



Teaching Guide

For

Planning for a Roundabout

**Illinois Transportation, Distribution and Logistics
Math and Science Project**

2007

Table of Contents

Acknowledgements

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Problem Solving Activity

Overview of Module

- Scenario Focus (Pathway, Job Titles, Related Subject Matter)
- Description of the Problem to be solved
- TDL Cluster Knowledge and Skills and Performance Elements Addressed
- Illinois Learning Standards Addressed
- Objectives
- Measurement Criteria
- Teacher Notes
- Time Required to Complete Problem
- Support Materials and Resources Necessary for Completion of Scenario

Lesson 1 with Handouts 1, 2, 3 and 4

Lesson 2 with Handouts 5

Lesson 3 with Handout 6 and 7

Lesson 4 with Handout 8

Lesson 5

Lesson 6 with Handout 9 and 10

Teacher Assessment Materials

- Final Evaluation
- Sample Solution for Problem

Appendix

Glossary of Terms

Scenario Focus

Primary Career Pathway: Transportation Systems/Infrastructure Planning, Management and Regulation

Occupation/Job Titles Related to this Scenario: Transportation Engineer, Traffic Technician, Civil Engineer, Surveyor, and Regional Planner

Recommended Teaching Subject Areas: Math, Industrial Technology, Communication

Teacher/Writer Information

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Scenario Problem Statement and Performance Elements

The city of O'Fallon recently held an informational meeting on the roundabout that will be constructed at the intersection of State Street and Oberneufemann Road. Members of the city's engineering department and the city's consultant, Horner-Shifrin, Inc. were on hand to discuss the details of the project and answer questions presented by the attendees. During the evening, many questions and concerns were raised about the project, some of which were funding, traffic flow problems, and proximity of the railroad. Many residents seemed to be against the project. Horner-Shifrin has asked you to conduct a survey to determine the overall outlook of a community before and after the construction of a roundabout. Moreover, they have also asked you to develop a presentation to educate the residents of O'Fallon on how to properly use a roundabout.

TDL Cluster Knowledge and Skills and Performance Elements

Plan and maintain public transportation infrastructure

- Develop plans for new, improved, or discontinued public transportation infrastructure (e.g., highways, airports, train terminals, ports, intermodal facilities)
- Develop plans to maintain transportation infrastructure

Plan and manage public transportation services

- Monitor and report on the performance of public transportation operations

Transportation system management

- Develop plans to improve system utilization and traffic flow
- Develop plans to improve safety and environmental performance of carriers and safety conditions in transportation systems

Illinois Learning Standards:

Math

- Interpret scale drawings and models using maps and blueprints (7.C.4b)
- Represent mathematical patterns and describe their properties using variables and mathematical symbols (8.A.4b)
- Represent and organize data by creating lists, charts, tables, frequency distributions, graphs, scatterplots and boxplots (10.A.4a)

Language Arts

- Interpret tables, graphs, and maps in conjunction with related text
- Communicate information and ideas in narrative information and persuasive writing with clarity and effectiveness
- Deliver planned and impromptu oral presentations

What I Want Students to Know	What I Want Students to be Able to Do
<ul style="list-style-type: none">• Understand the role of a city planner• Understand the transportation infrastructure• Understand traffic flow concerns• How to use surveys to understand community wants/needs• Issues of traffic management	<ul style="list-style-type: none">• Create a useful survey to determine wants/needs of community• Draw/Create a scale model of intersection• Collect research data• Decipher research data• Write a business report• Make a presentation with visuals.

Objectives:

- **Learn about the role of city planners**
- **Acquire skills needed to develop infrastructures for roadways to increase traffic flow**
- **Describe major types of intersections that could be used**
- **Read and interpret maps**
- **Use scale drawings and create scale models**
- **Decipher information and draw conclusions from raw data**

- Prepare a written business report.
- Deliver an oral presentation of the solution.

Measurement Criteria for an acceptable solution:

1. Provided a recommendation that shows understanding of problem with supporting documentation which included student understanding of the infrastructure planning.
2. Recommendation shows proof that multiple scenarios were analyzed.
3. Recommendation shows proof that they
 - Collected and analyzed system utilization, traffic flow data and community input
 - Determined major problem areas
 - Identified and evaluated alternative solutions
 - Develop plans to improve safety and environmental performance
4. Actively participated in determining the recommendation and creation of model, presentation and report.
5. All calculations were correct using formulas, maps, and charts provided.
6. Business report included a cover letter, introduction stating the purpose of the report, documentation to support recommendations, a detailed explanation of costs, and tables, charts and spreadsheets to more clearly communicate recommended distribution plan.
7. Presentation presented the information with visual aids and/or handouts and met the 7 requirements of effective business presentations:
 - Evidence of preparedness and practice
 - Started on time
 - Dressed appropriately
 - Showed enthusiasm and confidence
 - Maintained eye contact, showed friendliness and respect
 - Spoke slowly and distinctly without grammatical errors or slang
 - Welcomed questions and answered completely; accepted reactions without being defensive.

Teacher Notes:

This Module should help students to better understand the transportation systems in their community. It will also teach them the importance of research and community understanding when exploring the options of "new" transportation concepts.

Another important piece of learning in the module is the fact that the problem does not have one clear answer. Rather, it provides an opportunity for the students to think creatively about how to develop the transportation system.

Given the need for creativity and time constraints it may be beneficial for students to work in teams to solve the problem. Engineering firms generally use teams to solve problems such as this one giving input from many different departments within the business.

Like most Problem Based Learning Projects, a field trip is very important. If that is not possible, video taping the intersection, roundabout and traffic circle would help provide some of the information the student needs to see.

