SURF Poster Presentation: "Statistics students' perception of including a course project on their attitudes toward statistics"

Sarah Mansoor & Mishaal Farooq

Abstract

The word statistics has preconceived notions in education, from high school to university students. These preconceived notions about statistics can sometimes steer students away from taking statistics courses. In this qualitative research study, we used thematic analysis to interpret students' anonymous survey responses from *STA258: Statistics with Applied Probability* about their perception of including a statistics course project, working with peers in small groups and using a free statistical software R to code and to analyze a realistic data. Three main themes emerged from our analysis of the qualitative data: 1) Students appreciated having had a hands-on learning experience opportunity in a statistics course, working with realistic data, and applying the skills they learned in the course in their statistical course project. 2) Students found that the inclusion of a course project enabled them to gain more practical and technical skills in terms of how to conduct statistical analyses using R. 3) Students described that the course project fostered their development of their statistical communication skills. Students practiced course contents on an on-going basis so that they could use appropriate statistical terms and vocabularies to communicate and interpret statistical results in effective ways, in writing and orally.

Introduction

Introductory statistics courses make a major impression on students' views and opinions on the subject (Songsore & White, 2018). In fact, for some, introductory courses could be the only form of contact they have with statistics in University. For this reason, it is important to ensure that students leave introductory statistics courses with a positive perception of statistics (Songsore & White, 2018). Statistics is considered a methodological discipline in that it exists to offer other fields a set of ideas and tools to work with data (Bond, Perkins, & Ramirez, 2012). Although it is important for students to have statistical knowledge that could be applied in real-life situations, there have been questions and research on how relevant students believe introductory statistics is and how these courses can be used in other projects (Songsore & White, 2018). The course, STA258, included 160 students, all of which answered a set of questions after the completion of their group project. It has been noted in the literature in statistics education that including a relevant course project in a statistics course contributes to students' positive perception about statistics. To conduct further study on this, with the use of thematic analysis on various qualitative data collected from the STA258 students through an end of course survey, the responses were analyzed. The data included both positive and negative feedback from students. Within this study, we aimed to understand students' perception of attitudes toward statistics when a course project is included in a statistics course.

We are interested in learning about students' perception on group projects in statistics, which we examine with the assistance of a few articles on thematic analysis by Virginia Braun, Victoria Clarke, Ronan Bree, Gerry Gallagher, Moira Maguire and Brid Delahunt. This poster will look at the methods used to analyze the students' responses, the results and themes that emerged from the analysis, and the future work of this research project.

Method

For this project, we use thematic analysis to answer our research questions using the students' responses in the year-end course survey.

Thematic analysis:

- Is a method for identifying patterns within data (Braun & Clarke, 2006)
- Offers accessible and theoretically flexible approach to analyzing qualitative data (Braun & Clarke, 2006)
- Provides core skills that are useful in conducting qualitative analysis (Braun & Clarke, 2006)

There are two ways in which themes can be identified in thematic analysis: inductive or theoretical (Braun & Clarke, 2006). Through the inductive approach themes are strongly linked to the data and have little relation to the questions asked (Braun & Clarke, 2006). Through the theoretical approach themes are explicitly analyst driven and provide more detailed analysis of the data (Braun & Clarke, 2006). There are two types of themes that are also described in Braun and Clarkes paper, semantic or latent themes. Semantic themes are identified within the explicit meaning of the data whereas latent themes identify underlying ideas of the data (Braun & Clarke, 2006).

Themes in this type of analysis capture important information about the data in relation to the research questions and allows the researchers to present a level of patterned response of meaning within the data (Braun & Clarke, 2006). Some themes may be more recurring than other themes, however more instances of the theme does not necessarily mean the theme is more important (Braun & Clarke, 2006). Researchers need to make clear and unbiased judgements to determine what themes are relevant and contribute to the research questions. It is important as researchers to analyze recursively rather than linearly. Analysis is not a linear process that goes from one step to the next but recursive where there are movements that go back and forth as needed throughout the steps and this process develops over time in thematic analysis.

