Teaching Guide

For

Making Bio Diesel

Illinois Transportation, Distribution and Logistics
Math and Science Project

2008

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Scenario Focus

Primary Career Pathway: Logistics Planning and Management

Occupation/Job Titles Related to this Scenario: Logistics Manager; Logistics Analyst; Transportation Manager; Fleet Manager;

Recommended Teaching Subject Areas: Industrial Technology, Math, Communication, Chemistry, Engineering

Teacher/Writer Information

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Business/Industry/Government Partner

Matt Seipp, Seipp Lawn Care

Scenario Problem Statement and Performance Elements

You have been hired by Seipp Lawn Care to research the usefulness of making Biodiesel as opposed to purchasing Diesel from the filling station. Much of the process of making the biodiesel can be obtained from local sources for minimal expenses. You must weigh the costs and the reliability of the product that you will create.

TDL Cluster Knowledge and Skills and Performance Elements

- Develop routes to meet service and time requirements at lowest cost.
- Develop transportation plans (e.g., report, memo, tables) including routing and scheduling.
- Present transportation plans (e.g. business meeting).
- Determine origin and destination points for routing.
- Determine load levels and transportation requirements for goods and/or people.
- Determine availability of qualified operators and required transportation equipment.

Illinois Learning Standards:

Math-*Stage I*

- Solve problems involving multiple rates, measures, and conversions. (7C)
- Calculate by an appropriate method the length, width, height, perimeter, area, volume, surface area, angle measures, or sums of angle measures of

common geometric figures, or combinations of common geometric figures. (7C)
- Represent and explain mathematical relationships using symbolic algebra. (8A)
- Justify the results of symbol manipulations, including those carried out by technology. (8A)
- Identify essential quantitative relationships in a situation and determine the class or classes of functions (e.g., linear, quadratic) that might model the relationships. (8A)
- Represent relationships arising from various contexts using algebraic expression. (8A)
- Students who meet the standard can organize, describe and make predictions from existing data. (10A) *(Data Analysis)*

Language Arts: Stage I

- Students who meet the standard can speak effectively using language appropriate to the situation and audience. (4B)

Objectives:

- Learn about alternative fuels in the automotive industry.
- Acquire the skills needed to develop a plan for making biodiesel.
    - Describe the major types of alternative fuels that could be used in a lawn care business.
    - Research different types of fuels and their costs.
    - Read and interpret maps and estimate mileage between two locations.
    - Use computers (map-quest, etc.) to estimate mileage between two locations.
    - Identify and describe all possible ways to reduce fuel costs.
    - Think of other possible solutions to the problem and have evidence to support those ideas.
- Prepare a written business report.
- Deliver an oral presentation of the distribution plan.

Measurement Criteria for an acceptable solution:

1. Evaluated alternative fuels and determined cost differences.
2. Researched different types of fuels and their costs.
3. Used computers (map-quest, etc.) to estimate mileage between two locations.
4. All calculations were correct using formulas and charts provided.
5. 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.
6. Presentation presented the information with visual aids and/or handouts.
7. The presentation 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:

Students should have a prior knowledge of working with the order of operations, distance formula, and solving problems. Students may need more information on the transportation and distribution of parts. This can be done right along with the scenario. Resources for this are in the Tool Box Bibliography in the Appendix.

Please review the materials needed prior to starting the problem solving activity so that you can make copies or obtain items needed. Notify students of the date that presentations will be made. Give students the opportunity to make their own cause and effect connections as various consequences present it.

Time Required to Complete Problem: 6 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 reading assignments and 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.
7. Toolbox Bibliography.

Support Materials and Resources Necessary for Completion of Scenario:

- Computer access to internet and map programs (mapquest, yahoo)
- Handouts (see each lesson)
- Websites (see each lesson)
- Software such as Excel, PowerPoint
- Calculators

Lesson 1

TOPIC	Introduction to Transportation, Logistics & Distribution	TIME ESTIMATE	80 minutes

OBJECTIVES
• Students will be able to understand alternative fuels. • Students will be able to apply math concepts to basic problems.

MATERIALS & RESOURCES
• **Handout #1, Transportation Questions** • **Handout #2, Review of Mathematics Concepts Worksheet**

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	40	• Introduction to TDL • Show video on gasoline or fuels or take field trip to fuel manufacturing facility. • Brainstorm with student's things they noticed in the video or field trip. Make a list of these on the board.
2	40	• Discuss how alternative fuels may impact society • Distribute Handout 1, Transportation Questions and have students complete. • Go over answers as a class discussion. • Distribute Handout 2, Review of Mathematics Concepts Worksheet. • Go over answers as a class discussion.

