smart lights connected to an operations center allow for a dispatcher to control signals so that emergency vehicles can also travel quickly.
      • Example: In Shanghai roads sensors and smart traffic lights are located near on-ramps to roads. The light will turn red after an accident so that other vehicles cannot enter the highway.
   b. Freeway management systems
      • Electronic collection of tolls eliminates the need for toll-booth personnel and reduces trip time.
      • Example: In Toronto, drivers who use the freeway can install a transponder in their cars. The transponder communicates to a central billing system. License plates on vehicles without transponders are photographed so that drivers can be billed. The cost is increased, but travel time isn’t. Congestion is reduced.
   c. Electronic control of the number of vehicles that go onto the road
      • A driver can enter the freeway only if a ramp signal is green. If the freeway is too crowded, the driver can’t enter until traffic is lighter.
      • Message signs above freeways also provide traffic and weather conditions to drivers. The outcome is better traffic flow for those already on the road. Research shows that there are no longer wait times for people who want to get on the freeway.
      • Example: In Minnesota, there are 430 smart traffic signals on the busiest on-ramps that comprise the management system. In a six-week period, the capacity of the highway increased by 9 percent, and highway speed increased by 7 percent. Accidents decreased by 26 percent. Vehicle pollution fell and travel times were reduced by 22 percent. The freeway-management system was effective.
Focused Reading, page 110

Review the academic skills focus: Recognizing the Relationship between Abstract Concepts and Concrete Information in Reading

Note that the typical arrangement of abstract concepts preceding concrete information may not be true for other languages. You may want to spend some time talking about whether this is true for students’ native languages.

Go to www.MyAcademicConnectionsLab.com for Reading Activity 5.

Go to www.MyAcademicConnectionsLab.com for Checkpoint 2.

4 BUILDING ACADEMIC WRITING SKILLS

Make sure that students are familiar with the grammar point covered in MyAcademicConnectionsLab for this unit (present unreal conditional) before they begin this section. Go to page 14 in these Teacher’s Notes for the grammar chart.

Go to www.MyAcademicConnectionsLab.com for Grammar Check.

Highlight the purpose of this section, stated on the left. In this section, students will finish a report about a traffic issue in the fictional city of Markdale.

Before You Write, page 111

In this section, students read a report on traffic congestion in the city of Markdale and discuss advantages and disadvantages of proposed solutions.

- Note that the organizational structure of this report is problem / solution. This structure typically has four steps: description of the situation, explanation of the problem, description of the solution, and explanation of the (anticipated) results.
- For a more detailed explanation of this organizational structure, see Academic Connections 4, Unit 2.
Summary of the Report


A. The Challenge
1. In the rapidly growing town of Markdale, rush-hour traffic has become a critical issue. Two major roads handle most of the traffic, and for five hours a day, highway capacity is over its capability.
2. Taxpayers are complaining, and three major businesses decided not to come to Markdale because of the rush hour traffic.
3. Safety is a concern. There has been an increase of accidents at highway intersections, especially downtown. One or two pedestrians are killed each year.
4. The city has ample money to add one lane to the east-west highway, but not enough to widen the bridge, since bridge construction is more costly.

B. Summary of the Possible Solutions
1. Land developers want to move one of the highways so it goes around the city. To do this, a new bridge would need to be built and valuable farmland to the east, north, and west of the city would need to be purchased. This would open up new land for homes to be built and accommodate city growth.
2. Merchants downtown want to widen the road from two to four lanes. Homes, trees, and business property would need to be bought and destroyed. This would bring more business to the downtown area.
3. An environmental organization wants public transportation increased along one of the existing roads and a new subway from north to south that would go through the downtown area. Land would have to be purchased, but not as much as for the first two solutions. This organization thinks its solution would have the least impact on the environment.
4. Most taxpayers want no action taken. They say that increasing highway capacity means more traffic, and new roads mean an unwanted increase in taxes. They want the money the city has to go to improving schools and health care.
5. Transportation engineers are recommending ITS.

Go to www.MyAcademicConnectionsLab.com for Comprehension.

Focused Writing, page 114

Review the academic skills focus: Elaborating on Information from Sources.
After you have examined the information in the skills section, point out that there is a fine line between elaboration and adding insignificant information. Effective elaboration does not include non-essential information or unnecessary repetition.

Go to www.MyAcademicConnectionsLab.com for Writing Strategy.

