



Teaching Guide

For

Calculating Efficiency, Utilization and Productivity for Auto Repair Job

Illinois Transportation, Distribution and Logistics
Math and Science Project

2007

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Acknowledgements

We would like to recognize the following people for their contribution to this module:

Steve Bowns, Service Manager, Bob Dennison Ford

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Scenario Focus

Primary Career Pathway: Facility and Mobile Equipment Maintenance

Occupation/Job Titles Related to this Scenario: Service Manager, Parts Distributor, Auto Service Technician

Recommended Teaching Subject Areas: Industrial Technology, Automotive Repair Technology, Math

Teacher/Writer Information

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Scenario Problem Statement and Performance Elements

A customer brought in his 1999 Econoline. The diagnosis revealed the following conditions: engine light is on, engine runs poorly, #3 cylinder is missing compression, a rocker arm is off and lifter sticks.

You know the following:

- Cost of labor is \$20 per hour
- Time allowed for labor for this job is 6.5 hours.
- Cost of parts is \$119.69
- Cost of building and all other expenses is \$130.
- The lifter must be ordered which takes two days.
- Cost of valve lifter service is \$719.69.

Your service manager has asked you to calculate the efficiency, utilization and productivity for this repair. You are to present the results of your calculation, the total cost to the customer, the steps the service manager would oversee the technician performing, and an outline of how the service manager would determine if the work had been performed to the customer's satisfaction.

TDL Cluster Knowledge and Skills and Performance Elements

- Develop and manage repair plans
- Develop strategies to improve service levels and quality and reduce costs.
- Determine customer needs and requirements.

Illinois Learning Standards:

Math

- Compute and estimate using mental math, paper and pencil methods, calculators and computers. (6C)
- Solve problems using numbers and their properties. (8C)

Language Arts

- 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">• How to calculate efficiency, utilization and productivity for a given situation.• Be able to define efficiency, utilization and productivity.• Understand the importance of efficiency, utilization and productivity to automotive repair.	<ul style="list-style-type: none">• Apply math skills as needed in performing automotive technology skills.• Develop steps for evaluating work to be done.• Identify steps to enhance customer satisfaction.• Make a presentation with visuals (poster or PowerPoint).

Objectives:

- Be able to define efficiency, utilization and productivity in the context of automotive repair.
- Be able to calculate efficiency, utilization and productivity for a specific repair job.
- Know how to utilize Service Manual to provide supervision in job performance.
- Develop a method for customer feedback.
- Deliver an oral presentation that presents the solution to the problem.

Measurement Criteria for an acceptable solution:

1. All calculations were correct on worksheet for calculating efficiency, utilization and productivity.
2. Calculated total cost to the customer to be \$969.38.
3. Students utilized service manual to formulate steps service manager would use to oversee the technician performing.
4. Presentation included all the information requested in the problem statement.
5. Presentation presented the information with visual aids and met the 7 requirements of effective business presentations:
 - Evidence of students being prepared
 - Started on time and kept the presentation under 10 minutes
 - Dressed in business attire
 - Showed enthusiasm and confidence
 - Showed good speech etiquette—eye contact, respect
 - Spoke distinctly without grammatical errors or slang.
 - Answered questions the best they could; accepted reactions without being defensive.

Teacher Notes:

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.

Use discretion in providing business contact information. When students have questions, first direct them to use reliable Internet resources. You may want to use a local dealership as a business partner. This would be advantageous; particularly if the students could visit the service department or if you could utilize someone from the service department as a guest speaker or if they could be present during the student presentations.

Time Required to Complete Problem: 7+ 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. Possible solution as PowerPoint file: auto repair possible solution.ppt

Support Materials and Resources Necessary for Completion of Scenario:

- Computer access to internet
- Handouts (see each lesson)
- Websites (see each lesson)
- Software such as PowerPoint
- Calculators
- Automotive Service Manual

Lesson 1

TOPIC	Defining Efficiency, Utilization, & Productivity	TIME ESTIMATE	80 minutes
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OBJECTIVES

- Students will be able to define efficiency, utilization and productivity.
- Students will be able to understand how efficiency, utilization and productivity affect the auto repair business.

MATERIALS & RESOURCES

- Handout #1, Memo with description of an auto repair job
- Handout #2, Definitions
- Computer with Internet Access
- Dictionary or Website: www.wikipedia.com

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	20	<ul style="list-style-type: none"> • Introduction to TDL Project • Discuss the role of the service manager in a dealership and the importance of meeting customer requirements. • Brainstorm with student's things they would expect a dealership to provide for them if they took their car to be serviced. What would make you happy with the service you received? May want to write these on the board.
2	20	<ul style="list-style-type: none"> • Distribute Handout 1, Memo. • Discuss as a class and make a list of things they need to know in order to complete the task assigned in Handout 1.
3	40	<ul style="list-style-type: none"> • Distribute Handout 2, Definitions. • Ask students to look up in a dictionary or on the computer the definition of efficiency, utilization and productivity. • Discuss their answers on Handout 2. • Discuss why efficiency, utilization and productivity are important to a service manager of an automotive repair business. Why is it important to the customer?

Bob's Dealership

1400 Main St.
Bloomington, IL 61701

To: Assistant Service Manager (Student)

From: Steve Bowns, Service Manager

A customer brought in his 1999 Econoline. The diagnosis reveals the following conditions: engine light is on, engine runs poorly, #3 cylinder is missing compression, a rocker arm is off and lifter sticks.

You know the following:

- Cost of labor is \$20 per hour
- Time allowed for labor for this job is 6.5 hours.
- Cost of parts is \$119.69
- Cost of building and all other expenses is \$130.
- The lifter must be ordered which takes two days.
- Cost of valve lifter service is \$719.69.

