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Introduction

Students in introductory statistics courses are mainly exposed to elementary methods and textbook examples of their applications. This is in part due to the field's emphasis on teaching students to think statistically using real data [Carver et al., 2016]. Many textbooks, such as Tintle et al. [2021], take a single scenario and ask students to perform its corresponding inferential test. This process is then repeated over the course content without much deviation.

In some cases, students have the opportunity to participate in well-designed experiments in the classroom [McGowan, 2011]. This can expose students to concepts such as randomization and let students see the specifics of experimental design through their participation. Loy [2021] demonstrated that student participants often recalled their experiment in later concepts, showing some evidence that students can benefit from the hands-on experience.

One key aspect in the statistics classroom is teaching students to interpret data through visualizations. Nearly 40 years ago, Cleveland and McGill [1984] began the process of establishing good practices for making graphs. While Cleveland and McGill's findings have been replicated

[Heer and Bostock, 2010], there are many areas in data visualization that remain underdeveloped, such as 3D graphs. The current mantra is to avoid 3D graphs when possible and studies around the 1990s seem to provide some valid skepticism of their use. Barfield and Robless [1989] showed that 3D graphs were sometimes better than 2D graphs depending on the participant's experience level, but that participants were most confident with their answers for 2D graphs. Fisher et al. [1997] also observed a preference for 2D graphs over 3D graphs when extracting information while simultaneously showing no preference for visual appeal for either graph type. A major limitation of these studies is that the 3D graphs were 2D projections and not "true" 3D graphs. This is somewhat addressed by Kraus et al. [2020] with the use of virtual reality, but effectively rendering "true" 3D graphs is largely unexplored.

This underdeveloped area of 3D graphs provides a unique opportunity to be used as an experiential learning opportunity for statistics students. Not only can students benefit from the exposure to different graph types, but they can also see how research is conducted through the lens of a participant and researcher. While it is unclear how students will respond to active research as a teaching method, it may be beneficial for reinforcing statistical thinking.

In this paper, we discuss the use of an experiential learning module in an introductory statistics classroom environment and its potential application as an educational tool.

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Link to journal citation style: here

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