Time Required to Complete Problem: 15 hours

Types of Materials included in this Module:

1. Lesson plans for each topic with discussion questions and student activities.
2. Copy of student handouts with activities for duplication.
3. Copy of material describing problem for students.
4. Evaluation with measurement criteria and scoring guide.
5. Teacher materials to assist in evaluation of problem and possible solution steps.
6. Glossary of terms related to this module.

Support Materials and Resources Necessary for Completion of Scenario:

- Computer access to internet and map programs
- Software such as Excel, Word processing and Presentation
- Handouts (see each lesson)
- Websites (also see each lesson)
 - www.ofallon.org --O'Fallon, Illinois official website
 - www.hornershifrin.com --Horner-Shifrin, Inc. website
 - www.roundaboutsusa.com -- information about roundabouts and design
 - <http://www.tfhrc.gov/safety/00068.htm> -- information about roundabouts from Turner-Fairbanks highway research Center (PDF File)
 - <http://www.ci.highland.il.us> - Highland, Illinois official website (They have a new roundabout)
 - www.dot.gov -- US Department of Transportation
 - <http://www.accesscable.net/~infopoll> - information on writing surveys

Lesson 1

TOPIC	Introduction to Roundabouts	TIME ESTIMATE	90 minutes
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OBJECTIVES
<ul style="list-style-type: none"> • Students will be able to define Infrastructure and Roundabout. • Students will be able to explain the difference between a roundabout and traffic circle.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Handout #1, Memo from Horner-Shifrin • Handout #2, What I know and What I Don't Know • Handout #3, Common questions about roundabouts • Handout #4, Matching Game • Picture of a Roundabout • Teachers Resource: "Roundabouts: An Informational Guide" This can be downloaded from website: http://www.tfhrc.gov/safety/00068.htm

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	10	- Introduction to Project <ul style="list-style-type: none"> • Initiate discussion "What is infrastructure? How is it important to you? To your community?" • An optional activity is to have students research on internet definition of infrastructure and share one incident (good pr bad) relating to infrastructure.
2	35	- Distribute copies of Handout 1, Memo from Horner-Shifrin. - Read as a class and answer any immediate questions. - Divide students into work groups for project and have them complete Handout 2, What I know and What I don't know. - Have groups share their responses and make a list on the board of what they know and what they don't know for future study.

3	25	<ul style="list-style-type: none"> - Share on PowerPoint or handout a picture of a roundabout. - Distribute Handout 3, Common Questions about Roundabouts. - Read with class and answer any immediate questions.
4	20	<ul style="list-style-type: none"> - Using Handout 4, Matching Game, cut each square with definitions and word. Can have students divide into groups and compete with each group to see who can match the word with the definition. May want to assign points for each correct answer.



Interoffice Memorandum

To: Independent Consulting Firm

From: Tom Mannino, Project Engineer

The city of O'Fallon recently held an informational meeting on the roundabout that will be constructed at the intersection of State Street and Oberneufemann Road. Members of the city's engineering department and the city's consultant, Horner-Shifrin, Inc., were on hand to discuss the details of the project and answer questions presented by the attendees. During the evening, many questions and concerns were raised about the project; e.g. funding, traffic flow problems, and proximity of the railroad. Many residents seemed to be against the project. We are asking you to conduct a survey to determine the overall outlook of a community before and after the construction of a roundabout. Moreover, they have also asked you to develop a presentation to educate the residents of O'Fallon on how to properly use a roundabout.

Once you have arrived at your recommendation would you please prepare a written business report with details and present it at our next management team meeting.

If you have any questions please let me know.

Problem Analysis Work Sheet

What I Know	What I Don't Know (Need to Ask)

Common Questions about Roundabouts

What is a roundabout?

A roundabout is a form of intersection control that provides safe and efficient traffic flow. It operates with yield control at the entry points, and gives priority to vehicles within the roundabout.

Why build a roundabout instead of installing a traffic signal (stop light)?

Roundabouts move traffic safely and efficiently through an intersection because of slower speeds, fewer conflict points and easy decision-making. Studies show that roundabouts provide a 90 percent reduction in fatal crashes, a 75 percent reduction in injury crashes, a 30-40 percent reduction in pedestrian crashes, and a 10 percent reduction in bicycle crashes.

Slower vehicle speeds (under 25 mph) mean drivers have more time to judge and react to other vehicles and pedestrians. Slower speeds make it easier to use for older and novice drivers, reduce the severity of accidents and help to protect pedestrians.

Roundabouts provide for efficient traffic flow because traffic is always on the move with less delay. There is a 30-50 percent increase in traffic capacity.

Other benefits of roundabouts include:

- Reduces pollution and fuel use
- Reduces noise due to fewer stops and starts
- Eliminates signal equipment installation and repair
- Provides traffic calming
- Improves visual quality and character through aesthetic landscaping

What is the difference between a "traffic circle" and a roundabout?

Roundabouts are different from traffic circles in that traffic circles can involve stop signs, stop signals, or no control at all; traffic circles can be very large, operate at higher speeds and can be confusing to navigate, often requiring motorists to move from one lane to another.

Some traffic circles still exist (Belleville Square). However, safety and operational problems caused many of them to fall out of favor in the 1950s and 1960s.

Roundabouts are not traffic circles. Roundabouts follow a yield at entry rule, which requires approaching vehicles to wait for a gap in the circulating traffic before entering the roundabout. Roundabouts involve low speeds for traffic entering and driving through the roundabout; they use deflection to slow entering traffic and enhance safety. Vehicles in the roundabout have the right of way.