Integrated Writing Task, page 115

The Integrated Writing Task requires students to synthesize the information in this unit and write a conclusion to a report.

Review the academic skills focus: Synthesizing Information.

- Go over the Integrated Writing Task assignment on page 115.
- Go over Steps 1–5 on page 116.
- You may want to provide students with the steps of a problem-solution organizational structure. Point out that the conclusion they write will include a description of the solution and an explanation of the anticipated results.
- You may want to assign Steps 1, 2, and/or 3 for homework.

Go to www.MyAcademicConnectionsLab.com for Internet Activity and Academic Words Puzzle.
GRAMMAR CHART: Present Unreal Conditional

<table>
<thead>
<tr>
<th>Present Unreal Conditional</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Use the present unreal conditional to</strong> express untrue or imagined conditions and their results in the future.</td>
</tr>
<tr>
<td>The action (or result) is expressed in the main clause. The condition is expressed in the *if-*clause.</td>
</tr>
<tr>
<td>• Use the simple past tense form in the *if-*clause although the meaning is not past.</td>
</tr>
<tr>
<td>• Use <em>would</em> + verb in the result clause.</td>
</tr>
<tr>
<td>• Use <em>could</em> for possibility.</td>
</tr>
<tr>
<td>• Either clause can come first. When the result clause is first, do not add a comma. When the *if-*clause comes first, add a comma.</td>
</tr>
<tr>
<td>• <em>Would</em> is often contracted.</td>
</tr>
<tr>
<td><strong>If the road were wider, there would be more cars. (The road is not wider, so there are not more cars.)</strong></td>
</tr>
<tr>
<td><strong>If the city built more roads, taxes would go up. (The city isn’t building more roads; taxes are not going up.)</strong></td>
</tr>
<tr>
<td><strong>If the city built more roads, taxes could go up.</strong></td>
</tr>
<tr>
<td><strong>Taxes would go up if the city built more roads.</strong></td>
</tr>
<tr>
<td><strong>If the city built more roads, taxes would go up.</strong></td>
</tr>
<tr>
<td><strong>I’d be upset if taxes went up.</strong></td>
</tr>
<tr>
<td>**2. When the <em>be</em> verb is in the <em>if-<em>clause, use <em>were</em> for all persons.</em></em></td>
</tr>
<tr>
<td><strong>Correct: If I were in a hurry, I wouldn’t take the bus.</strong></td>
</tr>
<tr>
<td><strong>If he were in a hurry, he wouldn’t take a bus.</strong></td>
</tr>
<tr>
<td><strong>Incorrect: If I was in a hurry, I wouldn’t take the bus.</strong></td>
</tr>
<tr>
<td><strong>Incorrect: If he was in a hurry, he wouldn’t take a bus.</strong></td>
</tr>
</tbody>
</table>
3. Use *not*, often contracted to *'nt*, to negate one or both clauses.

<table>
<thead>
<tr>
<th><strong>If this road weren’t so narrow, traffic would move faster. (This road is narrow, so traffic doesn’t move faster.)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If we had a transponder in our car, we wouldn’t have to stop to pay tolls. (We don’t have a transponder in our car, so we have to stop to pay tolls.)</strong></td>
</tr>
<tr>
<td><strong>If I didn’t want to avoid traffic, I wouldn’t ride a train to work. (I want to avoid traffic, so I ride a train to work.)</strong></td>
</tr>
</tbody>
</table>

4. You can omit the conditional clause if it is understood from the context.

<table>
<thead>
<tr>
<th>If you write a series of conditional sentences, you don’t have to repeat the <em>if</em>-clause in each sentence.</th>
</tr>
</thead>
<tbody>
<tr>
<td>If they installed road sensors in our town, traffic would move more smoothly. Express buses would travel faster through the crowded downtown area during rush hours. Ambulances and police cars would travel quickly during emergency situations.</td>
</tr>
</tbody>
</table>
UNIT 5 ANSWER KEY

1 PREVIEW

Previewing the Academic Content

Exercise 1, page 100
*Answers will vary. Possible answer:*
The number of cars exceeds the highway capacity for a short period of time each day—this is the rush hour.

Exercise 2, page 100
1. There would be a traffic jam, traffic congestion, or rush hour.
3. *Answers will vary. Possible answers:* more lanes, HOV lanes, bigger roads, additional roads
3. *Answers will vary. Possible answers:* Public transit, high-occupancy vehicle lanes, encourage biking, charge tolls, charge for peak-time travel, provide information about traffic jams to divert traffic, etc.