Transportation Questions

As a small group answer the following questions and be prepared to discuss them as a class.

1. What are three types of fuels made from crude oil?

2. What are engines used in the US?

3. How is a pipeline used in the fuel manufacturing process?

4. How many gallons of crude oil are in a barrel?

5. What is the price for a barrel of crude oil?

6. What is the price for a gallon of crude oil? (price/gallons)

7. What are 4 types of alternative fuels?

8. What are some reasons for using alterative fuels?

Review of Mathematics Concepts Worksheet

1. If a bus travels 55 mph and travels for 5.6 hours, how many miles did it go? Use d=rt.

2. If a person travels for work for 240 miles, and gets paid 40.9c per mile, how much did they make?

3. Solve for x; 18 = 2x + 6

4. Michael has 1 liter of a mixture containing 69% of boric acid. How much water must be added to make the mixture 50% boric acid? (Represent your answer as a fraction).

5. If a triangle has legs of 3 and 6, find the hypotenuse. Round to the nearest 10^{th}. Use the Pythagorean Theorem.

6. In a shipment of 100 tired, 1/10 of them are defective. What is the ratio of defective bulbs over non-defective bulbs?

7. If you have gone 4.8 miles in 24 minutes, what was your average speed, in miles per hour?

8. A box of Goldfish crackers contains 4 $\frac{1}{2}$ cups of goldfish. At most, how many persons can you serve from this box of goldfish if each serving must be at least 2/3 a cup?

Lesson 2

TOPIC	Overview of Biodiesel	TIME ESTIMATE	1 hour

OBJECTIVES
• Students will be able to understand costs of fuels. • Students will have an understanding of the oil problem.

MATERIALS & RESOURCES
• Handout #3, Oil Prices Hit an All Time High • Handout #4, Memo from Seipp Lawn Care

Lesson Description & Activities

Steps	No. of Minutes	ACTIVITIES
1	30	- Distribute Handout 3, Oil Prices Hit an All Time High. - Have students work in pairs by searching on computer for gasoline prices and minimum wage rates from 1980 to present.
2	20	- Have students graph the cost of fuel in relation to the minimum wage.
3	10	- Provide background information on the Seipp Lawn Care Biodiesel module, The Problem. - Read the scenario together as a class and answer any questions the students may have about the assignment.

Oil Prices Hit An All Time High

The past 20 years has been alarming when we look at the price of oil and what we have to pay for our fuel to move about our society. In the 80's fuel prices were below $1.00 per gallon, much of the time below $.50 per gallon and with minimum wage being $3.35. As we entered the 2000's we have watched fuel prices increase to $2.00 per gallon and now has consistently risen to a high above $4.00 per gallon while minimum wage has only risen to $5.85. If it is looked at from the perspective the amount of increase of minimum wage to the amount of increase to a gallon of fuel the findings are stunning.

In a small group you will graph the change of fuel costs from 1980 to present in correlation to the change of minimum wage. After completion of the graph you should also synthesize the difference of cost to pay and draw conclusions of what impact this may have on our society.

Handout 4 for Lesson 2
Shipping Auto Parts Module

Seipp Lawn Care

701 Country Oaks
O'Fallon, IL 62269

To: Cost Analysis team (Student)

From: Matt Seipp, Manager

As the manager and owner of Seipp Lawn Care I have had several dilemmas in the last year. We pride ourselves in keeping the prices down for our clients, but with the rising fuel costs this has become difficult. We have explored several options to reduce our costs, one of which is to schedule lawns in the same neighborhood and maintain all on the same day to eliminate the amount of miles driven in a day.

We have also considered using alternative fuel sources for our equipment and trucks. We would like for you to create an analysis of the cost to produce biodiesel for our company. Currently we are consuming about 150 gallons of diesel fuel per week.

I look forward to hearing your findings.

Lesson 3

TOPIC	Review of Transportation	TIME ESTIMATE	2 hours

OBJECTIVES
Students will develop a plan to address their solution to the scenario.