Would you calculate the efficiency, utilization and productivity for this repair. Present the results of your calculation, the total cost to the customer, the steps I as the service manager need to take to oversee the technician performing, and an outline of how I can determine if the work was performed to the customer's satisfaction.

If you can present this to me a two or three days, I would appreciate.

Definitions

Answer the following questions and be prepared to discuss them as a class.

1. What is efficiency? Give an example of how this applies in automotive repair businesses?
2. What is productivity? Give an example of how this applies in automotive repair businesses?
3. What does utilization mean? How does it apply to the automotive repair business?
4. If you were a customer, how would each of these terms be important to you?

Lesson 2

TOPIC	Calculating Efficiency, Utilization, & Productivity	TIME ESTIMATE	110 minutes
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OBJECTIVES

- Students will be able to calculate efficiency, utilization and productivity.

MATERIALS & RESOURCES

- Handout #3, Worksheet for Calculating Efficiency, Utilization and Productivity
- Calculators
- Automotive Service Manual

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	10	<ul style="list-style-type: none"> • Distribute Handout 3, Worksheet. • Go over worksheet and answer any questions.
2	60	<ul style="list-style-type: none"> • Allow time for students to complete the worksheet.
3	20	<ul style="list-style-type: none"> • Discuss their answers. • Discuss how not including costs of building and other expenses would affect efficiency.
4	20	<ul style="list-style-type: none"> • Introduce or refer to Service Manual. • Allow time for students to review and locate information about supervising or overseeing technicians while they are performing a task. (They will need to identify the steps for their oral presentation.)

Calculating Efficiency, Utilization and Productivity Worksheet

Using the data you have from the Memo, Handout 1, complete this worksheet to determine the efficiency, utilization and productivity of the job.

Some definitions you will need to know are as follows:

1. Hours Sold - Flat rate hours your technicians booked, based on your labor guide.
2. Hours Available - Total number of hours your technicians were available for work based on your technician schedule.
3. Hours Worked - The actual number of hours your technicians clocked on repairs. This figure is on the time cards.

The totals entered can be for a day, week or month, just as long as the same period is used for each.

Calculation for _____
(indicate period—day, week, month)

Total available hours: _____

Total sold hours: _____

Total worked hours: _____

1. Hours Sold/Hours Worked = Overall Efficiency

_____ / _____ = _____

2. Hours Worked/Hours Available = Utilization

_____ / _____ = _____

3. Hours Sold/Hours Available = Productivity

_____ / _____ = _____

Benchmarks or Guides

Efficiency = 135%

Utilization = 87.5 %

Productivity = 118%

Lesson 3

TOPIC	Making the Presentation	TIME ESTIMATE	260 minutes
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OBJECTIVES
<ul style="list-style-type: none"> • Students will be able to prepare an oral presentation. • Students will deliver an oral presentation.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Computer with access to presentation software. • Materials for any visuals such as poster board, etc. • Resource: Service Manual

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	10	<ul style="list-style-type: none"> • Review basic information about making a presentation. • Answer any questions students may still have about the problem to be solved.
2	10	<ul style="list-style-type: none"> • Have students work in groups and brainstorm ideas for helping plan activities that the service manager can do that will promote customer satisfaction.
3	120	<ul style="list-style-type: none"> • Allow time for students to develop their presentations and visual aids.
4	120	<ul style="list-style-type: none"> • Have students make their presentations. • Allow time for feedback from other students and/or business partner.

Teacher

Assessment Materials

FINAL EVALUATION

Problem Statement to be Solved:

A customer brought in his 1999 Econoline. The diagnosis revealed the following conditions: engine light is on, engine runs poorly, #3 cylinder is missing compression, a rocker arm is off and lifter sticks.

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Measurement Criteria that would describe an acceptable solution

1. All calculations were correct on worksheet for calculating efficiency, utilization and productivity.
2. Calculated total cost to the customer to be \$969.38.
3. Students utilized service manual to formulate steps service manager would use to oversee the technician performing.
4. Presentation included all the information requested in the problem statement.
5. Presentation presented the information with visual aids and met the 7 requirements of effective business presentations:
 - Evidence of students being prepared
 - Started on time and kept the presentation under 10 minutes
 - Dressed in business attire
 - Showed enthusiasm and confidence
 - Showed good speech etiquette—eye contact, respect
 - Spoke distinctly without grammatical errors or slang.
 - Answered questions the best they could; accepted reactions without being defensive.

Scoring Guide

Activity	Point Value	Points Received
Accurately completed the worksheet using the data provided in the problem statement.	30	
All calculations were correct and the total cost to the customer is provided.	15	
Provided the steps for the service manager to use in overseeing the technician performance.	10	
An outline or description of steps the service manager would take to satisfy the customer.	10	
The presentation met the 7 requirements of effective business presentations and included visual aids.	35	
Total Points	100	

Solution Checker

Answers for Worksheet:

Correct answers will vary according to the number of total available hours the student chooses to use but should be as follows:

Total sold hours: 6.5

Total worked hours: 6.5

Overall efficiency: $6.5/6.5$

Utilization: $6.5/\text{total hrs. available}$

Productivity: $6.5/\text{total hrs. available}$

A partial example of a student presentation is available with this module as a separate file: Auto Repair Possible Solution.ppt

APPENDIX

GLOSSARY of TERMS

Efficiency

Effective operation as measured by comparison of production with cost

Hours Available

Total number of hours technicians are available to work

Hours Sold

Flat rate hours technicians booked

Hours Worked

Actual number of hours technicians clocked on repairs

Productivity

Total output

Utilization

Practical use or account