ESM Comprehensive Exam

Anthony Schmidt

Presented on

*Date of Comprehensive Exam*

**Committee Members**

Louis Rocconi, PhD, Chair

Gary Skolits, PhD

Christina Ergas, PhD

Joshua Rosenberg, PhD

Table of Contents

[Letter of Introduction 8](#_Toc78201361)

[A. Evaluation and Applied Research Experience 10](#_Toc78201362)

[Timeline of Applied Research and Evaluation Experiences 10](#_Toc78201363)

[List of Evaluation and Applied Research Projects 10](#_Toc78201364)

[#TidyTuesday Data Visualization Research 10](#_Toc78201365)

[Computer Science Education Needs Analysis 11](#_Toc78201366)

[Distance Education Needs Analysis 11](#_Toc78201367)

[Engineering Evaluation Project 11](#_Toc78201368)

[Fair Chance Impact Evaluation RFP 12](#_Toc78201369)

[Higher Education Sustainability (STARS) Ratings 12](#_Toc78201370)

[Intensive English Program and Direct-Admit International Student Achievement 12](#_Toc78201371)

[International Student Graduation Rates 13](#_Toc78201372)

[PhD Student Conference Travel and Employment Outcomes 13](#_Toc78201373)

[Sustainable Energy Working Group 14](#_Toc78201374)

[University Air Travel 14](#_Toc78201375)

[Description and Reflection of Experiences 14](#_Toc78201376)

[#TidyTuesday Data Visualization Research 14](#_Toc78201377)

[Computer Science Education Needs Analysis 16](#_Toc78201378)

[Distance Education Needs Analysis 18](#_Toc78201379)

[Engineering Evaluation Project 20](#_Toc78201380)

[Fair Chance Impact Evaluation RFP 22](#_Toc78201381)

[Higher Education Sustainability (STARS) Ratings 25](#_Toc78201382)

[Intensive English Program and Direct-Admit International Student Achievement 26](#_Toc78201383)

[International Student Graduation Rates 28](#_Toc78201384)

[PhD Student Conference Travel and Employment Outcomes 30](#_Toc78201385)

[Sustainable Energy Working Group 33](#_Toc78201386)

[University Air Travel 35](#_Toc78201387)

[Materials in Appendix A 36](#_Toc78201388)

[B. Statistical Analysis Experience 38](#_Toc78201389)

[Timeline of Statistical Analysis Experience 38](#_Toc78201390)

[List of Statistical Analysis Experiences 38](#_Toc78201391)

[Applied Statistics III: Volunteer State University Sharktank Project 38](#_Toc78201392)

[Engineering Evaluation Project 39](#_Toc78201393)

[footprint Air Travel Emissions R Package 39](#_Toc78201394)

[Higher Education Sustainability (STARS) Ratings 39](#_Toc78201395)

[Intensive English Program and Direct-Admit International Student Achievement 39](#_Toc78201396)

[International Student Graduation Rates 39](#_Toc78201397)

[PhD Student Conference Travel and Employment Outcomes 39](#_Toc78201398)

[Project Advising 39](#_Toc78201399)

[R Software Handbook 40](#_Toc78201400)

[TA for Statistics in Applied Fields III Transition to R 40](#_Toc78201401)

[Description and Reflection of Experiences 40](#_Toc78201402)

[Applied Statistics III: Volunteer State University Sharktank Project 40](#_Toc78201403)

[Engineering Evaluation Project 42](#_Toc78201404)

[footprint Air Travel Emissions R Package 43](#_Toc78201405)

[Higher Education Sustainability (STARS) Ratings 46](#_Toc78201406)

[Intensive English Program and Direct-Admit International Student Achievement 46](#_Toc78201407)

[International Student Graduation Rates 46](#_Toc78201408)

[PhD Student Conference Travel and Employment Outcomes 47](#_Toc78201409)

[Project Advising 48](#_Toc78201410)

[R Software Handbook 48](#_Toc78201411)

[TA for Statistics in Applied Fields III Transition to R 50](#_Toc78201412)

[Materials in Appendix B 51](#_Toc78201413)

[C. Measurement and Instrument Development Experiences 52](#_Toc78201414)

[Timeline of Measurement and Instrument Development Experiences 52](#_Toc78201415)

[List of Measurement Tools/Protocols 52](#_Toc78201416)

[#TidyTuesday Data Visualization Research 52](#_Toc78201417)

[Computer Science Education Needs Analysis 52](#_Toc78201418)

[Faculty Perceptions of PhD Applicant Conference Experience 52](#_Toc78201419)

[PhD Student Conference Travel and Employment Outcomes 53](#_Toc78201420)