Another distinguishing difference between traffic circles and roundabouts is that roundabouts have a smaller diameter than most traffic circles, resulting in safer conditions and lower speeds. Vehicles can enter modern roundabouts much easier than traffic circles due to flared approaches, entry angles, slower speeds on the circulating roadway and the fact that vehicles entering roundabouts always yield to circulating traffic.

Entering a roundabout is as easy as making a right hand turn onto a one-way street.

Why roundabouts?

The geometry of a roundabout is designed so all motorists have to slow down.

Properly planned roundabouts are designed using rigorous standards based on specific turning volumes. Traffic circles are typically sized based on land availability, location, and vehicle size.

Many of us have experience with a large, old style traffic circle (also called rotaries in some locations). The Du Pont Circle in Washington D.C. for example is a traffic circle, not a roundabout. Traffic circles are large in diameter, have high circulating speeds and can require some merging and weaving between lanes to exit. Traffic circles exhibit poor operation and high crash rates (Belleville Square is smaller and exhibits a better safety record, but is still a traffic circle, not a roundabout). Driving through traffic circles can be unnerving to the uninitiated driver. In some instances driving through traffic circles can be unnerving to any driver! People unfamiliar with the modern roundabouts often assume they cause similar problems since they are circular too. However, the yield-at-entry rule eliminates the "How do I drive this?" confusion.

Here is a brief history about traffic circles and modern roundabouts. In 1966, research in Great Britain led to a yield-at-entry rule. The yield-at-entry rule ended a locking problem in the modern roundabout, improved capacity, reduced crashes

and created a complete change in philosophy of roundabout designed and operation.

In the mid-1970's, research continued and engineers came up with another variable that introduced a revised design that recommended a curved vehicle path or deflection be added to prevent vehicles from taking too straight a path into the intersection.

According to studies in Kansas by E.R. Russel, G. Luttrell and M. Rys., by 1984 the modern roundabout had three principal features: yield to the traffic in the circle, deflection at entry and low design speed,

Wouldn't a traffic signal be safer than a roundabout?

Research from the Insurance Institute for Highway Safety and Maryland State Highways shows far fewer crashes occur at intersections with roundabouts than at intersections with signals or stop signs. Roundabouts are substantially safer than intersections controlled by stop signs, traffic signals or traffic circles. The majority of U.S. roundabouts have substantial safety performance because of their small diameter (compared to traffic circles), slower circulating speeds, flared approach and deflection, and yield control entrances.

Considering the massive costs to society related to traffic injuries and deaths, this is an extremely important benefit associated with roundabouts.

Couldn't a traffic signal handle higher traffic volumes better than a roundabout?

Many people do not realize how many vehicles can be processed at a properly designed roundabout intersection. In most situations, a roundabout can handle higher traffic volumes with less delay than traffic signals.

A single-lane roundabout can handle up to 2500 vehicles an hour. It would take two travel lanes and usually left and right turn lanes in each direction to match that capacity. In other words, a single-lane roundabout will handle the same capacity as other larger intersections.

Will a roundabout cost more than a traffic signal?

In some situations, modern roundabouts require more right-of-way at intersections than traffic signals, resulting in higher initial costs. However, in other cases, traffic signals require numerous lanes and lengthy turn lanes to move traffic effectively through the intersection. In these situations, traffic signals may

require more total right-of-way than roundabouts. (The O'Fallon roundabout requires very little new right-of-way.)

Additionally, roundabouts often solve traffic congestion problems without requiring road segments to be widened between intersections (known as the "wide nodes, narrow roads" philosophy) resulting in a net cost savings.

Another factor worth consideration is costs associated with crashes. Because they result in far fewer injury and fatal crashes than traffic signals, roundabouts produce lower long-term costs to society as a result of these crashes. Also, roundabouts do not require as much maintenance as signals and only require electricity for lighting at night. These factors result in long-term cost savings. Considering all of these items, roundabouts may cost more than traffic signals initially but are far less expensive in the long run.

Roundabouts might work in other locations, but can they work with our aggressive drivers?

Aggressive driving affects other motorists regardless of what kind of traffic controls are in place. Aggressive drivers are less of a safety threat when intersections are controlled by roundabouts than traffic signals and stop signs because (1) the potential for head-on and broadside crashes is almost completely eliminated with roundabouts and (2) speeds are lower. Roundabouts have been implemented with success throughout the world.

Aren't roundabouts confusing?

Roundabouts are different from traffic signals and will require drivers to learn how they operate. Experience in the U.S. has shown that motorists quickly adapt to this new type of intersection. Perhaps the newest illustrations of this are in Vail and Avon, Colorado, the locations of numerous high-capacity roundabouts. Both of these cities are major tourist destinations with many thousands of first-time roundabout drivers using the roundabout intersections each year. Despite large number of drivers who have not driven roundabouts previously, these intersections work well and do not confuse motorists.

Will older drivers have a more difficult time negotiating roundabouts than traffic signals?

Studies of roundabouts in the U.S. have shown that the average age of drivers involved in crashes did not increase following replacement of traffic signals and stop signs with roundabouts. Although not conclusive, these results suggest that

roundabouts do not pose a problem for older drivers.

Will the roundabout be unsafe for pedestrians and bicycles?

Auto-pedestrian crash rates are usually lower at roundabouts than at traffic signals. Those pedestrian injuries that do occur tend to be less serious due to the relatively low speeds encountered at roundabouts. Legitimate concerns have been raised regarding the ability of blind pedestrians to negotiate roundabouts, and this topic is under consideration within the U.S. transportation community. At intersections that are used by blind pedestrians, other countries such as the United Kingdom have implemented designed measures including signalized crosswalks with good success. Where appropriate, these measures will promote safe conditions for blind pedestrians.