MATERIALS & RESOURCES
• Handout #4, The Problem Memo from previous lesson • Handout #5, What I know; What I don't know • Videos from Utah Biodiesel Supply available on www.youtube.com Making biodiesel part 1 (8:03 min) Making biodiesel part 2 (5:24 min) Mixing biodiesel part 1 (6:28 min) Mixing biodiesel part 2 (7:47 min) Making titration kit (4:11 min) Titrating Oil - Preparing Titration Solution (4:31 min) Titrating oil the chemistry (5:04 min) • **Handout #6, Making Biodiesel/Washing Biodiesel**

Lesson Description & Activities

Steps	No. of Minutes	ACTIVITIES
1	15	- Distribute Handout 5, What I know; What I don't know. - Have students in their groups complete what they know and what they don't know
2	30	- As a class discuss Handout 5. List what they know and don't know on the board or on projector.

3	45-60	- Provide class time for the students to work on their possible solutions.
4	**50**	- Show videos on Biodiesel making process. - Distribute Handout 6, Making Biodiesel/Washing Biodiesel. - Allow time for students to read or assign as homework.
5	**Optional**	- Teacher Note: If students have any experience with making electronic spreadsheets, all math formulas and problems can be done with Excel or other spreadsheet software.

What I Know	What I Don't Know

Making Biodiesel

WARNING:

- THESE ARE DANGEROUS/POISONOUS CHEMICALS
- COMMON SENSE MUST BE USED
- YOU ARE RESPONSIBLE FOR YOUR ACTIONS AND THE SAFETY OF YOURSELF AND
EVERYONE/EVERYTHING AROUND YOU
- METHANOL IS A POISON WHICH CAN BE ABSORBED THROUGH YOUR SKIN, BY
INHILATION, OR CONSUMPTION
- METHANOL CAN CAUSE BLINDNESS AND DEATH
- METHANOL IS AS FLAMMABLE AS GASOLINE/PETROL
- CARTRIDGE RESPIRATORS DO NOT WORK WITH METHANOL
- Sodium hydroxide (Caustic soda, NaOH, lye) can cause severe burns and death.
- Long-sleeve shirt, full shoes and long pants are recommended, NO SHORTS OR SANDALS.
- Wear chemical proof gloves, apron, and eye protection.
- Do NOT inhale any vapors.
- Always have running water available to wash off any splashes.

Now that I have managed to scare you, just realize that Methanol is the fuel used in most model airplanes. Methanol is available in small quantities as HEET brand fuel line antifreeze (Yellow bottle)
Lye is an every-day drain cleaner.
Both are freely available in most large shopping centers.

MATERIALS REQUIRED

1 liter oil- new or used
NaOH (lye / caustic soda), at least 6g.
--Used as a drain cleaner and can often be found next to the Drano.
Methanol at least 250ml.

--HEET® Gas- Line Antifreeze in the yellow bottle is methanol and readily available in most auto supply stores.

EQUIPMENT REQUIRED

1- Dry 2 liter soda bottle with lid and in sound condition.
1- Measuring cup to measure out 250ml methanol
1- scale to measure 6g NaOH
OR
1- teaspoon measure metric or imperial
1- glass container to mix the methanol and NaOH in which makes meth oxide.
1- Funnel

THE TECHNIQUE

OIL PREPERATION

If using waste oil, take one liter and heat to at least 250 deg F to remove all water.
If water is present the oil will spit and pop and carry on.
If there is a lot of water this could get very violent, so be careful.

Once the water is gone (Oil becomes calm and there is no more spitting and popping) let the oil cool.

If you are using new oil from the bottle it should have no water in it, so in this case just heat to 130 deg F when you are ready to mix.

MAKING THE METHOXIDE
WARNING:
METHOXIDE IS A POISON! DO NOT BREATH VAPORS. WASH OFF ANY SPLASHES.
DO NOT MIX THE METHOXIDE IN A PLASTIC SOFT DRINK BOTTLE AS THE NaOH ATTACKS THE PLASTIC AND YOU WILL QUICKLY BE SHAKING A BOTTLE FULL OF HOLES WITH METHOXIDE GOING EVERYWHERE.

While the oil is cooling mix your methanol and NaOH (lye) to form the meth oxide. Use 250ml of methanol. This is more methanol than most people use but will help insure a successful first batch.
If you are using new oil this will require 4g (about half a Teaspoon) NaOH.

For used oil, you should do a titration to determine the correct amount of NaOH to use. However, if you do not have the materials to do a titration, just use 6g- 7g NaOH as this amount almost always works. If you do not have a scale, this is about 1 level teaspoon measure (metric or imperial).

