# Data Visualization

Introduction

Data visualizations are a key way to understand results of instructional initiatives, student achievement, programs, strategic plan objectives VOC surveys (and other surveys) or tracking and assessing KPIs. Many people use spreadsheets to track development of these projects over time, but sometimes spreadsheet tracking can be hard for those that don't own and manipulate that data to discern its intent. This is where data visualizations can come in handy. Overall, across higher education, there is a lack of capacity for analyzing academic performance and learning (Ifenthaler, 2016). We want to provide you some tools that can assist in building academic performance and learning capacity at SPC. Students, staff, faculty and administrators can use data visualizations to assist in summative, real-time and predictive decision making at various points in the semester (Ifenthaler, 2016).

Sources of Visualizations

The IPRE office is tasked with helping the institution effectively assess performance in many ways. One of the easiest ways that IPRE can help faculty and staff analyze their own data is through the use of effective visualizations of data. IPRE staff use numerous programs and data to develop various visualizations. Some of the common items include final grades by course, CRN or instructor, completion rates by course, CRN, or instructor, and overall enrollment. The classroom side of data may be what comes to mind, but we can also serve other departments across the college with data visualizations by providing information about attendance of events, visuals representing survey results, or other various projects. The possibilities are endless! If you run your own survey for an event, you can send us the results and we can create a visual way to interpret your results.
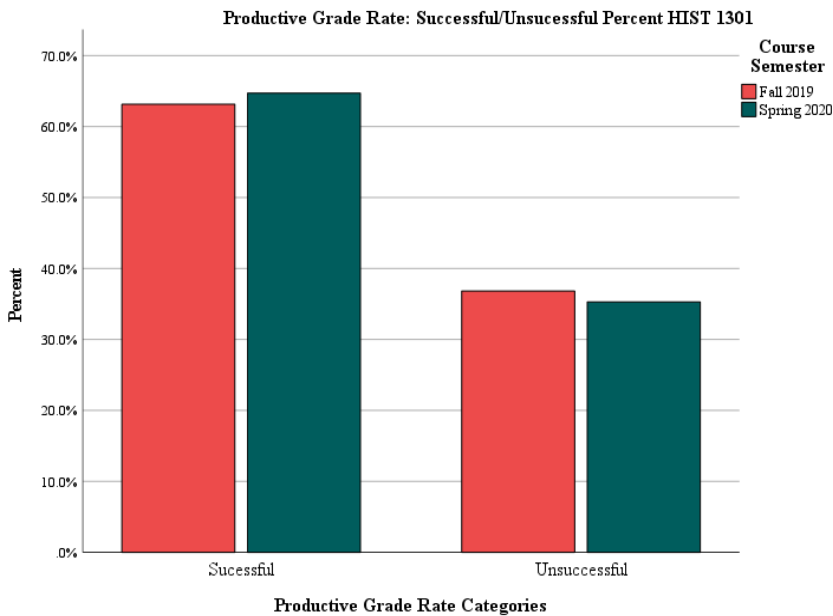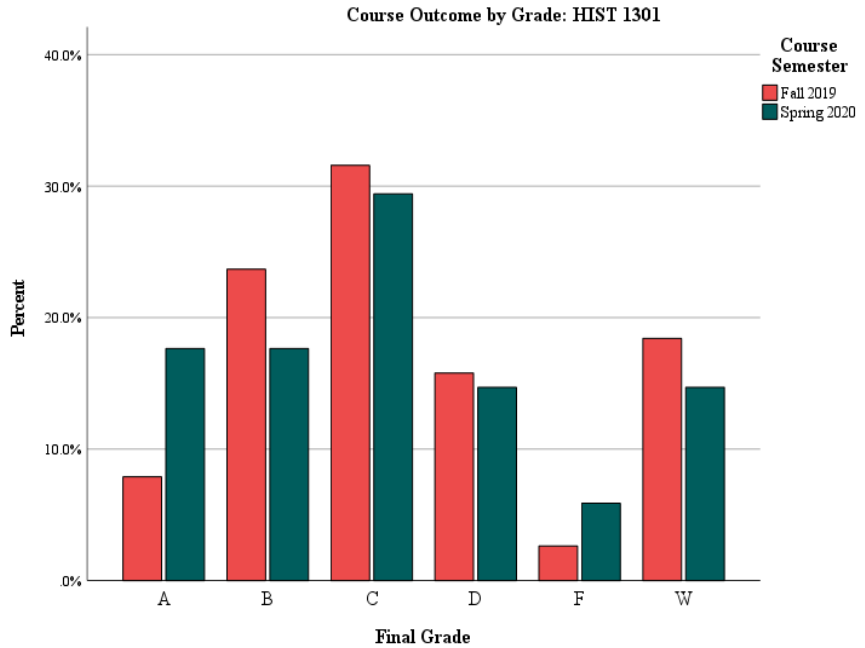
Using Data Visualizations

For this example, I am going to provide a comparison of two classes that were taught by the same professor in two subsequent semesters. This graphic is clustered bar chart that shows the percentage of students who earned different grades in class. The purpose of this bar chart might be something along the following lines*: I changed the assessment for a majority of my online course from reading based quizzes to discussion boards with written feedback. Did the change have a positive impact on my educational outcomes for my students?*