Properly designed roundabouts also safely accommodate bicycles. Because vehicles are traveling at low speeds that are comparable to bicycle speeds, bicycles can negotiate a roundabout like motorized vehicles. Bicycles have two choices to negotiate a roundabout. The more avid and skilled bicyclists can merge into a traffic lane before the bike lane ends, ride close to the middle of the lane to prevent vehicles from passing, enter the roundabout after yielding to vehicles within the roundabout, circulate the roundabout being careful to watch for vehicles waiting to enter the roundabout and exit the roundabout as a normal vehicle would do. Bicyclists not wanting to enter traffic can use the sidewalk ramps where the bike lane ends, and proceed around the roundabout as a pedestrian on the sidewalk.

Won't roundabouts slow emergency vehicles? Can a fire truck safely negotiate the roundabout?

A roundabout is designed to be safely negotiated at about 20 mph. The average speed for roundabouts is between 15 and 25 miles an hour. The time lost negotiating the roundabout will only be a few seconds.

Roundabouts are carefully designed to accommodate emergency and large sized vehicles. Drivers should behave in the same manner as they would on any other road if an emergency vehicle approaches: yield to emergency vehicles in the roundabout, exit, and if possible, pull over.

The O'Fallon roundabout has been designed to accommodate the largest fire-rescue ladder truck.

What about the location of rail crossings?

Installing a roundabout near a rail crossing needs to be evaluated carefully. The O'Fallon roundabout location was evaluated by Horner & Shifrin, and underwent a peer review by the Illinois Department of Transportation, citing no adverse safety effect. The proposed roundabout will actually significantly reduce the number of times traffic is stopped near the crossing. When the crossing is operational, drivers will be expected to follow the same procedure as they do today; don't block the intersection and obey the warning gates.

There are a couple of benefits provided by the installation of a roundabout at this location: a u-turn movement will allow for drivers to select an alternate route, and the truck apron allows for bypass of backed up vehicles in the intersection.

What about the location of existing traffic signals? Will they affect the roundabout?

Just like railroad crossings, the location of traffic signals and other traffic control devices will have an effect on the operation of the roundabout. However, in the case of traffic signals, this effect can be a good one. In places like Towson, Maryland, a very high-volume urban multi-lane roundabout, the placement of traffic signals nearby actually helps to create artificial gaps in traffic approaching the roundabout. These gaps in traffic allow for the other high volume approaches to enter the roundabout. In this way, the roundabout functions much like a traffic signal.

What about the location of existing traffic signals? Will they affect the roundabout?

Roundabouts are growing in number throughout the United States, over 600 so far. Traffic engineers and city planners are discovering the benefits of roundabouts. An easy way to track the progress of roundabout construction is to search the internet for recent news articles and project websites

Vocabulary Matching Game

<p>These are large in diameter (over 300 feet), have high circulation speeds, and require some merging and weaving between lanes to exit. These generally have higher crash rates than roundabouts.</p>	<p>The large-scale public systems, services, and facilities of a country or region that are necessary for economic activity, including power and water supplies, public transportation, telecommunications, roads, and schools</p>	<p>This is a roadway with a circle in the center. It generally has a small diameter center (around 60 feet) and requires a low rate of speed. It operates with yield controls at the entry points, and gives priority to the vehicles inside the circle</p>
<p>Stoppage of traffic on a circular roadway caused by queuing backing into the roundabout from one of the exits resulting in traffic being unable to enter or circulate</p>	<p>A large diameter circle within the smaller diameter roundabout that allows larger trucks to navigate a roundabout. This is designed to be driven by larger vehicles</p>	<p>A measurement generally done electronically that determines the number of vehicles that pass through a given point on a road during a given time period</p>
<p>A line of vehicles, bicycles, or persons waiting to be served by the system (in our case, the roundabout)</p>	<p>Infrastructure</p>	<p>Locking</p>
<p>Queue</p>	<p>Roundabout</p>	<p>Traffic Circle</p>
<p>Traffic count survey</p>	<p>Truck apron</p>	

Picture of a Roundabout



Lesson 2

TOPIC	Field Trip	TIME ESTIMATE	160 minutes*
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OBJECTIVES	
<ul style="list-style-type: none"> • Students will be able to observe proposed intersection location. • Students will be able to draw conclusions of traffic flow problems. • Students will be able to observe current roundabout intersection and draw conclusions about how a roundabout could affect traffic flow issues. 	

MATERIALS & RESOURCES	
<ul style="list-style-type: none"> • Handout #5, Field Trip Worksheet • Arrangements including transportation for field trip 	

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	80	<ul style="list-style-type: none"> - Take field trip to visit proposed intersection and if possible, an existing roundabout intersection. - During or prior to field trip, distribute Handout 5, Field Trip Worksheet.
2	40	<ul style="list-style-type: none"> - Allow time for students to complete the field trip worksheet. Most of this will be done while on the field trip but the last part may be completed as a homework assignment if extra time needed.
3	20	<ul style="list-style-type: none"> - Review as a class the findings recorded on the field trip worksheet.

* Travel time will lengthen or shorten the amount of time needed for this lesson.

Roundabout Field Trip

Proposed roundabout location:

1. What time of day is it?
2. Watch the intersection for 5 minutes. What observations did you make about the intersection? Discuss traffic flow, volume, wait time, etc.
3. Where is the location of Highway 50 in relation to the intersection?
4. Where is the location of the railroad tracks in relation to State Street?

Belleville Traffic Circle:

1. What time of day is it?
2. What is located in the center of the circle?
3. Are there any traffic control devices that control the intersection?
4. How many lanes of traffic are in the intersection?
5. Observe the intersection for 5 minutes. What observations did you make about the intersection? Discuss traffic flow, volume, wait time, etc.