NaOH and Methanol do not readily mix so if you are doing it by hand a bit of time and patience is required. **Don't sniff the fumes**. **CARTRIDGE RESPIRATORS DO NOT WORK WITH METHANOL**

For quickest mixing, start with the methanol at **JUST** body temp (not warm). As you mix, the temperature will increase substantially. This is normal. Make sure **ALL** the NaOH (lye) is dissolved. This may take 10 minutes or more.

Hand mixing can be accomplished using a spoon to stir/crush the NaOH granules; **OR** placing methanol/NaOH in a glass bottle with a top and shaking/ swirling until ALL NaOH is dissolved.

After ALL the NaOH has dissolved, top off the container to 250ml with fresh methanol, as there may be some evaporation during mixing.

MAKING THE BIODIESEL!

When the Oil's temp has dropped to 140 deg F or less, using a funnel, pours the liter of oil into a **DRY** 2 liter Soda bottle.
Take the mixture of methanol/NaOH (commonly called meth oxide) and pour on top of the oil using the same funnel.
Remove funnel.
Screw the lid on **TIGHT** to the bottle.
Shake vigorously for about five seconds (about 20 shakes) / every 15 minutes for 1 hour.
NO appreciable pressure is generated during this mixing.

Now place the bottle on a table and observe the oil change color from a "Chocolate milk to a rich, darker brown."
Then, as if by magic, within 10 minutes the by-product (commonly referred to as glycerin) starts to settle out and form an increasing layer on the bottom of the bottle.

Within an hour, most of the glycerin will be settled out. *This is referred to as **separation***.

Be sure to notice that you can see a very definite, slowly sinking line towards the top of the Biodiesel as the glycerin slowly settles.

You should now have a bottle containing lighter colored biodiesel on top of a layer of darker glycerin. The biodiesel will be very cloudy, and it will take a day or two more for it to clear.
Typically the glycerin layer is about the same or a bit more than the amount of methanol used.

ADDITIONAL COMMENTS

CARTRIDGE RESPIRATORS DO NOT WORK WITH METHANOL
a few cautions:
DON'T mix the methanol and NaOH (lye) in a plastic bottle as NaOH attacks some types of plastic. Once mixed it is quite acceptable to mix your biodiesel in a soda bottle.
Do NOT store unused meth oxide in plastic bottles. Some plastic will degrade over time when in contact with meth oxide.
DO NOT allow any WATER into any steps of this procedure.
Methanol boils at about 150 deg F. DO NOT mix until the oil is below 140 deg F.

Again, these are dangerous chemicals and care is necessary, **Report all spills or contact to skin immediately to the instructor.**

YOU ARE RESPONSIBLE FOR YOUR ACTIONS AND YOUR SAFETY AND THE SAFETY OF EVERYONE AROUND YOU.

Washing Biodiesel

INTRODUCTION:
Having just produced your first batch of biodiesel! This is an easy method of washing it.

By using this method you can easily wash a batch of biodiesel in about 1 hour.

Be aware that unwashed biodiesel contains soap. If you agitate your first few washes hard/violently, there is a huge likelihood that the water, soap, and biodiesel will form an emulsion that may take days or weeks to separate.

The three important steps in washing are **GENTLY, GENTLY, GENTLY** to begin with.

THE TECHNIQUE:

Wash One:
Pour 1 liter biodiesel into a 2 liter soda bottle.
Gently pour about 500ml of body temperature water into the bottle.
Replace cap.
GENTLY rotate bottle end for end for about 30 seconds (about 30 rotations).
After 30 seconds place bottle upright.
If you have been **GENTLE** the water and Biodiesel will separate immediately.
You will notice the water is not clear.
Remove top and using your thumb as a stopper, turn the bottle upside down and drain only the water using your thumb as a valve.
You have finished wash one.

Wash Two:
Pour in another 500ml of water and repeat wash one, except rotate GENTLY for about 1 minute (about 60 rotations).
Let the water and biodiesel settle and drain as in wash one.
You have finished wash 2.

Wash Three:
Again pour in another 500ml of water and **GENTLY, GENTLY, GENTLY** shake bottle for a minute or so (about 120 shakes).

When the water and biodiesel separate, discard the water in same fashion as before.

Wash Four:
Another 500ml of water and a bit more agitation for about 1 min.
After separation of water and biodiesel drain as above.