Previewing the Academic Skills Focus, pages 101–102
*Abstract concepts are shaded. Concrete information is underlined.*

The function of transportation is to provide for the movement of people and products from one place to another safely and efficiently, with minimum negative impact on the environment. The demand for transportation is based on the demand for an activity or product. When no particular demand for a specific activity or product exists, then no transportation will occur. This could happen because people do not want to travel to a certain place or because the cost of transport exceeds the value placed on it by the traveler. When viewed as a system, transportation must have three main requirements for it to be effective: location utility, time utility, and cost utility.

**Location Utility**
The demand for most vehicle transportation is to provide access from an origin, such as a residence, to a destination, such as an industry, commercial center or public place. Therefore, transportation is closely tied to how land and space are used. For instance, Ottawa, the capital city of Canada, has many urban streets on which people drive, walk, or ride buses to get from their homes to work or to school. It has major highways that connect it to the neighboring cities of Toronto and Montreal. It has an airport that permits its residents to travel long distances by plane. It is also located at the meeting point of three rivers: the St. Lawrence, the Rideau, and the Gatineau. In the past, these rivers were used...
to move valuable trees to national and international markets. Ottawa has strong location utility.

**Time Utility**

Time utility is related to the trip speed of transportation. True trip speed is really not the speed of a vehicle; it is the distance traveled divided by the total trip time including stops, delays, and vehicle changes from origin to destination. For example, to fly from Beijing to New York, you might have to choose between two flights. The first flight with Continental Airlines leaves Beijing at 3:45 P.M. and arrives in New York at 10:54 P.M. the following night, with an overnight stay in Houston, Texas. The total trip time is 31 hours and 9 minutes. The second flight with Air China is a nonstop flight that leaves Beijing at 1:00 P.M. and arrives in New York at 1:30 P.M. the next day. The total trip time is 13 hours and 30 minutes. Clearly, the time utility of the nonstop flight with Air China is best.

**Cost Utility**

Cost-effective transportation is required for both passenger and product movement to take place. When the cost to move people from an origin to a destination is so high that the trip becomes undesirable, then the person will choose not to travel. To return to our Beijing to New York example, the nonstop Air China flight has the highest time utility, but it costs $2,673. The slower Continental Airlines flight costs just $1,141. The cost utility of the Continental Airlines flight is best.

- Transition words: For instance; For example; To return to our Beijing to New York example
- The concrete information supports the abstract concepts.
## 2 BUILDING ACADEMIC LISTENING SKILLS

### Before You Listen

**Exercise 1, page 103**

*Answers will vary. Possible answers:*

<table>
<thead>
<tr>
<th>Traffic Problems</th>
<th>Traffic Solutions</th>
</tr>
</thead>
</table>
| 1. too many cars arriving at and leaving from the stadium | • build more roads  
• make roads wider / add lanes  
• encourage public transit  
• encourage car pooling  
• change the traffic signals on game days to help fans arrive and leave the stadium |
| 2. not enough places to park                          | • build bigger parking lots  
• allow parking on streets for game day  
• put up signs to tell cars where to park |
| 3. not enough public transit (buses)                  | • increase the frequency of service for game days  
• decrease fares on game days  
• provide shuttle buses from key locations  
• build a subway system |
| 4. other problems: not enough roads that lead to the stadium | • build additional roads leading to the stadium  
• widen the existing roads |
Global Listening
Exercises 1–3, page 104

<table>
<thead>
<tr>
<th>Abstract Concept The Challenges</th>
<th>Transition Word</th>
<th>Concrete Information</th>
<th>Relationship between Abstract Concept and Concrete Information (Support or Contradict)</th>
</tr>
</thead>
<tbody>
<tr>
<td>efficient</td>
<td>such as</td>
<td>Beijing, Berlin, Dubai, Los Angeles, Mexico City, and Toronto</td>
<td>support</td>
</tr>
<tr>
<td>• location and time utility</td>
<td></td>
<td>consider traffic needs for today and tomorrow</td>
<td></td>
</tr>
<tr>
<td>• normal road use is inefficient due to rush hour more complicated in growing cities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cost effective</td>
<td>for example</td>
<td>trade-off between bigger airport and wider highway</td>
<td>support</td>
</tr>
<tr>
<td>• cost utility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• very expensive to build may need to trade-off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>environmentally responsible</td>
<td>for instance</td>
<td>airport in Thailand near Bangkok</td>
<td>support</td>
</tr>
<tr>
<td>• transportation projects damage the environment</td>
<td></td>
<td>environmental impacts included noise pollution, air quality, traffic congestion, wastewater production, and bird migration</td>
<td></td>
</tr>
<tr>
<td>• air pollution noise pollution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>safe</td>
<td>however</td>
<td>transportation safety committees consider how to build safely as well as cost effectively</td>
<td>contradicts</td>
</tr>
<tr>
<td>• often bigger is safer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Solutions to Transportation Challenges:
building new roads, or new lanes onto existing roads, increasing public transit, encouraging car pooling and high-occupancy vehicle lanes, and providing radio and TV traffic reports, advanced electronic technologies called Intelligent Transportation Systems
### Four Main Transportation Challenges:
- efficient
- cost effective
- environmentally responsible
- safe

