



Teaching Guide

For

ER-Lab Turnaround Time Module

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

2008

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Acknowledgements

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McDonough District Hospital

Stephen Hopper MDH President/CEO

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Passavant Area Hospital

Kathryn Heath laboratory technician

Problem Solving Activity

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Scenario Focus

Career Cluster: Health Science

Primary Career Pathway: Health Informatics and Biotechnology and Development

Occupation/Job Titles Related to this Scenario: Cardiovascular Technologist, Clinical Lab Technician, Emergency Room Nurse, Health Care Administrator, Biomedical Chemist, Medical Information Technologist, Microbiologist, Biomedical/Clinical Technician

Recommended Teaching Subject Areas: Biology, Anatomy and Physiology, Chemistry, and Health Services

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Scenario Problem Statement and Performance Elements

A Hospital Emergency Room must meet the needs of all patients. Each patient should be treated in a timely manner. Lab tests and the return time of lab test results are in important aspect of proper care.

The Directors of Emergency Services in five Illinois district hospitals have noticed increasing patient dissatisfaction with ER wait time according to patient surveys. Your team is to determine if the turn around times at your hospital are acceptable within current emergency care standards? If they are not, you are to develop a plan for reducing turn around time for the ER.

Cluster Knowledge and Skills and Performance Elements

- Communicate health/medical information accurately and within legal/regulatory guidelines established by the facility holding to the strictest standards of confidentiality.

- Know the quantitative and qualitative requirements for information and analyze the information for designated purposes.
- Read and interpret and extract information from medial documents, applying knowledge of medical terminology and codes.
- Understand the principles of solution preparation, sterile techniques, contamination control, & measurement and calibration of instruments.
- Maintain safe laboratory environment using biosafety protocols.

Illinois Learning Standards:

Science

- Conduct issue investigation, using technologies for data collection and assimilation, following established formats for random sampling, or following all procedural and safety precautions, materials and equipment directions.
- Apply scientific habits of mind to curricular investigations in life, environmental, physical, earth, and space sciences, evaluating evidence, inferring statements based on data, questioning sources of information, explaining necessity of manipulating only one variable at a time, or retrieving mathematical data accurately for scientific analysis.

Mathematics

- Determine the best measure of central tendency from mean, median, or mode.

What I want students to Know	What I want student to be Able to Do
<ul style="list-style-type: none"> • Basic sequence of events in an emergency room visit • Procedure and purpose for the most commonly run emergency room blood tests • Simple medical terms • Understand the flow of information between the lab and the ER 	<ul style="list-style-type: none"> • Create table and graphs from data • Calculate mean, median, and mode for data • Evaluate data and compare to standards • Write a business report • Make an oral presentation with visuals

Objectives:

- Learn about the sequence of events during an emergency room visit.
- Acquire the skills needed to evaluate the turn around time for a particular hospital's laboratory.
- Learn about five specific commonly performed blood tests.
- Become familiar with simple medical terminology used in the emergency room and hospital laboratory.
- Prepare a written business report.
- Deliver an oral presentation with visuals.

Measurement Criteria that would describe an acceptable solution

1. Recommendation was creative but reasonable in costs and implementation.
2. Recommendation showed evidence that the student understood the flow information and items between an ER and lab.
3. Recommendation showed evidence that the students understood the function of the ER and the lab.
4. Recommendation showed evidence that the student understood the importance of acceptable turnaround time.
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 recommendations.
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 and slang
 - Welcomed questions and answered completely
 - Accepted reactions without being defensive.

Teacher Notes

Students should have a good working knowledge of math and formulas. Writing reports and making presentations may be necessary for some students. This can be done congruently with the scenario or prior to working on the scenario. Resources for these topics can be found 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.

Use discretion in contacting hospitals for information. Students should contact hospital personnel only with your permission. One hospital's data was used and then supplemented with data created for the scenario.

Grading daily activities is optional. A group work evaluation method is included with the final evaluation materials along with the final measurement criteria.