Wash Five:
You should now be able shake fairly vigorously.

Testing For Completion
Washing is finished when after shaking, water is nearly clear.
Be aware that in your later washes you should be able to shake violently.
The water and oil will take longer to separate because the water forms tiny bubbles in the biodiesel that take time to settle out.

Washed biodiesel is VERY CLOUDY, much lighter in color than the original biodiesel and looks terrible. After a day or 2 settling and drying it will clear.

Lesson 4

TOPIC	Writing a Business Report	TIME ESTIMATE	3 hours

OBJECTIVES
• Students will understand and be able to write a business report. • Students will develop and present an oral report based on the business report.

MATERIALS & RESOURCES
• Handout #7, Writing a Business Report • Computer with access to word processing and presentation software

Lesson Description & Activities

Steps	No. of Minutes	ACTIVITIES
1	20	- **Discuss any questions students had regarding Handout 6, Making Biodiesel/Washing Biodiesel**. - **Distribute Handout 7,** Writing a Business Report. - Discuss Handout 7 as a class and as any questions students may have.
2	100	- Allow time for students to prepare the report.
3	40	- Have students make presentations to the class and let the class ask questions about their solution and make suggestions.
4	20	- Allow time for student reflection on the module. What did you learn new as a result of this activity? How is math important in this career? - Discuss various careers in logistics and distribution that would be associated with this problem.

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.

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.

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?

Activity:

With your team,

1. Develop a draft outline of your report.
2. Critique and revise your outline.
3. 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.

With your group, do the following:

1. Write your first draft of each section including any graphs, tables, and figures.
2. 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?

Teacher

Assessment Materials

FINAL EVALUATION

Problem Statement to be Solved:

As the manager and owner of Seipp Lawn Care I have had several dilemmas in the last year. We pride ourselves in keeping the prices down for our clients, but with the rising fuel costs this has become difficult. We have explored several options to reduce our costs, one of which is to schedule lawns in the same neighborhood or are to be maintained all on the same day to eliminate the amount of miles driven in a day.

We have also considered using alternative fuel sources for our equipment and trucks. We would like for you to create an analysis the cost to produce biodiesel for our company. Currently we are consuming about 150 gallons of diesel fuel per week.

Measurement Criteria that would describe an acceptable solution

1. Evaluated alternative fuels and determined cost differences.
2. Researched different types of fuels and their costs.
3. Used computers (map-quest, etc.) to estimate mileage between two locations.
4. All calculations were correct using formulas and charts provided.
5. 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.
6. Presentation presented the information with visual aids and/or handouts.
7. The presentation 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.

Scoring Guide

Activity	Point Value	Points Received
Evaluated alternative fuels and determined cost differences.	**10**	
Researched different types of fuels and their costs.	**10**	
Used computers (map-quest etc.) to estimate mileage between two locations.	**5**	
All calculations were correct using formulas and charts provided.	**10**	
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 plan	**20**	
The presentation met the 7 requirements of effective business presentations:	**15**	
Total Points	**70**	

A P P E N D I X

GLOSSARY of TERMS Related to this Scenario

Titration- Calculation of the pH of a solution

Washing- Removal of soap from biodiesel by using water to clean the solution.

Toolbox Bibliography

1. How do I inform students about transportation, distribution, and logistics?
   A Practical Guide to Transportation and Logistics by Michael B Stroh, 2006, Demount, NJ: Logistics Network.

   "*What in the World is the Global Supply Chain?*" DVD from Council of Supply Chain Management Professionals. Oak Brook, IL or www.cscmp.org.

2. Instructional Strategies and Help for Math Teachers
   This website offers a resource for teachers to search for any kind of mathematics games, help, and worksheets. This resource has many algebra reviews, which can help in the implantation of the module.

   http://www.mathforum.com/te/

3. How can I define terms Transportation, Distribution, and Logistics in a way students can understand?
   Wikipedia is a website which allows students to have access to an online encyclopedia. This is a great resource in letting students' research information and definitions on their own.

   www.wikipedia.com

4. How can I help students review mathematical topics as they will be presented in TDL module?
   Teachers can go to the following website to look up topics in mathematics and print worksheets to use for students to review. It really saves time in planning and writing new worksheets.

   www.edhelper.com

5. Utah Biodiesel Supply Company

   http://www.utahbiodieselsupply.com/