Teacher: Deb Faunce
School: Gloucester High School
District: Gloucester

Course Name: Algebra 1
Unit Name: Data Analysis

Science or Education Topic(s):
 data distributions and measures of center and spread
 two way frequency tables

Engineering Technology Industry Related Field/Activity:
 performance task

When Taught:
 This will be taught in the spring. It is our last unit.

Abstract: In 200 words or less, please provide a summary of your objectives, implementation, and the results of your implementation.

I plan to use Medtronic ICD device options as the context of a end of unit performance task. I will use videos to inform the students about ICDs, their purpose and history of use. I will use data available from Medtronic for students to analyse to inform patient recommendations. I will not be able to use this task this year.

Objectives and assessment: Using the table below, identify at least 3-5 learning objectives (content and/or pedagogical) and describe how each will be assessed.

Objectives *By the end of this lesson/unit, the students will be able to:*	Assessment *How was the objective assessed? List the example of formative or summative assessment.*
S.ID.1 Represent data with dot plots, histograms and box plots	Unit quiz on data distributions S.ID.1-3
S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more data sets.	Unit test S.ID.1-3, 5
S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for the effect of outliers	Reflection (student summary of lesson goals and their learning) S.ID.1-3, 5
S.ID.5 Summarize categorical data in two way frequency tables. Interpret relative frequencies in the context of data. Recognize associations or trends in the data.	Performance task S.ID.1-3

Engineering/Technology Link: Please check the appropriate box(es) in question 1. And provide a brief answer to question 2.:

1. How did you *introduce* engineering/ technology concepts or the company/industry focus in your course? Check the appropriate box(es) or choose Other.

⊗ Defined terms (science, engineering, technology)

o Described the engineering design process

⊗ Engineering design challenge related to industry

⊗ Overview of the company

o Challenge based on 'industry specific' area of focus (manufacturing process, quality control, measurement, development, teamwork etc.)

⊗ Other: Performance task based quality control and reliability

2. After introducing the concepts, what did/will the students do to explore and apply the engineering/technology and industry specific concepts? (include information about the actual activity students did, discussions they had, or instructional strategies you used)

Performance Task.

Level of Inquiry: Which of the following best describes the level of inquiry (adapted from Bell 2005) you used for this lesson/unit? Check the appropriate level.

o *Structured inquiry*: Instructor provides question and procedure. Students determine the results based on given procedures.

⊗ *Guided inquiry*: Instructor provides question and data. Students analyze data and draw conclusions and make recommendations.

o *Open inquiry*: Students investigate their own research question. Students design procedures and implement the procedure on their own.

Lesson Extension Plan:

Title/Topic: What should the doctor recommend?
Time (minutes): 45 minutes
Company Name and brief Description: Medtronic: medical device manufacturer
Overview of the Lesson   Introduce the company and the device. Have students complete the performance task.
Standard(s)/Unit Goal(s) to be addressed in this lesson: S.ID.1-3

Essential Question(s) addressed in this unit:

What is a statistical question?

Why do we need to know the center of data?

How do you categorize the center and spread of data?

Enduring Understanding(s) addressed in this unit:

Mean and standard deviation are used when the distribution is symmetric

Mean and IQR are used when the distribution is skewed

Objectives: students will be able to
- How to calculate the measures of central tendency and data spread
- Represent data with plots on the real number line
- Interpret differences in shape, center, and spread
- Predict the effect of outliers
- Create and interpret two way frequency tables

Link to Industry: Students will analyze data about three different ICDs. ICDs are made by Medtronic.

What students should know and be able to do before starting this lesson

Students previously studied statistics in 6th grade.
Statistics and Probability 6.SP
Develop understanding of statistical variability.
1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.
2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Summarize and describe distributions.
4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
      MA.4.a. Read and interpret circle graphs.
5. Summarize numerical data sets in relation to their context, such as by:
      a. Reporting the number of observations.
      b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered

Instructional Materials/Resources/Tools Projector and access to the internet. Copies of task.