Time Required to Complete Problem: 13

Types of Materials included in this Module:

1. Instructional plan for each topic with questions and activities
2. Copy of student handouts
3. Teacher answers keys for handouts
4. Final evaluation with measurement criteria and scoring guide

Support Materials and Resources Necessary for Completion of Scenario:

- Access to a hospital tour - ER and Lab
- Medical Terminology Text or resource
- Library and textbooks
- Internet access for all students
- Blood typing lab kit
- Websites specifically used for creation of the module
 - www.labtestsonline.org
 - www.webmd.com
 - www.hcdsinc.com
 - www.medicinemas.gov

Lesson 1

TOPIC	Problem and Hospital Tour	TIME ESTIMATE	3 hour
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OBJECTIVES
<ul style="list-style-type: none"> • Student will observe Emergency Room and Laboratory. • Students will develop and present questions about the Problem Statement.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Handout #1, Problem Statement • Tour of hospital facilities • Hospital personnel for question and answer

Lesson Description & Activities		
Steps	No. of Minutes	ACTIVITIES
1	30	<ul style="list-style-type: none"> - Present Problem Statement on Handout 1 - Discussion/Overview of module
2	2 hours 30 min	<ul style="list-style-type: none"> - Trip to Hospital, tour of facilities, question and answer time with hospital personnel, return trip - Optional: If a field trip cannot be arranged, teacher can video hospital facilities and arrange for students to email their questions or have hospital staff at school.

Problem Statement:

A Hospital Emergency Room must meet the needs of all patients. Each patient should be treated in a timely manner. Lab tests and the return time of lab test results are an important aspect of proper care.

The Directors of Emergency Services in five Illinois district hospitals have noticed increasing patient dissatisfaction with ER wait time according to patient surveys. Your team is to determine if the turn around times at your hospital are acceptable within current emergency care standards? If they are not, you are to develop a plan for reducing turn around time for the ER.

You will be given the opportunity to take notes while touring the emergency room and laboratory at McDonough District Hospital in Macomb. You may also ask questions. If questions arise later during the project, your instructor will forward your questions on to hospital personnel.

Lesson 2

TOPIC	Medical Terminology	TIME ESTIMATE	1 hour
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OBJECTIVES
<ul style="list-style-type: none"> • Students will determine the meaning of medical terms by using basic word parts. • Students create possible medical terms which could be used from basic word parts. • Students will define terms used in this module.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Handout #2, Using Medical Terminology • Handout #3, Creating new words • Handout #4, Terms for this Module • A Glossary of Word Parts or Medical dictionary • Copy of Quick & Easy Medical Terminology (See Toolbox for reference info) • Internet access

Lesson Description & Activities		
Steps	No. of Minutes	ACTIVITIES
1	15	<ul style="list-style-type: none"> - Give students Handout 2, Using Medical terminology and access to a glossary of word parts or medical dictionary. - Students will determine meaning for each term. - Discuss answers as a class.
2	15	<ul style="list-style-type: none"> - Give students Handout 3, Creating new words and access to Quick & Easy Medical Terminology book or excerpts from the book. - Students are to make up terms from word parts. - Go over responses as a class.
3	30	<ul style="list-style-type: none"> - Give students handout 4. Students may use internet and library resources to find meanings for terms in this module.
4	Home-work	<ul style="list-style-type: none"> - Optional: Students will create an activity at home (such as a story) to help re-enforce the module terminology. Internet sources can be used.

Using medical terminology

Using a glossary of word parts or medical dictionary, determine a meaning for each term. Be sure to phrase answers so that they are meaningful and not just a simple translation.

postpepsia –

otoscopy –

hypoglossoma –

tachygenous –

arteriostenosis –

cryptorrhagia –

mycopathy –

rachiorrhexis –

euhemocalc –

gastrostomy –

cystectomy –

Answer Key for Handout 2

Using the glossary of word parts, determine a meaning for each term. Be sure to phrase answers so that they are meaningful and not just a simple translation.

postpepsia – after digestion

otoscopy – ear examination

hypoglossoma – tumor under the tongue

tachygenous – fast beginning

arteriostenosis – artery narrowing or narrowing artery

cryptorrhagia – hidden hemorrhage

mycopathy – fungus disease

rachiorrhaxis – rupture of the spleen or spleen rupture

euhemocalc – normal blood calcium

gastrostomy – new stomach opening

cystectomy – cyst removal

Creating new words.

Using the, Quick & Easy Medical Terminology book or handout provided to create new words. Place your new word in the space provided. Write the meaning of your new term in the space provided. Be sure to phrase answers so that they are meaningful and not just a simple translation.