<table>
<thead>
<tr>
<th>Student Opinions</th>
<th>Relationship between Student Opinion and Main Lecture (<em>similar, contrasting, solutions to a problem, reasons why something is true, unrelated</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1:</td>
<td>Reasons why something is true</td>
</tr>
<tr>
<td>• It makes sense that one of the challenges is environmental responsibility. Everyone is worried about the environment these days.</td>
<td></td>
</tr>
<tr>
<td>Student 2:</td>
<td>Unrelated</td>
</tr>
<tr>
<td>• I was so tired in that lecture, I nearly fell asleep. I really need to get more rest.</td>
<td></td>
</tr>
<tr>
<td>Student 3:</td>
<td>Similar (in agreement)</td>
</tr>
<tr>
<td>• I think the four challenges were well explained. These four things must be challenges for every transportation project.</td>
<td></td>
</tr>
<tr>
<td>Student 4:</td>
<td>Solution to a problem</td>
</tr>
<tr>
<td>• The four challenges are really difficult to overcome. I think that applying electronic and communications technology to transportation problems will give us new ways to build roads and travel efficiently.</td>
<td></td>
</tr>
<tr>
<td>Student 5:</td>
<td>Contrasts (disagrees)</td>
</tr>
<tr>
<td>• There must be more than four transportation challenges. Only four sounds too simple.</td>
<td></td>
</tr>
</tbody>
</table>

**Your opinion:**
*Answers will vary.*
3 BUILDING ACADEMIC READING SKILLS

Before You Read

Exercise 1, pages 106–107

<table>
<thead>
<tr>
<th>Synonyms for Highways and Highway Systems</th>
<th>Synonyms for Traffic Congestion</th>
<th>Words for Collection of Money from Drivers</th>
<th>Cheap Solutions for Traffic Problems</th>
<th>Words Related to Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td>freeway, expressway, highway, networks</td>
<td>traffic jam, traffic gridlock, heavy traffic flow</td>
<td>fare, payment, toll collection</td>
<td>carpooling, public transit, high-occupancy vehicle lanes shuttles</td>
<td>road, lane, traffic lights, traffic signals</td>
</tr>
</tbody>
</table>

Global Reading

Exercise 1, page 108

2. f  4. i  6. b  8. d  10. j
3. a  5. g  7. e  9. h

Exercise 2, page 108

1. ITS use electronic and communication technologies to improve the efficiency of existing transportation systems. Electronic devices, such as road sensors, smart traffic signals, video links, and variable message signs are used.
2. Rush hour only occurs for a few hours each morning and afternoon. The rest of the day the roads are not nearly as busy.
3. The traffic engineer can a) do nothing, b) charge fees for road use, or c) use technology. The third alternative leads to ITS.
4. Road sensors sense the flow of traffic and adjust the timing of the lights so traffic flows most efficiently. This is used for express buses, police, and ambulances.
5. Freeway management systems can collect tolls electronically without increasing total trip time. They can also control the flow of traffic onto a freeway.
6. increased average highway speed; reduced highway accidents; reduced vehicle pollution; reduced highway travel times
7. Answers will vary.
Focused Reading, pages 110–111

1. a

2. The introduction (paragraphs 1–3) contains abstract information. Abstract concepts come before concrete information. We understand concrete information better when it is introduced first in a general way. The abstract concept helps us to understand why the concrete information is important or significant.

3. The writer uses *For instance* in paragraph 4, *for example* in paragraph 5. The last shift to concrete information in paragraph 7 is not introduced by a transition word / phrase, but the name of the specific transportation project is provided, which should tell the reader that this is specific information.