Themes / Results

Q1	**Q2**	**Q3**

Understanding the meaning behind statistical concepts	Selecting appropriate tools to communicate results effectively	Develop statistical thinking to analyze, interpret, and transfer skills to future data analysis
Visualizing concepts and data effectively using R	Communicate in ways others can understand statistics	Simulated work experience through statistician level experience, workflow, and peer edits
Statistics can be applied to other disciplines (social statistics)	Terms/words used to convey statistics/interpret within the context of data in an understanding way	Communication with data for interpretation and drawing conclusions

Through this chart we can see for each question, three common themes that have emerged.

For the first question: “How did the course project enable you to use and apply statistical concepts and techniques covered in this course?”, we noticed that students appreciated having had a hands-on learning experience opportunity. This was achieved by working with realistic data, and applying the skills they learned in the course in their statistical course project. A direct quote from a student is as follows, “This course project helped me use statistical concepts and techniques covered in the course by asking questions on various topics, making different types of graphs, and get more familiar with R”.

For the second question: “How did the course project develop your communication skills in statistics?”. We discovered that the course project fostered their development of their statistical communication skills which they had to learn to effectively explain to team members. In fact, a direct quote from a student is the following: “The course project helped develop my communication skills in statistics by requiring me to communicate answers to the project questions by looking at the data and interpreting it to words. Additionally, the project allowed me to work on communicating my ideas to my group in a way that they can understand”.

Finally, for the third question: How did the course project facilitate the usefulness, relevance, and worth of statistics in your personal and academic life?, we found that the inclusion of a course project enabled them to gain more practical and technical skills in terms of how to conduct statistical analyses using R. Here is a quote from a student: “This course project facilitated the usefulness, relevance, and worth of statistics in my personal and academic life by presenting an application to the concepts studied in lecture and further familiarizing myself with R”.

Future work / Conclusion

Through this research and analysis, we have thoroughly understood the use of thematic analysis for qualitative work. The common themes among STA258 students are now understood, along with their attitude toward statistics while completing a group project. The main themes which emerged from the analysis can be summarized as the following: Students appreciated having had a hands-on learning experience opportunity in a statistics course, working with realistic data, and applying the skills they learned in the course in their statistical course project. As well, students felt more enabled to gain more practical and technical skills in terms of how to conduct statistical analyses using R. Students also mentioned that the project fostered the development of their overall statistical communication skills. With this information and understanding, for the future, we would like to create a more tailored end-of-course survey for future STA258 students. The questions would relate more to the themes that have emerged, and in a sense get a more detailed understanding of the students' perceptions and attitudes. As well, with our findings, we aim to create a course project in STA258 that now considers the feedback that students have provided. We will change some aspects of the project that students seemed to like or dislike. Overall, through this study, detailed information was understood about current and future STA258 students.

Future Work

- Create a more tailored end-of-course survey for STA258 students that include questions more related to themes
- Aim to create a course project that considers the feedback (both positive and negative)

References

Bree, R., & Gallagher, G. (2016). Using Microsoft Excel to code and thematically analyze qualitative data: a simple, cost-effective approach.

Bond, M. E., Perkins, S. N., & Ramirez, C. (2012). Students' perceptions of statistics: An exploration of attitudes, conceptualizations, and content knowledge of statistics. *Statistics Education Research Journal*, *11*(2), 6–25. https://doi.org/10.52041/serj.v11i2.325

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Maguire, M., & Delahunt, B. (2017). Doing a Thematic Analysis: A Practical, Step-by-Step Guide for Learning and Teaching Scholars.

Schau, C., & Emmioglu, E. (2012). Do introductory statistics courses in the United States improve students' attitudes? *Statistics Education Research Journal*, *11*(2), 86–94. https://doi.org/10.52041/serj.v11i2.331

Songsore, E., & White, B. J. (2018). Students' perceptions of the future relevance of statistics after completing an online introductory statistics course. *Statistics Education Research Journal*, *17*(2), 120–140. https://doi.org/10.52041/serj.v17i2.162

Acknowledgements

STA258 students in Fall 2021 for participating in this study by completing an anonymous graded survey.

Prof. Asal Aslemand, Prof. Luai Al Labadi, Prof. Omidali (Omid) Aghababaei Jazi