Highland Roundabout

1. What time of day is it?
2. What is located in the center of the circle?
3. Are there any traffic control devices that control the intersection?
4. How many lanes of traffic are in the intersection?
5. Observe the intersection for 5 minutes. What observations did you make about the intersection? Discuss traffic flow, volume, wait time, etc.

Overall observations

1. Think back to the intersections that you saw today. What differences did you notice about the intersections?
2. What intersection seemed to flow more smoothly?
3. What intersection was smaller in diameter?
4. List the advantages of each intersection that you observed.

Lesson 3

TOPIC	Analyzing the Data	TIME ESTIMATE	155 minutes
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OBJECTIVES	
<ul style="list-style-type: none"> • Students will be able to create a scale drawing of proposed intersection. • Students will be able to analyze research data given in raw form to draw conclusions. 	

MATERIALS & RESOURCES	
<ul style="list-style-type: none"> • Handout #6, Pros/Cons of Roundabouts • Handout #7, Sample Traffic Flow Survey Data • Internet access - web sites will vary depending on search engine used. • Computer with AutoCAD software • Measurements of intersection (may want to get from the business partner) 	

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	35	<ul style="list-style-type: none"> - Distribute Handout 6, Pros/Cons of Roundabouts. - Have students research via internet to complete handout. - Share findings in class.
2	60	<ul style="list-style-type: none"> - Distribute Handout 7, Sample Traffic Flow Survey Data. - Ask students to analyze the data on Handout 6 and compile information and their conclusions in a table. - Have student share their work.
3	60	<ul style="list-style-type: none"> - Provide students with the measurements of the proposed intersection. - Have them draw a scale model of the proposed intersection using AutoCAD. - Discuss any questions or concerns students had with completing scale model.

Pros/Cons of Roundabouts	
Pros	Cons

Sample Traffic Flow Survey Data

Location	x-street	Date	Volume
Oberneufemann	Main	2/10/2001	100
Oberneufemann	Main	4/16/2002	185
Oberneufemann	Main	1/8/2003	270
Oberneufemann	Main	10/29/2004	348
Oberneufemann	Main	10/15/2005	518
Oberneufemann	Main	3/20/2006	715
Main	Oberneufemann	2/10/2001	453
Main	Oberneufemann	4/16/2002	694
Main	Oberneufemann	1/8/2003	899
Main	Oberneufemann	10/29/2004	1120
Main	Oberneufemann	10/15/2005	1695
Main	Oberneufemann	3/20/2006	2306

Lesson 4

TOPIC	Developing, Administering and Analyzing Surveys	TIME ESTIMATE	120 minutes
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OBJECTIVES
<ul style="list-style-type: none"> • Students will be able to develop a quality survey. • Students will be able to express important information used for infrastructure planning. • Students will be able to draw conclusions using data from a survey.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Handout #8, What is a Quality Survey? • Computer with word processing and spreadsheet software

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	10	<ul style="list-style-type: none"> - Distribute Handout 8, What is a Quality Survey? - Allow time for students to read. - Discuss any questions students may have.
2	40	<ul style="list-style-type: none"> - Have students work individually or in groups to develop survey questions for their survey about roundabouts.
3	30	<ul style="list-style-type: none"> - Administer survey created. This may be done as a homework assignment with each student involving their friends and family in completion of the survey.
4	50	<ul style="list-style-type: none"> - Compile and analyze data from the survey in a spreadsheet.

What is a Quality Survey?¹

Words are often used in different ways by different people. Your goal is to write questions that each person will interpret in the same way. A good question should be short and straightforward. A questionnaire should not be too long. Use plain English so the questions are not difficult to answer. Only through careful writing, editing, review, and rewriting can you make a good questionnaire. The following provides you with guidelines for conducting your surveys.

Write a short questionnaire

Above all, your questionnaire should be as short as possible. When drafting your questionnaire, make a mental distinction between what is essential to know, what would be useful to know and what would be unnecessary. Retain the former, keep the useful to a minimum and discard the rest. If the question is not important enough to include in your report, it probably should be eliminated.

Use simple words

Survey recipients may have a variety of backgrounds so use simple language. For example, "What is the frequency of your automotive travel to your parents' residents in the last 30 days?" is better understood as, "How many times in the last 30 days have you driven to your parent's home?"

Relax your grammar

Relax your grammatical standards if the questions sound too formal. For example, the word "who" is appropriate in many instances when "whom" is technical correct.

Assure a common understanding

Write questions that everyone will understand in the same way. Don't assume that everyone has the same understanding of the facts or a common basis of knowledge. Identify commonly used abbreviations to be certain that everyone understands.

Start with interesting questions

Start the survey with questions that are likely to sound interesting and attract the respondents' attention. Save the questions that might be difficult or threatening for later. Voicing questions in the third person can be less threatening than questions voiced in

¹ Information on What is a Quality Survey was downloaded from the following website: www.accesscable.net/~infopoll

the second question. For example, ask: *"What is the attitude in your office about management?"* rather than *"How do you feel about management?"*

Don't write leading questions

Leading questions demand a specific response. For example: the question "Which day of the month is best for the newly established company-wide monthly meeting?" leads respondents to pick a date without first determining if they even want another meeting.

Avoid double negatives

Respondents can easily be confused deciphering the meaning of a question that uses two negative words.

Balance rating scales

When the question requires respondents to use a rating scale, mediate the scale so that there is room for both extremes.

Don't make the list of choices too long

If the list of answer categories is long and unfamiliar, it is difficult for respondents to evaluate all of them. Keep the list of choices short.

Avoid difficult concepts

Some questions involve concepts that are difficult for many people to understand.

