

Plotting Your College Future

Tables and Graphs

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Grade Level	9th Grade	**Time Frame**	2-3 class period(s)
Subject	Mathematics	**Duration**	80 minutes
Course	Algebra 1		

Essential Question

How do we use graphical data to analyze, draw conclusions, and make decisions?

Summary

Students will practice data analysis by studying tables and scatterplots. Information regarding the costs of resident and non-resident college tuition and available financial aid. Students will create representations of the data and theorize possible reasons behind the change in education costs over the year. Finally, students approximate costs for a 4-year education in an area of interest and investigate the possible ROI on their educational expenses.

Snapshot

Engage

Students create a list of college majors using ABC Graffiti instructional strategy.

Explore

Students generate tables and graphs comparing resident and non-resident tuition.

Explain

Students use Think-Pair-Share to analyze the data they graphed.

Extend

Students analyze a new set of data that compares historical tuition costs and financial aid amounts.

Evaluate

Each student creates a one-pager showing their chosen major, the school they would like to go to, and the ROI on their education over the last 5 years.

Standards

ACT College and Career Readiness Standards - Mathematics (6-12)

AF303: Relate a graph to a situation described qualitatively in terms of familiar properties such as before and after, increasing and decreasing, higher and lower

Oklahoma Academic Standards Mathematics (Algebra 1)

A1.F.1.5: Interpret graphs as being discrete or continuous.
A1.D.1.2: Collect data and analyze scatter plots for patterns, linearity, and outliers.

Attachments

- ABC Grafitti Poster—Plotting Your College Future.pdf
- Lesson Slides—Plotting Your College Future.pptx
- Resident vs. Non-Resident—Plotting Your Future - Spanish.docx
- Resident vs. Non-Resident—Plotting Your Future - Spanish.pdf
- Resident vs. Non-Resident—Plotting Your Future.docx
- Resident vs. Non-Resident—Plotting Your Future.pdf
- Return on Investment—Plotting Your College Future - Spanish.docx
- Return on Investment—Plotting Your College Future - Spanish.pdf
- Return on Investment—Plotting Your College Future.docx
- Return on Investment—Plotting Your College Future.pdf
- Tuition and Financial Aid—Plotting Your College Future - Spanish.docx
- Tuition and Financial Aid—Plotting Your College Future - Spanish.pdf
- Tuition and Financial Aid—Plotting Your College Future.docx
- Tuition and Financial Aid—Plotting Your College Future.pdf

Materials

- Lesson Slides (attached)
- ABC Graffiti Poster handout (attached; one per group)
- Tuition and Financial Aid handout (attached; one per student)
- Resident vs. Non-Resident handout (attached; one per student
- Return on Investment handout (attached; one per student)
- Notebook paper (one per student)
- Blank white paper
- Calculator (one per student)
- Laptop/tablet (one per 2–3 students)
- Graph paper (optional; one per group)

Preparation

Prior Knowledge: Students should be familiar with scatter plots and how to plot points. This lesson focuses on the analysis of the graphs, not the creation. They should also be familiar with the definition of a function, linearity, and how to find the slope between two points.

10 minutes

Engage

Use the attached **Lesson Slides** to guide the lesson. Use **slides 2–4** to review the lesson title, essential question, and objectives as needed.

Display **slide 5** and explain to the students that you are going to be talking about college during this lesson. Ask students to form groups of three, introduce them to the ABC Graffiti instructional strategy and hand out a **ABC Graffiti Poster** handout to each group. Using the 2-minute timer on the slide, give them 2 minutes to come up with as many college majors as they can for every letter in the alphabet.

When time is up, display **slide 6** and have groups trade papers so they have another group's ABC Graffiti poster. Using the 1-minute timer on the slide, give the students one minute to fill in any missing letters or add to others. At the end of the minute, have students trade with another group and repeat the exercise for another minute.

When students have finished, display **slide 7** and lead a discussion with the class about the types of majors they came up with.

- Which letter was the hardest to think of a college major?
- Which letter was the easiest?
- Did anyone see a major on one of the lists that they hadn't heard of before?

20 minutes

Explore

Group the students into pairs, distribute the **Resident vs. Non-Resident** handout to each pair, and display the data on **slide 8.** Explain to the students that they are going to use the given data to create a scatterplot that shows the change in tuition at OU (or your college of choice) from 2013 to 2022. Tell the students to use the data to create a table and scatter plot for resident tuition and another table and scatter plot for non-resident tuition. They should then answer the questions on the last page that will help them better understand the data.