Newly Created Term

New definition

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Terms for this module

Find a definition for each of the following terms which may come up during this module. Some words may have multiple meanings; you are seeking the definitions that would relate to hospital activities.

order –

stat –

blood typing –

phlebotomist –

circulation –

enzyme –

catalyst -

measures of central tendency –

stick –

triage –

EMT –

TAT or turnaround time –

vitals -

antigens -

type A blood -

type B blood -

type O blood -

histology -

coagulation –

antibody –

rh factor –

serum -

blood transfusion -

Answer Key

ER-Lab Turnaround Time Module
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Handout 4Answers, Lesson 2 ER-Lab Turnaround Module
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Definitions are given as examples of possible right answers. A variety of sources may be used, and may generate a variety of ways to say the same thing.

Find a definition for each of the following terms which may come up during this module. Some words may have multiple meanings; you are seeking the definitions that would relate to hospital activities.

order – to give a prescription for or give directions for

stat – to be done as quickly as possible, to be given priority

blood typing – determining a persons blood group (also cross typing or typing)

phlebotomist – a person who draws blood for diagnostic testing

circulation – movement of blood through vessels in the body

enzyme – complex protein produced by living cells and catalyzes biochemical reactions

catalyst – enables a chemical reaction to proceed under not normal conditions

measures of central tendency – mean, median, and mode; ways to determine the typical behavior of data

stick – application of a needle to draw blood

triage – the sorting of patients by the severity of illness or injury

EMT – emergency medical technician, three levels based on training – EMTA, EMTB, and Paramedic

TAT or turnaround time – the time it takes for a lab order sample to be taken, processed and results returned to the physician

vitals – vital signs, blood pressure, temperature, and pulse

antigens – substances that can trigger an immune response

type A blood – has antigen A only

type B blood – Has antigen B only

type O blood – Has antigen neither antigen A or B

coagulation – The process on blood clotting

antibody – proteins located in the plasma of the blood that attacks foreign substances in the blood

Rh factor – the presence of a Rh surface antigen

serum – similar to plasma but without clotting factors, liquid part of blood

blood transfusion – blood donation given to an eligible recipient

Lesson 3

TOPIC	What happens when you go to the ER	TIME ESTIMATE	1 hour
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OBJECTIVES
<ul style="list-style-type: none"> • Students will use their own experiences to brainstorm a sequence of events for a trip to the ER. • As a class, students will create an overall sequence.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Handout #5, What happens when you go to the ER? and teacher notes • Chalkboard, whiteboard, Smartboard, large sheets of paper, etc.

Lesson Description & Activities		
Steps	No. of Minutes	ACTIVITIES
1	30	<ul style="list-style-type: none"> - Distribute, Handout 5, What happens when you go to the emergency room? - Allow time for students to complete the work in groups.
2	30	<ul style="list-style-type: none"> - As a class, allow students to share their ideas. - Teacher creates a sequence or timeline from student input and resources.

What happens when you go to the emergency room?"

Within your group, brainstorm the steps or events that happen when a person is admitted to the emergency room. You may make a numbered list or use a graphic organizer to connect steps. You will share your thoughts with the class.

A large, empty rectangular box with a thin black border, intended for students to brainstorm and record the steps or events of an emergency room admission.

On the back of the sheet you will record the results of the group discussion.

Teacher's notes for Handout 5

When a person enters the emergency room, several things may be taking place at once. Create an outline or flow chart from the comments made from the class. The list below contains the items which should not be left out. They are listed in their basic order.

- Triage system used to sort patients
- Assessment of ABCs
 - Is the **A**irway open?
 - What is **B**reathing like?
 - How is **C**irculation?
- Medical history questions and retrieval of medical records if possible
- Ordering of diagnostic tests
 - Blood tests
 - X-rays
 - MRI
 - etc.
- Drawing of blood
- Performing of x-rays, MRI, etc.
- Leaving the ER
 - Admission to the hospital
 - Transfer to another facility
 - Prescriptions and discharge

Lesson 4

TOPIC	Basic Blood Tests	TIME ESTIMATE	2 hours
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OBJECTIVES

- Students will research the internet for ABG, CBC, CPK, BMP, and Troponin.
- Students will learn the purpose or each test; how the tests are performed and when to perform each test.

MATERIALS & RESOURCES

- Handout #6, Research 5 Tests
- Internet, textbooks, library books - for research

Lesson Description & Activities

Steps	No. of minutes	ACTIVITIES
1	60	<ul style="list-style-type: none"> - Distribute Handout 6, Research 5 Tests. - Allow time for students to research each of the 5 tests and complete the information for each test.
2	60	<ul style="list-style-type: none"> - Have students report on the results of their research. - Teacher will fill in gaps if there are any.