Total Enrollment by Course: HIST 1301
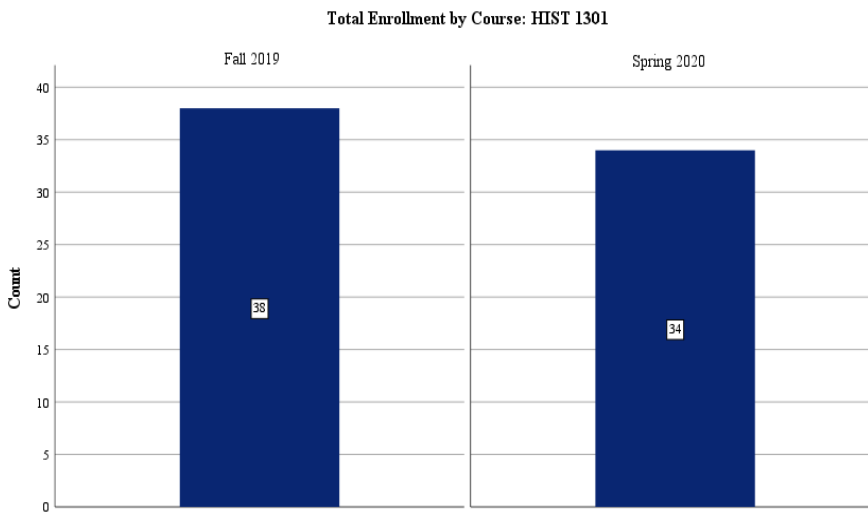
This first chart is provided to look at the total enrollment. Both of the courses that this history instructor taught online were comparable in size, with 4 fewer students in the spring semester. The similar class sizes make this course a good example to test outcomes based on a major change in the course.

The chart to the right entitled, "Course Outcome by Grade: HIST 1301" shows us a percentage of the students that earned each letter grade. As you can see from the chart, while the number of students who gained Cs and Ds remained within a few percentage points, this professor had about 8% of the students earn As in the first course. In the second course, students earning As were closer to about 18%. There were also fewer withdrawals from the second course. Upon initial results, the differences show the professor that there were some positive outcomes from switching to discussion boards in the second online course. It is important to not just look at individual grade percentage, but overall productive grade rate to see if there was any aggregate improvement in success.

Course Outcome by Grade: HIST 1301

Course Semester
- Fall 2019
- Spring 2020

(Bar chart: Percent vs Final Grade — A, B, C, D, F, W)

Productive Grade Rate: Successful/Unsucessful Percent HIST 1301

Course Semester
- Fall 2019
- Spring 2020

(Bar chart: Percent vs Productive Grade Rate Categories — Successful, Unsuccessful)

The chart, "Productive Grade Rate: Successful/Unsuccessful Percent HIST 1301," tells a slightly different story. "Successful" in a course indicates the student earned an A, B or C in the course, and "Unsuccessful" signifies a student earned a D, F, withdrew, or took an incomplete in the course. The chart "Course Outcome by Grade: HIST 1301" reveals there was a significant increase in the percentage of total students who earned an A and a decline of those who withdrew from Fall 2019 to Spring 2020. While this may lead the instructor to assume their change in instruction had a significant impact, we can also examine the overall success rate in the course. There is only a slight difference in the percentage of students who were successful (less than 5%). The data indicate that there might be something positive coming from the changes in instruction, but not enough to be significant. A deeper look at courses using the two methods would be required to show a true impact.

Conclusion

While the data only looks at an individual course, you can see that some interesting findings can be gathered from a simple bar chart. Now there are some things to keep in mind if you choose to examine data in this way. When interpreting data through visualizations, your previous beliefs and opinions about course materials, student performance, and effectiveness of events/teaching methods may impact your understanding of the data (Kennedy, 2016). When looking at your results, try to maintain a neutral view and a critical eye. When results do not align to your expectations, keep in mind that the data may help answer questions or even lead to new inquiries, but it is not guaranteed to prove a hypothesis or belief. Do not be discouraged if you found your results did not align to your perceived outcomes, because anecdotal data can be used in conjunction to understand the visualization and the outcomes of your research question.

In the particular example used for our discussion, we cannot say for certain that switching the mode of assessment made students more or less successful, but we can say that there are some indicators that the switch has a positive impact. While analyzing the data, we take a unbiased stance and look at the positive, negative and neutral outcome. Though as a professor, you would want there to be a significant difference if you made a major change to your course to improve student outcomes. Even so, it remains necessary to look at your course results with a critical eye. At the IPRE office, we can help you run further studies to drill down into the differences in course outcomes. The goal would be to expand the pool of courses you teach using each method and do a larger study. You can request similar data with visualizations using our data request form on the Institutional Planning, Research and Effectiveness website (https://www.alamo.edu/spc/about-spc/college-offices/planning-research-and-effectiveness/institutional-data/). We hope this research brief gives some insight into some of the tools you have at your disposal for understanding changes in your courses and other college events.

References

Ifenthaler, D. (2016). Are higher education institutions prepared for learning analytics? *TechTrends*, *61*(4), 366–371. https://doi.org/10.1007/s11528-016-0154-0

Kennedy, H., Hill, R. L., Allen, W., & Kirk, A. (2016). Engaging with (BIG) data visualizations: Factors that affect engagement and resulting new definitions of effectiveness. *First Monday*. https://doi.org/10.5210/fm.v21i11.6389

ALAMO COLLEGES DISTRICT

St. Philip's College

Institutional Planning, Research & Effectiveness

Dr. Diane Gavin, Interim Director

Shanna Bradford, Coordinator of Measurement & Evaluation

Hayley Aniol, IT Data Analyst