[Statistical Literacy Assessment through the Media (SLAM) 53](#_Toc78201421)

[Sustainable Energy Working Group 53](#_Toc78201422)

[Description and Reflection of Experiences 54](#_Toc78201423)

[#TidyTuesday Data Visualization Research 54](#_Toc78201424)

[Computer Science Education Needs Analysis 56](#_Toc78201425)

[Faculty Perceptions of PhD Applicant Conference Experience 57](#_Toc78201426)

[PhD Student Conference Travel and Employment Outcomes 59](#_Toc78201427)

[Statistical Literacy Assessment through the Media (SLAM) 59](#_Toc78201428)

[Sustainable Energy Working Group 60](#_Toc78201429)

[Materials in Appendix C 62](#_Toc78201430)

[D. Scholarly Writing Experience 63](#_Toc78201431)

[List of Evaluation/Assessment/Technical Reports 63](#_Toc78201432)

[Applied Statistics III: Volunteer State University Sharktank Project 63](#_Toc78201433)

[Computer Science Education Needs Analysis 63](#_Toc78201434)

[Distance Education Needs Analysis 63](#_Toc78201435)

[Project Advising 63](#_Toc78201436)

[List of Research Papers 64](#_Toc78201437)

[Higher Education Sustainability (STARS) Ratings 64](#_Toc78201438)

[Intensive English Program and Direct-Admit International Student Achievement 64](#_Toc78201439)

[University Air Travel 64](#_Toc78201440)

[List of Publications 65](#_Toc78201441)

[Description and Reflection of Experiences 65](#_Toc78201442)

[Applied Statistics III: Volunteer State University Sharktank Project 65](#_Toc78201443)

[Computer Science Education Needs Analysis 65](#_Toc78201444)

[Distance Education Needs Analysis 65](#_Toc78201445)

[Higher Education Sustainability (STARS) Ratings 67](#_Toc78201446)

[Intensive English Program and Direct-Admit International Student Achievement 67](#_Toc78201447)

[International Student Graduation Rates 67](#_Toc78201448)

[Project Advising 68](#_Toc78201449)

[University Air Travel 68](#_Toc78201450)

[Materials in Appendix D 68](#_Toc78201451)

[E. Presentation Experience 69](#_Toc78201452)

[List of Presentations at Professional Conferences 69](#_Toc78201453)

[List of Presentations for Clients 70](#_Toc78201454)

[Description and Reflection of Experiences 70](#_Toc78201455)

[#TidyTuesday Data Visualization Research 70](#_Toc78201456)

[Computer Science Education Needs Analysis 72](#_Toc78201457)

[Engineering Evaluation Project 72](#_Toc78201458)

[Intensive English Program and Direct-Admit International Student Achievement 72](#_Toc78201459)

[University Air Travel 74](#_Toc78201460)

[Materials in Appendix E 76](#_Toc78201461)

[F. Teaching or Supervisory Experience 77](#_Toc78201462)

[Teaching Experience 77](#_Toc78201463)

[Non-Program Related Teaching Experiences 77](#_Toc78201464)

[Program-Related Teaching Experiences 77](#_Toc78201465)

[Professional Workshops/Trainings 77](#_Toc78201466)

[Description and Reflection of Experiences 77](#_Toc78201467)

[Non-Program Related Teaching Experiences 77](#_Toc78201468)

[Teaching Experiences as an English Language Instructor 77](#_Toc78201469)

[Program-Related Teaching Experiences 79](#_Toc78201470)

[Applied Statistics III: Volunteer State University Sharktank Project 79](#_Toc78201471)

[Professional Workshops/Trainings 80](#_Toc78201472)

[R Basics and Data Visualization (2020 Fall) 80](#_Toc78201473)

[Tableau Training (2020 Spring) 81](#_Toc78201474)

[Equivalence Testing (2019 Fall) 83](#_Toc78201475)

[Materials in Appendix F 84](#_Toc78201476)

[References 85](#_Toc78201477)

[Appendices 86](#_Toc78201478)

[Appendix A – Evaluation and Applied Research Materials 86](#_Toc78201479)

[Evaluation Proposal: Computer Science Education Needs Analysis 86](#_Toc78201480)

[Evaluation Proposal: Fair Chance Impact Evaluation RFP 86](#_Toc78201481)

[First Author Research Proposal: PhD Student Conference Travel and Employment Outcomes 86](#_Toc78201482)

[Appendix B – Statistical Analysis Materials 86](#_Toc78201483)

[Detailed Analysis with Code: Higher Education Sustainability (STARS) Ratings 86](#_Toc78201484)

[First-Author Quantitative Paper (published): International Student Graduation Rates 86](#_Toc78201485)