Teacher's Note: Scaffolding

Make sure the students think about what to label the axis, what type of value is the input (independent)/output (dependent), and how the data points should be labeled (3,000 or 3 thousand).

Do not try to connect the points (unless you connect them using a step function, which still is not completely accurate)! This is a discrete function, since tuition does not change in the middle of an academic year and students cannot add classes in the middle of a year.

If you would prefer to use technology, students can graph the data in a graphing calculator or on a spreadsheet program, such as Excel or Google Sheets.

When groups have finished, display **slide 9** and lead a whole-class discussion about the handout and what the students learned. Some possible questions include:

- How did you know if the graph was a function?
- How did you find the average?
- How did you find the slope?
- How did you know whether or not the graph was linear?

15 minutes

Explain

Display **slide 10** and share the following questions one at a time for the students to think about and answer using the data using the Think-Pair-Share instructional strategy.

- How much did tuition change between 2013 and 2022? What are some possible reasons for this?
- What is the difference between resident and non-resident tuition?
- Why do you think schools charge different rates for residents and non-residents?
- Do you think this is fair?
- Does tuition change throughout the year, or just once a year?

After each question appears on the slide, students should think on their own about their answer. Give students a sheet of notebook paper and provide approximately one minute to write their answers down. Students should then pair up to share their responses. Together, partners will decide on a best response or collaborate to create a shared response. The student pairs will then share their responses in a whole-class discussion. Click on the slide to repeat this process for each of the next four questions, asking students to pick different partners each time.

After the last question, show **slide 11**. Discuss the definition of a continuous function and how it differs from a discrete function. Ask the students if they believe that the graphs they have created are continuous or discrete.

15 minutes

Extend

Display **slide 12** and give students the **Tuition and Financial Aid** handout. They may work in groups or individually; that is up to you to decide. Explain to them that they will be analyzing more data about college, this time comparing tuition and financial aid amounts. On this handout, the tables and graphs are complete, students are focusing on analyzing the data and drawing conclusions from their analyses.

20 minutes

Evaluate

Pass out the **Return on Investment** handout and a calculator to each student. Instruct students they need to pick a major and college. Then they need to find the tuition cost and calculate how much they would pay over 4 years.

Display **slide 13** and direct students to use the QR code or short link on the slide to access the "Career Earnings by College Major" page on Hamilton Project's website.

This website allows the user to choose a level of education and a major and see, on average, how much money is made by others with this major throughout their career.

Once all students have navigated to the website and completed the Return on Investment handout, display **slide 14**. Share the One-Pager instructional strategy with students. Ask students to create their own One-Pager that includes the following criteria:

- Title of your One-Pager
- Identify the following:
  - Major
  - College/University
  - Current tuition
- Graph representing the ROI of your chosen profession for the first 5 years after graduating from your chosen school
- Answer the question:
  - How many years would you need to work to have an ROI greater than 100%? Explain what this means in your own words.

Resources

- Hamilton Project. (n.d.). Career earnings by college major. https://www.hamiltonproject.org/data/career-earnings-by-college-major/
- K20 Center (n.d.). ABC graffiti. Strategies. https://learn.k20center.ou.edu/strategy/96
- K20 Center. (n.d.). One-pager. Strategies. https://learn.k20center.ou.edu/strategy/72
- K20 Center. (n.d.). Think-pair-share. Strategies. https://learn.k20center.ou.edu/strategy/139
- K20 Center. (2021, September 21). *K20 Center 1 minute timer* [Video]. YouTube.https://www.youtube.com/watch?v=6ilD555O_RE
- K20 Center. (2021, September 21). *K20 Center 2 minute timer* [Video]. YouTube. https://www.youtube.com/watch?v=HcEEAnwOt2c
- National Center for Education Statistics. (n.d.). Average amount of grant or scholarship aid from the federal government, state/local government, or the institution awarded to full-time, first-time undergraduate students [Graph]. https://nces.ed.gov/ipeds/trendgenerator/app/answer/8/220?f=5%3D1
- OU Fact Book. (n.d.). Other reports. https://www.ou.edu/irr/other-reports