Research 5 Tests

A. Research the test for **arterial blood gases (ABG)**. Explain the following:

1. What is the purpose of the test?

2. How is the test done?

3. When is the test done?

B. Research the test for complete **blood count (CBC)**. Explain the following:

1. What is the purpose of the test?

2. How is the test done?

3. When is the test done?

C. Research the test for **cardiac enzymes (CPK)**. Explain the following:

1. What is the purpose of the test?

2. How is the test done?

3. When is the test done?

D. Research the test for **basic metabolism panel (BMP)**. Explain the following:

1. What is the purpose of the test?

2. How is the test done?

3. When is the test done?

E. Research the **Troponin cardiac marker test**. Explain the following:

1. What is the purpose of the test?

2. How is the test done?

3. When is the test done?

Lesson 5

TOPIC	Blood typing	TIME ESTIMATE	1 hour
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OBJECTIVES

- Students will explain the procedure for ABO blood typing.
- Students will determine the ABO type of a simulated blood sample.

MATERIALS & RESOURCES

- Blood typing kit (See Toolkit for source of blood typing kit)
- Glass slide with two depressions
- Simulated anti-A serum
- Simulated anti-B serum
- Simulated blood types A,B,A

Lesson Description & Activities

Steps	No. of Minutes	ACTIVITIES
1	60	<ul style="list-style-type: none"> - Distribute directions and supplies for blood typing. - Explain directions and lab procedure in blood typing kit to students - Allow students time to complete lab procedure. - Discuss their findings and results.

Lesson 6

TOPIC	Measures of Central Tendency	TIME ESTIMATE	2 hours
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OBJECTIVES	
<ul style="list-style-type: none"> • Students will calculate the mean, median, and mode for a set of data. • Students will graph their raw data vs time with a line for mean, median, and mode. • Students will determine, with explanation, which is the most representative measure for their data. • Students will evaluate their data to determine if it is acceptable when compared to standards. • Students will brainstorm possible reason for data not being acceptable and will identify ways to reduce turnaround time to make data acceptable. 	

MATERIALS & RESOURCES	
<ul style="list-style-type: none"> • Handout #7, Data for Turnaround Time of Lab Results (5 sets of data for 5 groups) • Handout #8, Acceptable Turnaround Times • Calculator • Graphing utility such as Excel • Internet access may be needed • Contact with the partner hospital may be needed 	

Lesson Description & Activities		
Steps	No. of Minutes	ACTIVITIES
1	30	<ul style="list-style-type: none"> - Give each student group their version of Handout 7, Data for Turnaround Time of Lab Results. - Allow time for students to calculate the mean, median, and mode
2	30	<ul style="list-style-type: none"> - Have students graph their data and draw conclusions about which measure is the most representative.

3	60	<ul style="list-style-type: none">- Distribute Handout 8, Acceptable Turnaround times.- Have students compare their data to the standards on Handout 8.- Ask students to brainstorm reasons for discrepancies between the standard and their data.- Allow time for students to identify ways to reduce the turn around time to make it acceptable.
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Data for Turnaround Time of Lab Results

Group A – Big Hospital

Your hospital has compiled the following data regarding turnaround time for lab results going to the emergency room. Use the data to do the following:

1. Find the mean, median, and mode for each of the five tests.
2. Graph the raw data verses time for each test. Then overlap a line for the mean, a line for the median, and a line for the mode.
3. Determine, with justification, which of the three methods for finding central tendency is most representative of the data.

ABG	BMP	CBC	CPK	TROPONIN
87.9	79.8	38.9	102	64.3
37.5	39	29.2	51.4	114.9
37.4	37	59.5	63.2	46
23	40.3	25.4	72.6	64.9
22.8	46.5	25.1	53.4	95
22.5	42.4	25	74.4	49.5
23.2	110	34.7	46.6	47.3
23.8	99	53.1	46.9	52.3
22.4	37.7	27.5	68.9	46
35.2	73	25.3	68.1	55.2
23.9	50.7	28.2	46.6	48.4
77.6	49.3	32.1	54.7	94.4
27.1	38.9	27.9	46.3	47.2
24.4	45.7	27.2	46.3	46.4
24.9	70.1	25	46	48.8
94.7	40.9	42.3	59.2	59.6
43.1	50.2	28.8	46	46
71.5	38.6	26.4	46.1	46.4
89.7	37.1	84.4	68.2	76.8
40.7	37.2	27.8	48.4	47.9
45.9	55.9	27.1	83	46
86.9	38.7	29.9	53.5	46
28.2	40.7	25.2	110.9	57.7
57.2	49.6	43.4	46	54.9
55.4	37.5	28.7	81.9	48.6
36.8	40.5	25	49.6	71.6
25.1	37	83	68.8	51.6
50.1	78.6	44.4	46.8	46
22.1	80.6	25	62.6	51.2