Lesson Delivery

Lesson Opening
I will open with the following video (ok to stop at 57 seconds)
https://www.youtube.com/watch?v=UjZK4HgoY2Q&list=PLaIasPOp7tC033uZa_it QcsNp7D38c8mJ&index=1

Share how the ICD is an implanted defibrillator and then show this untill 2:12
https://www.youtube.com/watch?v=UjZK4HgoY2Q&list=PLaIasPOp7tC033uZa_it QcsNp7D38c8mJ&index=1
Mention Medtronic is in Danvers and specializes in leads and catheters "the delivery systems"
If time share the story in another video
http://www.medtronic.com/about-us/mission-statement/Every-3-seconds/bruce/ind ex.htm

During the Lesson (activities/labs/challenges)
Performance Task will be completed individually.

Lesson Closing
Students will share their recommendations and justify their finding by sharing how they analyzed the data.

Assessment

Student Assessment:
The task is an assessment.

Delivery Assessment:

Additional resources and assessments: List the attachments here. Attachments should include handouts, readings (with references), lab write-ups, rubrics, exams/quizzes, and/or other similar materials.

To create the following performance task I used data from the document found at this link:
http://wwwp.medtronic.com/productperformance-files/Issue%2072%20MDT%20CRHF%20PPR%202015%201st%20Edition.pdf

I had to create tabular data from survival curves and I created fictitious product names.

The attached rubric is our math problem solving rubric which my students are accustomed to using.

North Shore Cardiatrics

325 Conant St.
Suite 1320
Danvers, MA 01923

October 10, 2015

Gloucester Research Services, Inc.
32 Leslie O'Johnson Road
Room 3203
Gloucester, MA 01930

Dear Statistical Analyst,

We, at North Shore Cardiatrics, are constantly evaluating the medical devices available to ensure we use those that are reliable and meet the needs of our patients. We are interested in reviewing the Implantable Cardioverter Defibrillator (ICD) devices available from Medtronic. We are contacting you to review the data provided by Medtronic and to report back to us.

We are specifically interested in determining the average lifespan of the device. ICDs are battery operated and will need to be replaced. This involves replacing the ICD and may involve replacing the leads.

We are also interested in determining the average charge time of the device. After detecting an irregular heart beat the ICD will charge to create the electrical shock needed to restore the heart rate and save the patient. Medtronic strives to produce ICDs that deliver charge times that are short and consistent.

Enclosed please find the data provided by Medtronic and make the following recommendations.

- For our patients who are at least 70 years of age we are most concerned about longevity of the device. Which product should we recommend?

- For our patients with specific heart rhythm abnormalities we are most concerned with the recharge time as swift delivery of a shock is imperative. Which product should we recommend?

We look forward to receiving your final report on this problem *on or before the 6th of October 2015*.
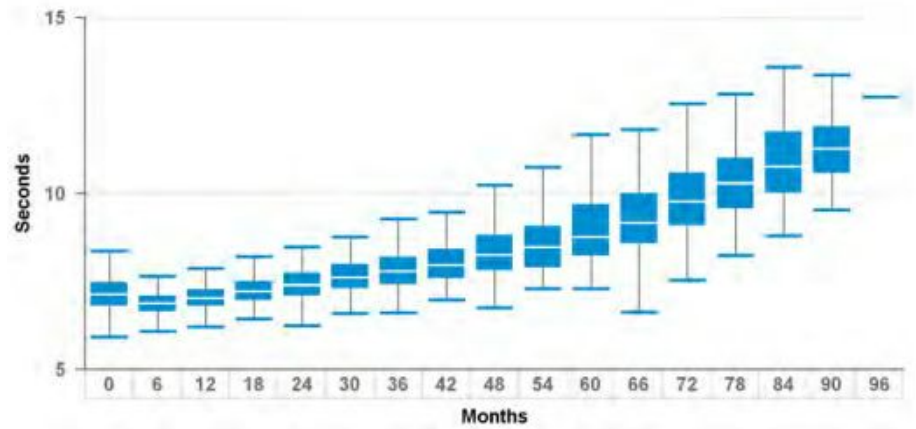

Yours sincerely,

Harold Hartwell , M.D.
Director, North Shore Cardiatrics, Inc

5472   Centurion

Longevity

Years after Implant	Percent Failed
1	0.5
2	0.5
3	1
4	1
5	6
6	19
7	36
8	28
9	4
10	2
11	1
12	0.5

Charge Time

8729   Syntronic

Longevity

Years after Implant	Percent Failed
1	0
2	0.5
3	0.5
4	1
5	1
6	2
7	10
8	10
9	35
10	20
11	10
12	6
13	3
14	1

