The State of Computing in Introductory Statistics

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Many introductory statistics students are not being given experiences with the computation and data structures elemental to modern scientific inquiry.

Take a picture for references and additional information

INTRODUCTION

Computing with data is fundamental to contemporary statistical practice and scientific inquiry. The proliferation of data and the increased demand for a data-literate workforce has led to several calls for reforming the introductory statistics curriculum to give students broader experiences with computation and modern data structures (American Statistical Association, 2014; Horton, 2015; National Academies of Sciences, Engineering, and Medicine, 2018; Nolan & Temple Lang, 2010).

RESEARCH QUESTIONS

1. To what extent are ideas of statistical computing being integrated into the introductory statistics curricula?
2. Are students receiving experiences with modern data structures in the introductory statistics curricula?

METHODS

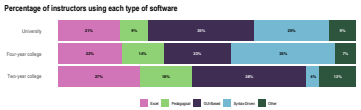
- The Statistics Teaching Inventory (STI; Zieffler et al., 2012) was modified to better align with current recommendations for teaching introductory statistics (ASA, 2016) and include items designed to measure the extent to which computing and ideas of computational thinking were being embedded in the introductory statistics curriculum (Weintrop et. al, 2016).
- Think-aloud interviews were conducted using the modified instrument with three statisticians/statistics educators, which informed revision on several items.
- In Fall 2019, we sent email messages to three statistics education oriented listservs to invite tertiary-level statistics instructors to complete the STI.
- The results of the 293 participants that responded are summarized in this poster.

LIMITATIONS

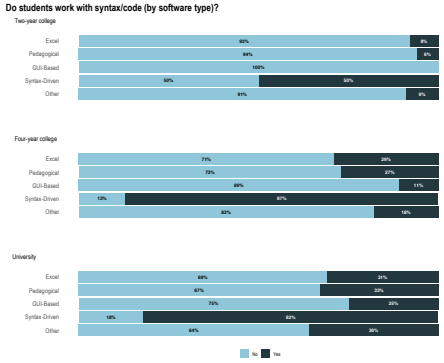
- The biggest limitation is the generalizations that can be made from the voluntary, convenience sample employed in the study. The audience in the email listservs are all members of the statistics education community. We suspect that these results are positively biased.
- A second limitation is the item nonresponse.

FUTURE WORK

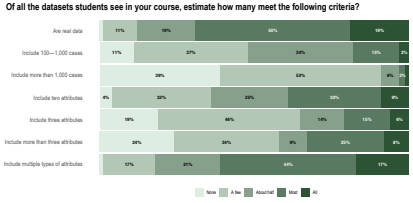
- Future work will compare results to previous administrations of the STI to gain insight into how the courses have changed over time.



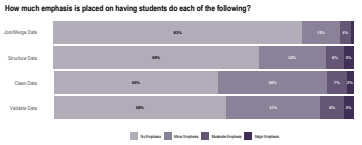
Excel and GUI-based software are also popular choices across institution types. Syntax-driven softwares are more commonly adopted in four-year colleges and universities than in two-year colleges.



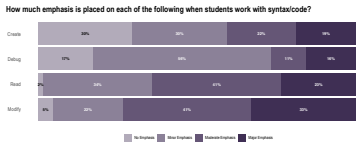
Coding is not commonly taught in introductory statistics courses. Instructors who adopt syntax-driven software are the ones primarily teaching coding.



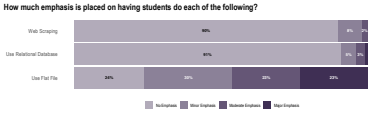
Most instructors use real data as recommended by GAISE (ASA, 2016). The majority of datasets include multiple types of attributes (e.g., categorical and quantitative attributes), but end to be small (less than 1,000 cases, fewer than three attributes).



Manipulating data to get it into a useable form is an important part of data analysis, yet these skills are not being emphasized in the introductory statistics course.



Instructors who teach coding tend not to emphasize debugging nor creation of syntax—higher-order skills associated with deeper and more critical thinking (e.g., DeLiema at al., 2020; Weintrop et al. 2016).



The majority of datasets students use tend to be flat files (e.g., CSV).