Avoid difficult recall questions

People's memories are increasingly unreliable as you ask them to recall events farther and farther back in time. You will get far more accurate information from people if you ask, "About how many times in the last month have you gone out and seen a movie in a movie theater or drive-in?" rather than, "About how many times last year did you go out and see a movie in a movie theater or drive-in?"

Use Closed-ended questions rather than Open-ended ones

Most questionnaires rely on questions with a fixed number of response categories from which respondents select their answers. These are useful because the respondents know clearly the purpose of the question and are limited to a set of choices where one answer is right for them.

An open-ended question is a written response. For example: "If you do not want a company picnic, please explain why". If there are an excessive number of written response questions, it reduces the quality and attention the respondents give to the answers.

Put your questions in a logic order

The issues raised in one question can influence how people think about subsequent questions. It is good to ask a general question and then ask more specific questions. For example, you should avoid asking a series of questions about a free banking service and then question about the most important factors in selecting a bank.

Pre-test your survey

It is better to identify a problem during the pretest than after you have published the survey. Before sending a survey to a target audience, send it out as a test to a small number of people. After they have completed the survey, brainstorm with them to see if they had problems answering any questions. It would help if they explained what the question meant to them and whether it was valid to the questionnaire or not.

Naming your survey

Some people discard an electronic message based entirely on its subject or sender. You should consider other titles that will pique the interest of the recipients. Here are examples of survey names that might be successful in getting attention:

- Memo from the Chief Executive Officer
- Evaluation of services of the benefits office
- You opinion about financial services
- Free t-shirt
- Win a trip to Paris
- Please respond by Friday
- Free Subscription
- Win a Laptop computer

Cover memo or introduction

Once a recipient opens your survey, you may still need to motivate him or her to complete it. The cover memo or introduction offers an excellent place to provide the motivation. A good cover memo or introduction should be short and include:

- What is the purpose of survey?
- Why it is important to hear from the correspondent?
- What may be done with the results and what possible impacts may occur with the results?
- Where to return the survey?
- Who to contact for questions about the survey?
- What is the due date for the response?

Lesson 5

TOPIC	Creating a Scale Model	TIME ESTIMATE	180 minutes
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OBJECTIVES
<ul style="list-style-type: none"> • Students will be able to create a scale model of a drawing to represent a visual 3-dimensional rendering of the roundabout.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Drawing of model from Lesson 3 • Drafting scale • Plaster of Paris • Paint • Hard board for back of model

Lesson Description & Activities		
Steps	No. of Minutes	ACTIVITIES
1	180	- Have students use the AutoCAD drawing completed in Lesson 3 to create a scale model of the proposed intersection that could be used in a presentation.

Lesson 6

TOPIC	Preparing the written and oral presentation	TIME ESTIMATE	160 minutes
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OBJECTIVES

- Students will be able to prepare a written business presentation.
- Students will be able to prepare and deliver an oral business presentation.

MATERIALS & RESOURCES

- Handout #9, Writing Business Reports
- Handout #10, Making Business Presentations
- Computer with PowerPoint and word processing software

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	10	<ul style="list-style-type: none"> - Distribute Handouts 9 and 10, Writing Business Reports and Making Business Presentations. - Ask students to read or review prior to preparing their reports and presentations.
2	120	<ul style="list-style-type: none"> - Allow time for students to complete their written report. - Have students create a PowerPoint presentation for their oral presentation
4	30	<ul style="list-style-type: none"> - Students will present their oral report of the project to business partner/ community leaders

Writing a Business Report

Your business report should clearly and effectively communicate to your audience the purpose, methods, and results of your project.

In developing and evaluating your business report, you should focus on three issues:

- Purpose and content
- Organization and structure
- Communication clarity and accuracy

Purpose and Content

The first step in developing or evaluating your business report is to make sure that you have clearly defined the purpose of the report and have addressed the needs and requirements of your audience.

You should start by developing a clear statement of the purpose of the report and a listing of the major topics and types of information that must be included.

Organization and Structure

The second step is make sure that your have organized your report in the most effective way. In general, reports should have four major parts:

- Introduction to the Report—The introduction should state the purpose of the report and should summarize what is described in the report.
- Body of the Report—The body of the report should contains the major sections that address all major issues and summarize all required information that may include graphs, charts, tables, and figures.
- Summary of the Report—The summary of the report should summarize the body of the report and major conclusions and recommendations
- Appendix Materials---The report may contain appendix materials that support or provide background information for major sections in the body of the report.

Communication Clarity and Accuracy

You should start by developing an outline of your report that shows the content and sequencing of each major section of your report. This outline should contain

titles for each section and a list of bulleted statements that summarize the purpose and content. It should also list any graphs, charts, tables and figures.

As you are developing your outline, you should ask:

- Do the report sections organize information logically? Does the information under each section belong there?
- Do the report sections contain all of the necessary information? Do the sections contain information that is not necessary?
- Are the report sections sequenced in the most effective order?
- Do the section titles clearly communicate the purpose and content of the sections?

The next step is to write and edit your report. In writing and editing your report, you should make sure that you are communicating clearly and are presenting accurate information. Remember, business reports should be short and to the point. They should communicate information effectively and efficiently. Here are some tips.

- Write your report using short sentences and paragraphs.
- Use supporting charts, graphs, tables, and figures to better convey your information whenever possible.
- Use consistent report formats for easy reading.
- Make sure your report does not contain spelling or grammatical errors.
- Make sure your report does not contain inaccurate information or math errors.