Data for Turnaround Time of Lab Results

Group B – Big Hospital

Your hospital has compiled the following data regarding turnaround time for lab results going to the emergency room. Use the data to do the following:

1. Find the mean, median, and mode for each of the five tests.
2. Graph the raw data verses time for each test. Then overlap a line for the mean, a line for the median, and a line for the mode.
3. Determine, with justification, which of the three methods for finding central tendency is most representative of the data.

ABG	BMP	CBC	CPK	TROPONIN
24	54.7	93.7	55.1	106.5
22.1	37	25.2	46	47.9
32.6	40.8	52	46.9	58.1
52.7	39.7	61.8	46	46.4
66	60.6	25.1	85.2	46.4
36.3	38.6	51	59.8	70.4
22.1	59.8	38.4	56.5	51.6
28.5	54.1	31.5	46.2	46.6
32.4	46.4	25	79.4	61.7
28	37.1	25.1	46.4	47.3
23.7	73.3	51.7	46	46.7
71.5	68.4	25	86.1	77.7
22.1	37	29.4	46	65.9
22	77.2	32.4	88.1	46.6
23.4	37	43.8	49.5	46
22.1	37.1	84.3	46.8	50.6
22.3	37.8	33	103.4	46
90.1	37.6	27.4	46.1	94.9
22	37	25.2	115.3	46
24.1	37.1	26.8	46	46
70.1	37.1	94.7	59.4	46.4
34.1	111.3	25	46	68.9
93.1	43.8	53.5	46.8	46.9
28.2	71.6	69.6	48.3	48
42.5	40	25.7	46	47.4
22.1	48	36.8	84.1	46.1
78.4	42.6	27.7	46.4	47.5
43	85.2	25.2	46.1	51.1
82.2	56.4	39.7	46	46.2

Data for Turnaround Time of Lab Results

Group C – Small hospital

Your hospital has compiled the following data regarding turnaround time for lab results going to the emergency room. Use the data to do the following:

1. Find the mean, median, and mode for each of the five tests.
2. Graph the raw data verses time for each test. Then overlap a line for the mean, a line for the median, and a line for the mode.
3. Determine, with justification, which of the three methods for finding central tendency is most representative of the data.

ABG	BMP	CBC	CPK	TROPONIN
43.8	58	26.5	51.6	51.1
30.2	62.2	30.9	58.7	69.5
37.6	53.7	27.6	61.7	68
49.5	59.8	40.7	72.7	52.5
52	59.4	44.8	73.7	55.1
45.1	57.9	40.2	58	56.8
46	51.9	41	50.6	49.1
49.1	52.7	39.8	50.9	71.9
51	57	46.7	73.2	55.2
48.9	59.2	36.4	74.1	73.8
29.3	53	41.9	46.9	68.4
28.5	46.2	54.2	72.1	50.4
39.5	53.6	38.8	63.3	53.3
48.7	39.3	45.1	66.8	51.8
31.5	46.1	42.7	60.6	56.2
47.3	53.7	48.7	57.5	75.5
39.6	52.6	37.7	52.4	67.3
36	39.8	42.9	56.6	59.3
25.3	42.9	29.6	62.3	69.4
42.1	50.3	28.6	64.9	66.9
34.8	62.8	30.4	51.8	55
23.6	51	49.2	65.9	53.8
37.1	60.7	50.3	50.2	74
26.8	50.2	42.4	60.7	56.6
42.8	57.5	28.1	64.4	68.6
48.7	55.7	45.7	62.7	72.5
47.9	58.9	36.2	63	62.4
38.8	42.5	53.4	57.7	69.1
34.9	42.9	51.7	52.9	49.6

Data for Turnaround Time of Lab Results

Group D – Small hospital

Your hospital has compiled the following data regarding turnaround time for lab results going to the emergency room. Use the data to do the following:

1. Find the mean, median, and mode for each of the five tests.
2. Graph the raw data verses time for each test. Then overlap a line for the mean, a line for the median, and a line for the mode.
3. Determine, with justification, which of the three methods for finding central tendency is most representative of the data.