Charge Time
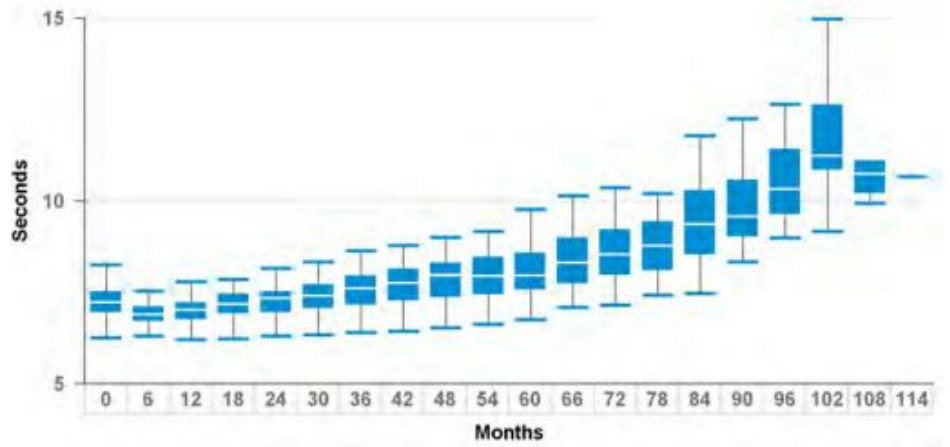
1735   Guardian

Longevity

Years after Implant	Percent Failed
1	0.25
2	0.25
3	0.5
4	2
5	6
6	21
7	30
8	25
9	11
10	2
11	1
12	0.5
13	0.5

Charge Time
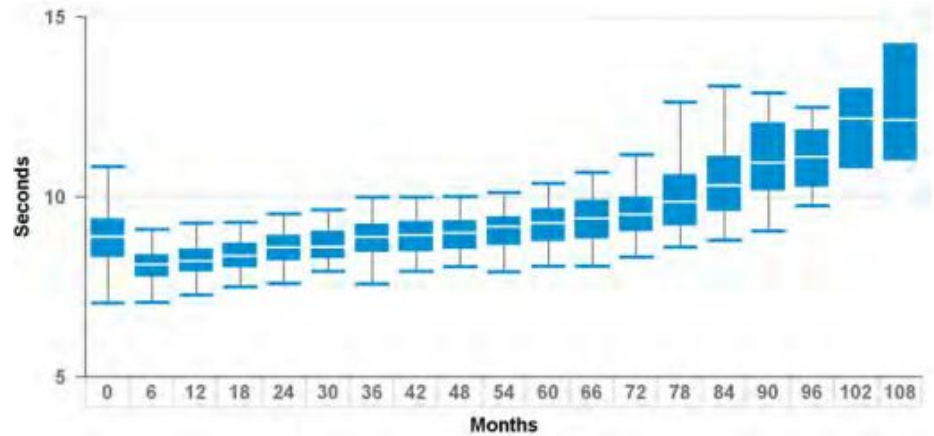
Indicators	Advanced	Proficient	Needs Improvement	Failing
DEFINE Understands the problem	Expertly demonstrates understanding of all elements of the problem.	Demonstrates understanding of all elements of the problem.	Demonstrates understanding of most elements of the problem.	Demonstrates understanding of few elements of the problem.
DEVELOP Analyzes the problem and develops a plan.	Expertly finds and evaluates content area strategies that will lead to a reasonable solution. Develops optimal plan.	Finds and evaluates content area strategies that will lead to a reasonable solution. Develops reasonable plan.	Needs help to find and evaluate content area strategies that will lead to a reasonable solution. Needs help developing a reasonable plan.	Unable to find a content area strategy that will lead to a reasonable solution.
DO Implements plan	Executes plan expertly. Solution is accurate and complete and shows consideration of all elements of the problem.	Executes plan completely. Solution is acceptable or shows a clear relationship to plan.	Executes plan incompletely. Solution is partially correct or shows some relationship to plan.	Fails to execute the plan. Solution is incorrect or has no relation to the plan.
DEFEND Evaluates outcomes and processes	Expertly justifies accuracy and completeness of solution. Expertly evaluates the process.	Justifies the solution. Evaluates the process.	Needs help justifying the solution. Partially evaluates the process.	Is not able to justify the solution or evaluate the process.

Students will assess themselves by placing a checkmark in each row. Students will justify this self assessment by writing a short paragraph that explains their reason for the boxes they have checked.