

Data Analysis and Display Distortion
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Part I: Lesson Plans

Day One: Introduction: Scatterplots and Definitions

Target learners: 1st semester algebra students, 9th grade.

Student Materials: Graph paper

Instructor Materials: Questionnaire (the more continuous data the better), Glyph

Objectives: Upon completion of this lesson, the student will be able to:

- Construct, discuss, and analyze scatterplots using pencil, and graph paper
- Construct a glyph

Overview of Lesson:

Introduction of terms, discussion of scatterplots and their various components, scatterplots constructed by teacher and students, discussion of what scatterplots show, where one would use a scatterplot, questionnaire filled out, glyph constructed.

Students will create a scatterplot using paper and pencil and discuss, verbally or in writing, what it is showing.

Day Two: Scatterplots and Calculators

Student Materials: classroom set of TI-84+ calculators

Instructor Materials: large posters (see about overhead system) linking cable(s); linked Calculators

Objectives: Upon completion of this lesson, the student will be able to:

- Construct, discuss, and analyze scatterplots using a graphing calculator
- Use the STAT, LIST, STAT PLOT keys on the TI-84

Overview of Lesson:

Talk about the questionnaire and the data now linked on the calculators and how we can investigate that data. Introduce terms STAT, LIST, and STAT PLOT using calculators, scatterplots constructed by teacher and students, glyphs arranged on wall. Discuss Hypotheses and investigate relationships in the data on the questionnaire. Continuation of yesterday's discussions, discussion of why scatterplots and why now? (box and whiskers later, similarity to algebra).

Students will create several scatterplots using the linked lists on the calculators, and discuss or explain the procedure to a classmate.

Day Three: Correlation

Student Materials: classroom set of TI-84+ calculators

Instructor Materials: large posters (see about overhead system)

Objectives: Upon completion of this lesson, the student will be able to:

- 🍎 Identify and draw a line-of-best fit
- 🍎 Draw conclusions and identify trends

Overview of Lesson:

Introduce terms line-of-best fit and correlation; recognize, predict, and draw them; include discussion of algebra and slope, x, y, graphing. Discuss items on questionnaire that may or may not show correlation.

Students will identify and draw lines of best fit from scatterplots.

Day Four: Conclusion and Distortion

Student Materials: classroom set of TI-84+ calculators

Instructor Materials: large posters (see about overhead system)

Objectives: Upon completion of this lesson, the student will be able to:

- 🍎 Construct scatterplots to show display distortion
- 🍎 Make decisions about appropriate scales

Overview of Lesson:

Introduce/review the WINDOWS key. Discuss scale and practice how changing the scale will affect the way the graph appears. Look for patterns.

Students will construct a graph on the calculator and by hand (chalkboard) that changes the scale and distorts data to show an improper correlation.

Students will explain, in writing, how changing the scale can change how a graph looks.

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Part II: Task Description

Meeting The Standards: Specific Statement(s) from the Standard:

Minnesota academic standards 2003

Probability and Statistics: 10) Grades 9,10,11 a) Data analysis, statistics, and probability i) Data and Statistics Standard: Represent data and use various measures associated with data to draw conclusions and identify trends. Understand the effects of display distortion and measurement error on the interpretation of data.) (1) Construct and analyze circle graphs, bar graphs, histograms, box-and-whisker plots, scatter plots and tables, and demonstrate the strengths and weaknesses of each format by choosing appropriately among them for a given situation. (3) Determine an approximate best-fit line from a given scatter plot and use the line to draw conclusions (6) Interpret data credibility in the context of measurement error and display distortion.

Ohio academic standards 2004

Data Analysis and Probability: Grades 8-10 A) Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability. E) Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.

NCTM Standards 2000

Data Analysis and Probability standard: Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Measurement standard: Understand measurable attributes of objects and the units, systems, and processes of measurement.

Communication standard: Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

Product(s):

Each student will create a report. In this report, two sets of data will be chosen and analyzed using the methods from this unit. The conclusion and analysis will show understanding of how the effects of display distortion can provide alternate interpretations of data.

Task Description:

- 1) Student will look at available data and formulate a question. (Is there a relationship between _____ and _____?)
- 2) A hypothesis will be chosen. (Yes there is a relationship, or no there is not a relationship.)
- 3) Appropriate methods and scales are chosen to represent data.
- 4) Data will be collected and represented with 3 graphs:
 - a) The first graph will be constructed using the methods decided upon.
 - b) The second graph will be constructed using display distortion to make hypothesis appear false.
 - c) The third graph will be constructed using display distortion to make hypothesis appear not false.
- 5) Using the first graph, data will be analyzed and trends will be identified.
- 6) Conclusion will include discussion of how display distortion can affect interpretation.

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Part III: Feedback Checklist for Task

Y=Yes

N=Needs Improvement

Student

Teacher

_____	Question	
_____	Hypothesis	_____
_____	Data and method to represent data chosen	_____
_____	Graph 1	_____
_____	Graph 2/graph 3	_____
_____	Analysis/Conclusion	_____