ABG	BMP	CBC	CPK	TROPONIN
42.3	37.6	35.4	59.4	56.6
30.9	41	33.5	47.2	68.2
45	65.9	51	49.1	66.3
40.8	42.4	43.7	71.5	60.8
46.1	61.9	48.8	66.7	68.8
32.8	50.1	45.9	52.3	65.3
28.6	52.2	25.7	66.1	65.6
44.6	49.9	38.5	67.5	57.3
32.5	61.7	26.6	57.6	68.1
37.2	43	29.7	64.9	66.6
46.3	42.3	32.7	47.8	74.3
25.7	36.9	48.8	74	53.6
26.1	54.4	33.4	63.4	60.6
43.1	54.4	32.5	60.5	67.4
44.9	49.2	32.9	51.7	60.3
26.2	51.3	32.8	72.4	66.7
32.3	43.8	44.2	74.4	50.9
47	38.4	29	62.5	55
46.5	46.1	45.9	59.8	48.3
33.2	55.9	38.6	73.6	52.4
35.1	54.3	43.3	63.3	60.9
42.1	59.3	29.1	63.1	50.7
21.4	44.8	25.5	67.5	56.9
41.1	38.4	34.4	54.7	51.1
44.4	42.8	51.4	57	59.4
31.7	63.1	49.1	63.6	73.3
38.9	46.2	26.6	72.7	58.9
30.4	53.7	45.4	55.7	55.9
24.4	42.6	38.6	57.7	56.9

Data for Turnaround Time of Lab Results

Group E – Small hospital

Your hospital has compiled the following data regarding turnaround time for lab results going to the emergency room. Use the data to do the following:

1. Find the mean, median, and mode for each of the five tests.
2. Graph the raw data verses time for each test. Then overlap a line for the mean, a line for the median, and a line for the mode.
3. Determine, with justification, which of the three methods for finding central tendency is most representative of the data.

ABG	BMP	CBC	CPK	TROPONIN
29.7	42	29.4	59.1	56
41.2	49	41.7	58.3	59.7
41.3	41.1	45	56.4	49.8
41	56.8	35.7	60.6	61.2
23.8	66.2	27.7	53	68.6
34.3	57.6	41.3	61.6	52
23.8	39.9	37.2	56.9	67.8
37.9	57.1	45.2	61.1	63.8
22.8	60.4	53.3	50.2	76
39.7	55.7	31.1	64	69.2
31.3	54	47.5	63.1	69.4
27.3	38.3	39.9	72.1	62.8
43.5	39.4	44.1	65.1	62
34.4	50.3	25.7	52.4	58.5
25.5	65.2	42.6	50.8	72.6
30	49.9	40.9	62.2	52.4
34.2	61.4	52	63	51.2
49.1	57.1	34.9	65.5	61.2
23.6	59.3	43.5	55.6	70.5
48.9	40.3	38.1	73.7	69.5
33.2	59.2	35.3	72.8	48.1
32.6	50.7	42.9	59.9	61.5
29	51	37.4	63	69.5
36.1	57.8	36.7	50	61.5
29.4	46.6	50	52.3	66.9
35.7	52	50.4	61.1	52.9
46.7	51.3	44.5	68.1	66.2
41.9	59.3	31.8	50.8	62.7
39.2	55.3	34.7	73.7	70.1

Acceptable Turnaround Times

The following values can be considered to be acceptable turn around times for the tests we are focusing on.

Small Hospital
ABG: 36 minutes

Big Hospital
ABG: 52 minutes

BMP: 51 minutes

BMP: 65 minutes

CBC: 40 minutes

CBC: 56 minutes

CPK: 60 minutes

CPK: 74 minutes

Troponin: 60 minutes

Troponin: 76 minutes

How do your values for tests compare to the acceptable times? Which measure of central tendency are you using and why? What might be some reasons for your values not being acceptable? What could be done to improve the times?

Lesson 7

TOPIC	Business report and presentation	TIME ESTIMATE	3 hours
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OBJECTIVES

- Students will create a written business report for their conclusions.
- Students will create a presentation with visual aids for communicating their conclusion to an audience.
- Students will present their conclusions to an audience.