Activity:

With your team,

1. Develop a clear and concise statement of the purpose of the report.
2. Develop a list of the major topics and types of information that must be included to meet the requirements of the customer.
3. Develop a draft outline of your report.
4. Critique and revise your outline.
5. Write your first draft of each section including any graphs, tables, and figures.
6. Evaluate the clarity and accuracy of your first draft using the five tips and develop a second draft.

Evaluating Your Draft Report

The final step in developing your business report is to conduct a final review and editing of your report before submitting it to your customer.

Activity: Check your work.

Purpose and Content

- Do you clearly communicate the purpose of the report?
- Does the report contain all of the information needed to meet the requirements of the customer?

Organization and Structure

- Does the report contain an introduction that summarizes the purpose and contents of the report?
- Is the body of the report divided into sections that logically group related information?
- Does each section contain all of the necessary information?
- Does any section contain information that is not necessary?
- Are the sections properly sequenced?
- Do the section titles clearly communicate the purpose and content of each section?
- Does the report have a final section that summarizes the conclusions and recommendations of the project?

Communication Clarity and Accuracy

- Does the report contain long sentences and paragraphs?
- Does the report effectively use supporting charts, graphs, tables, and figures to better convey your information?
- Does the report use consistent report formats for easy reading?
- Does the report contain spelling or grammatical errors?
- Does the report contain inaccurate information or math errors?

Making Business Presentations

Organizing Your Presentation

Business presentations usually have three major components:

Introduction. In the introduction, you tell the audience:

- your name and the name of your group or organization
- the purpose of your presentation
- the major topics or sections of your presentation and the order in which you will present each section.

Body of Presentation. In the body of the presentation, you:

- present the most critical information for the purpose of your presentation
- explain the importance of the information for the purpose of the presentation

Conclusion. In the conclusion, you:

- summarize the most critical information in the presentation
- summarize your conclusions and recommendations.
- ask for questions, reactions, and comments

Developing Your Presentation Materials

Keep your presentation short and to the point. Your presentation should be completed within the planned time. Visual support materials should support your presentation. These visual support materials should include:

1. Presentation outline that clearly communicates the organization of your presentation and the major points.
2. Supporting graphs, charts, figures, and tables.

Your supporting materials should minimally be printed and distributed as handouts to your audience. You also should prepare talking points and notes for your team to follow so that you make sure that everyone is making the essential points and following the plan. These talking points and notes can be written on note cards.

Making Your Presentation

Developing effective business presentations is only half the job. You also must deliver an effective presentation. Here are some tips for making effective business presentations.

Start on Time. Make sure that you are prompt and ready to begin your presentation when it is scheduled.

Project a Professional Image. Make sure that you are dressed appropriately for a business presentation. Show good posture and stand up straight when you speak.

Show Enthusiasm and Confidence. Show you are very excited about your report and that you are confident in presenting and explaining the information.

Maintain Eye Contact and Show Friendliness and Respect. Show interest in your audience by maintaining eye contact during your presentation. Show respect for your audience and do not use negative body language.

Use Effective Speaking Techniques. Speak slowly and distinctly. Use standard grammar. Avoid meaningless words like "y'know."

Use Visual Aids. Use visual aids effectively to communicate information and maintain the interest and engagement of the audience.

Answer Questions Completely. Welcome questions and reactions. Make sure you understand the question. Answer the question completely. Don't be defensive if you don't know the answer. Show interest in finding the answer.

End on Time. Complete your presentation within the planned time.

Practicing and Evaluating Your Presentation

Most people cannot deliver effective presentations without practice and feedback. It is critical that you practice your presentation out loud with your teacher and students using your visual aids and notes.

Ask for feedback on the following:

Introduction

- Did we present our name and the name of our group or organization
- Did we present the purpose of our presentation?
- Did we present the major topics or sections of our presentation and the order in which we will present each section?
- Did we effectively gain the interest and attention of the audience for our presentation?

Presentation Content and Visual Aids

- Did we present the most critical information for the purpose of your presentation?
- Did we organize this information in a logical way and in the most appropriate sequence?
- Did we effectively explain the importance of the information for the purpose of the presentation?
- Did we prepare neat and clear visual aids and handout materials without errors?
- Did we present a summary of the major conclusions and recommendations?
- Did we ask for questions, comments, and reactions?

Presentation Delivery

- Did we dress appropriately to project a professional image?
- Did we stand straight and maintain eye contact with the audience at all times?
- Did we demonstrate confidence in presenting the information?
- Did we speak clearly at the appropriate rate?
- Did we speak in complete sentences with correct use and pronunciation of words including professional terminology?
- Did we speak with intonation and volume that engaged the audience?
- Did we effectively use our visual aids?
- Did we present and explain the information effectively?
- Did we show respect for the audience in presenting and responding to questions, comments, and reactions?
- Did we effectively seek a full understanding of questions, comments, and reactions?
- Did we completely answer questions or respond to comments and reactions?

Activity

With your team,

1. Prepare your presentation and develop your notes cards and visual aids.
2. Practice your presentation with your teacher and students and make improvement based on their evaluations.

Teacher Assessment Materials

FINAL EVALUATION

Problem Statement to be Solved:

The city of O'Fallon recently held an informational meeting on the roundabout that will be constructed at the intersection of State Street and Oberneufemann Road. Members of the city's engineering department and the city's consultant, Horner-Shifrin, Inc. were on hand to discuss the details of the project and answer questions presented by the attendees. During the evening, many questions and concerns were raised about the project, some of which were funding, traffic flow problems, and proximity of the railroad. Many residents seemed to be against the project. Horner-Shifrin has asked you to conduct a survey to determine the overall outlook of a community before and after the construction of a roundabout. Moreover, they have also asked you to develop a presentation to educate the residents of O'Fallon on how to properly use a roundabout.