MATERIALS & RESOURCES

- Copies of Writing a Business report (can be downloaded at www.tdlmathscience.org/q=node.17.)
- Copies of Preparing Presentations (can be downloaded at www.tdlmathscience.org/q=node.17.)
- Computer access - word processing, graphing such as Excel, presentation such as Powerpoint
- Contact with partner hospital
- Copies of Presentation, Business Report and Group work rubrics from the assessment materials
- Equipment needed for presentations - projector, computer, microphone, etc.
- Personnel from the partner hospital or other non-student guests for the audience

Lesson Description & Activities

Steps	No. of Minutes	ACTIVITIES
1	20	<ul style="list-style-type: none"> - Download Writing a Business Report.pdf from www.tdlmathscience.org/q=node.17. - Distribute copies to the class. - Read with class and answer any immediate questions. - Download Making a Business Presentation.pdf from www.tdlmathscience.org/q=node.17 and distribute copies to the class. - Read with class and answer any immediate questions.

2	100	- Allow time for students to work in groups on their reports and presentations.
3	50	- Have each student group present their findings and recommendation in a 5 minute presentation. - Allow 5 minutes for questions and comments for each presentation.
4	10	- Allow time for final comments from hospital personnel or any special guests that have been invited to the presentations.

Teacher

Assessment Materials

FINAL EVALUATION

Problem Statement to be Solved:

A Hospital Emergency Room must meet the needs of all patients. Each patient should be treated in a timely manner. Lab tests and the return time of lab test results are in important aspect of proper care.

The Directors of Emergency Services in five Illinois district hospitals have noticed increasing patient dissatisfaction with ER wait time according to patient surveys. Your team is to determine if the turn around times at your hospital are acceptable within current emergency care standards? If they are not, you are to develop a plan for reducing turn around time for the ER.

Measurement Criteria that would describe an acceptable solution

1. Recommendation was creative but reasonable in costs and implementation.
2. Recommendation showed evidence that the student understood the flow information and items between an ER and lab.
3. Recommendation showed evidence that the students understood the function of the ER and the lab.
4. Recommendation showed evidence that the student understood the importance of acceptable turnaround time.
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 recommendations.
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 and slang
 - Welcomed questions and answered completely
 - Accepted reactions without being defensive.

Suggested Scoring Guide

- 1. Business Report 1/3**
- 2. Presentation 1/3**
- 3. Group Work/Team collaboration 1/3**

Attached are sample Report, Presentation and Group Work Rubrics.

Business Report Grading Rubric

Is the purpose of the report clearly communicated?	Completely clear 6	Somewhat clear 4	Included but not clear 2	Purpose statement can not be found 0
Does the report contain all of the information needed to meet the requirements of the customer?	All needs are covered 8	Most, but not all needs were addressed 6	Only part of the needs were covered 4	Very few needs of the customer are addressed 2
Does the report contain an introduction that summarizes the purpose and contents of the report?	Summary is clear and complete 6	Summary is not clear or not complete 4		Does not include a summary 0
Is the body of the report divided into sections that logically group related data?		Yes 2		No 0
Does any section contain information that is not necessary?		No 2		Yes 0
Are the sections properly sequenced?		Yes 2		No 0
Do the section titles clearly communicate the purpose and content of each section?		Yes 2		No 0
Does the report have a final section that summarizes the conclusions and recommendations of the project?	Yes 6	Section has recommendations but no summary or vice versa 4	Section is there but content is poor for both summary and/or recommendations 2	No final section for summary and recommendations 0
Does the report contain complete sentences and paragraphs?		Yes 2		No 0
Does the report effectively use supporting charts, graphs, tables, etc?	Included items are accurate, useful and easy to understand 6	Included items are not completely needed or are not easy to understand 4	Included items are inaccurate in some way 2	Does not include in supported items or items are irrelevant 0
Does the report use consistent report formats for easy reading?		Yes 2		No 0
Does the report		No 2		Yes 0

contain spelling or grammatical errors?				
Does the report contain inaccurate information or math errors?		No 2		Yes 0

Presentation Rubric

Presentation Components	Below Expectations	Meets Expectations	Exceeds Expectations	Score
Content	<ul style="list-style-type: none"> ▪ Provides inconsistent information for solution ▪ Has no apparent application of critical thinking ▪ Has no clear goal ▪ Is pulled from less than two sources ▪ Has significant factual errors, misconceptions, or misinterpretations 	<ul style="list-style-type: none"> ▪ Supports the solution ▪ Has application of critical thinking that is apparent ▪ Has no clear goal ▪ Is pulled from exactly two sources ▪ Has some factual errors and inconsistencies 	<ul style="list-style-type: none"> ▪ Is well thought out and supports the solution ▪ Reflects application of critical thinking ▪ Has clear goal that is related to the topic ▪ Has used more than two sources ▪ Is accurate 	
Professionalism	<ul style="list-style-type: none"> ▪ More than 5 spelling, grammatical, or punctuation errors ▪ Poor use of vocabulary and word choice 	<ul style="list-style-type: none"> ▪ Minimal (1 to 5) spelling, grammatical, or punctuation error ▪ Low-level use of vocabulary and word choice 	<ul style="list-style-type: none"> ▪ No spelling, grammatical, or punctuation errors ▪ High-level use of vocabulary and word choice 	
Organization	<ul style="list-style-type: none"> ▪ Content is unfocused and haphazard ▪ Information does not support the solution to the challenge or question ▪ Information has no apparent pattern 	<ul style="list-style-type: none"> ▪ Project has a focus but might stray from it at times ▪ Information appears to have a pattern, but the pattern is not consistently carried out in the project ▪ Information loosely supports the solution 	<ul style="list-style-type: none"> ▪ Information is clearly focused in an organized and thoughtful manner ▪ Information is constructed in a logical pattern to support the solution 	
Slide Show	<ul style="list-style-type: none"> ▪ Presentation appears sloppy and/or unfinished ▪ Multimedia is overused or underused ▪ Format does not enhance content ▪ Presentation has no clear organization 	<ul style="list-style-type: none"> ▪ Multimedia loosely illustrates the main points ▪ Format does not suit the content ▪ Presentation does not capture audience attention ▪ Presentation is loosely organized 	<ul style="list-style-type: none"> ▪ Multimedia is used to clarify and illustrate the main points ▪ Format is appropriate for the content ▪ Presentation captures audience attention ▪ Presentation is well organized 	

Group Team Member Evaluation Rubric

CATEGORY	4	3	2	1
Contributions	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares, with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.
Monitors Group Effectiveness	Routinely monitors the effectiveness of the group, and makes suggestions to make it more effective.	Routinely monitors the effectiveness of the group and works to make the group more effective.	Occasionally monitors the effectiveness of the group and works to make the group more effective.	Rarely monitors the effectiveness of the group and does not work to make it more effective.
Quality of Work	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked/redone by other group members to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is publicly critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).
Time-management	Routinely uses time well throughout the project to ensure things get done on time. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Usually uses time well throughout the project, but may have procrastinated on one thing. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Tends to procrastinate, but always gets things done by the deadlines. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Rarely gets things done by the deadlines AND group has to adjust deadlines or work responsibilities because of this person's inadequate time management.

Problem-solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest or refine solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
Focus on the task	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.
Preparedness	Brings needed materials to class and is always ready to work.	Almost always brings needed materials to class and is ready to work.	Almost always brings needed materials but sometimes needs to settle down and get to work	Often forgets needed materials or is rarely ready to get to work.
Pride	Work reflects this student's best efforts.	Work reflects a strong effort from this student.	Work reflects some effort from this student.	Work reflects very little effort on the part of this student.

A P P E N D I X

GLOSSARY

Antigen

Substances (usually proteins) that can trigger an immune response, defense mechanisms that protects the body from infection.

Antibodies

Proteins located in the plasma of the blood that attack foreign substances in the blood.

Type A Blood

Blood that has antigen A only.

Type B Blood

Blood that has antigen B only.

Type AB Blood

Blood that has antigen A and B

Type O Blood:

Blood that has neither A or B antigens.

Universal Donor:

People that have type O blood. No antigens present in O blood.

Universal recipients:

People that have type AB blood. No antibodies present in AB blood.

Coagulation:

The process of blood clotting. This involves a complex sequence of steps leading to the conversion of fibrinogen into an insoluble protein fibrin.

Agglutination

The aggregation (clumping) of red blood cells due to interactions between surface antigens and plasma antibodies.

Rh Factor:

The presence of a Rh surface antigen.

Rh positive (Rh+)

The blood has the presence of the Rh antigen.

Rh negative (Rh-):

The blood is absent of the Rh antigen.

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