Measurement Criteria that would describe an acceptable solution

1. Provided a recommendation that shows understanding of problem with supporting documentation which included student understanding of the infrastructure planning.
2. Recommendation shows proof that multiple scenarios were analyzed.
3. Recommendation shows proof that they
 - Collected and analyzed system utilization, traffic flow data and community input
 - Determined major problem areas
 - Identified and evaluated alternative solutions
 - Develop plans to improve safety and environmental performance
4. Actively participated in determining the recommendation and creation of model, presentation and report.
5. All calculations were correct using formulas, maps, and charts provided.
6. Business report included a cover letter, introduction stating the purpose of the report, documentation to support recommendations, a detailed explanation of costs, and tables, charts and spreadsheets to more clearly communicate recommended distribution plan.
7. Presentation presented the information with visual aids and/or handouts and met the 7 requirements of effective business presentations:
 - Evidence of preparedness and practice
 - Started on time
 - Dressed appropriately
 - Showed enthusiasm and confidence
 - Maintained eye contact, showed friendliness and respect
 - Spoke slowly and distinctly without grammatical errors or slang
 - Welcomed questions and answered completely; accepted reactions without being defensive.

Suggested Scoring Guide

1. Solving the Problem—50 points
2. Business Report—25 points
3. Presentation -25 points

Solution Checker:

A sample survey, data and analysis of data is presented on the next page. Student models and presentations will vary.

Sample Traffic Survey

What is a Roundabout?

The following survey is being conducted to determine the knowledge and opinions of the community in regards to the proposed roundabout that could be built at the intersection of State Street and Oberneufemann in O'Fallon, Illinois. Please circle the best answer that describes your opinion.

Thank you for your time.

- 1) Which of the following age groups describe you?
 - a. 16-21
 - b. 22-35
 - c. 36-50
 - d. 51-64
 - e. 65+

- 2) Do you drive?
 - a. Yes
 - b. No

- 3) Do you know what a roundabout is?
 - a. Yes
 - b. No

- 4) Is there a difference between a roundabout and a traffic circle?
 - a. Yes
 - b. No

- 5) Which do you think is more efficient, a traffic light or a roundabout?
 - a. Traffic light
 - b. Roundabout

- 6) Do you think a roundabout would help traffic flow?
 - a. Yes
 - b. No

- 7) Do you think a roundabout is worth the money?
- a. Yes
 - b. No
- 8) Do you think roundabouts are confusing?
- a. Yes
 - b. No
- 9) Do you think roundabouts are safe for pedestrians?
- a. Yes
 - b. No
- 10) Do you think roundabouts will work for aggressive drivers?
- a. Yes
 - b. No
- 11) Do you think different weather conditions will affect a roundabout?
- a. Yes
 - b. No
- 12) Please supply any additional information that you may feel could help with our research.

Roundabout Survey Data

survey percentages --75 surveys taken

1. Which of the following age groups describes you?
 - a-41.3%
 - b-25.3%
 - c-24%
 - d-5.3%
 - e-4%

2. Do you drive
 - a-82.7%
 - b-17.3%

3. Do you know what a roundabout is?
 - a-76%
 - b-24%

4. Is there a difference between a roundabout and a traffic circle?
 - a-57.3%
 - b-42.6%

5. Which do you think is more efficient, a traffic light or a roundabout?
 - a-60%
 - b-40%

6. Do you think a roundabout would help traffic flow?
 - a-57.3%
 - b-42.6%

7. Do you think a roundabout is worth the money?
 - a-30.7%
 - B-69.3%

8. Do you think roundabouts are confusing?
 - a-50.7%
 - b-49.3%

9. Do you think roundabouts are safe for pedestrians?

a-52%

b-48%

10. Do you think roundabouts will work for aggressive drivers?

a-30.7%

b-69.3%

11. Do you think different weather conditions will effect a roundabout?

a-65.3%

b-34.7%

Analyzing the survey

* the dominant age for driving in this survey was ages 16-21 with 41.3%

*The majority 82.7% of the people that took the survey drive.

*76% of people know what a roundabout is.

*42.6% of the people think that a roundabout and a traffic circle are the same thing which shows they don't really know what a roundabout is.

*There was not a great majority of people saying that a roundabout would help traffic.

*69.3% of people don't think a roundabout is worth the money.

*When it comes to people thinking roundabouts are confusing it is almost split but more people think they are confusing by around 1% in comparison to the people who do not think they are confusing.

*most people do not think that a roundabout will work with aggressive drivers.

*65.3% of people that took this survey think that weather conditions will affect a roundabout.

A P P E N D I X

GLOSSARY of TERMS Related to this Scenario

Infrastructure

The large-scale public systems, services, and facilities of a country or region that are necessary for economic activity, including power and water supplies, public transportation, telecommunications, roads, and schools.

Locking

Stoppage of traffic on a circular roadway caused by queuing backing into the roundabout from one of the exits resulting in traffic being unable to enter or circulate

Queue

A line of vehicles, bicycles, or persons waiting to be served by the system (in our case a roundabout)

Roundabout

A roundabout is a roadway with a circle in the center. It generally has a small diameter center (around 60 feet) and requires a low rate of speed. It operates with yield controls at the entry points, and gives priority to the vehicles inside the circle.

Traffic circle

Traffic circles are large in diameter (over 300 feet), have high circulation speeds, and require some merging and weaving between lanes to exit. Traffic circles generally have higher crash rates than roundabouts.

Traffic count survey

A measurement generally done electronically that determines the number of vehicles that pass through a given point on a road during a given time period.

Truck apron

A larger diameter circle within the smaller diameter roundabout that allows larger trucks to navigate a roundabout. The truck apron is designed to be driven on by these larger vehicles.