[First-Author Quantitative Paper (submitted): Intensive English Program and Direct-Admit International Student Achievement 86](#_Toc78201486)

[Appendix C – Measurement and Instrument Development Materials 86](#_Toc78201487)

[Survey Instrument: Sustainable Energy Working Group 86](#_Toc78201488)

[Interview Protocol: Distance Education Needs Analysis 86](#_Toc78201489)

[Assessment: Statistical Literacy Assessment through the Media (SLAM) 86](#_Toc78201490)

[Appendix D – Scholarly Writing Materials 86](#_Toc78201491)

[First-Author Paper (published): International Student Graduation Rates 86](#_Toc78201492)

[Technical Report: Project Advising 86](#_Toc78201493)

[First-Author Paper (submitted): University Air Travel 86](#_Toc78201494)

[Appendix E – Presentation Materials 86](#_Toc78201495)

[First Author Paper Presentation: Intensive English Program and Direct-Admit International Student Achievement 87](#_Toc78201496)

[First Author Poster Presentation: #TidyTuesday Data Visualization Research 87](#_Toc78201497)

[Panel Presentation: University Air Travel 87](#_Toc78201498)

[Appendix F –Teaching and Training Materials 87](#_Toc78201499)

[Teaching Material: TA for Statistics in Applied Fields III Transition to R 87](#_Toc78201500)

[End-of-Course Evaluations: TA for Statistics in Applied Fields III Transition to R 87](#_Toc78201501)

[Training Materials: Data Visualization in R 87](#_Toc78201502)

[Appendix G – ESM Coursework and Matrix 87](#_Toc78201503)

[Final Plan of Study 87](#_Toc78201504)

[ESM Program Matrix 87](#_Toc78201505)

[Appendix H – Scholarly Writing Sample 87](#_Toc78201506)

[Appendix I – Brief Curriculum Vita (no more than 5 pages) 87](#_Toc78201507)

# Letter of Introduction

The portfolio presented here is a compendium of evaluation, statistics, and measurement (ESM) experiences I have had since becoming a graduate student at the University of Tennessee, Knoxville (UTK) in 2018. My other degrees include a BA in anthropology from the University of South Florida and an MSEd in Language Education from Indiana University, Bloomington. From 2007 to 2014, I worked as an English language instructor in South Korea and Japan. I returned to the United States in 2014 to work as an English language instructor at UTK’s English Language Institute, where I taught English to international students. During this time, I became more interested in research and applied to UTK’s Theory and Practice in Teacher Education (TPTE) ESL doctoral program. Shortly after taking my first statistics course, I switched my program to ESM. Thanks to the coursework and skills I learned during my first year of the program, I obtained employment as a data visualization researcher at the College and University Professional Association for Human Resources (CUPA-HR), where I am still employed.

Without even having graduated, the ESM program already placed me on a radically different career trajectory, a testament to the program and the skills I had learned in such a short time. Experiences within the ESM program have deeply impacted my interests, skills, and confidence. These experiences have been vital in helping forge my path towards being a competent scholar. This portfolio aims to not only demonstrate these competencies in ESM but also my growth as a learner.

The portfolio is divided into seven sections, each of which contains descriptions of my experiences and detailed reflections on how those experiences impacted me. My reflections focus on what I learned from my experiences and how I might approach those experiences differently given the lessons learned. I also present key exemplars that demonstrate my competencies. These can be found at the end of each section and in the related appendices. Clicking on any blue hyperlinked text will take you to the document on Google Drive.

Because my ESM experiences varied in length and often overlapped, I have organized them alphabetically for each section. In sections A to C, a timeline of my experiences is presented to indicate starting and ending times, lengths, and progress. While each experience has its own reflection, there are threads of connection within and across the different sections. These threads are often mentioned explicitly in the text.

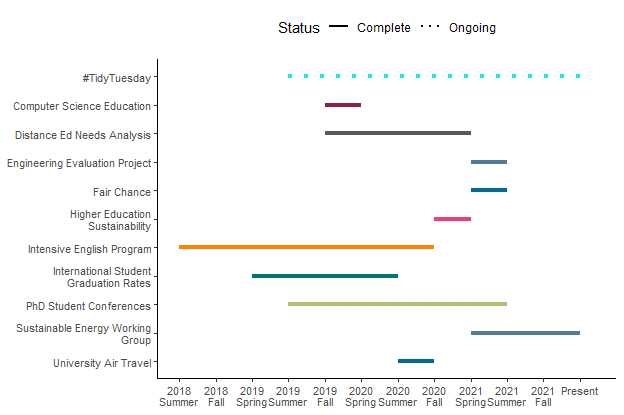
The portfolio itself should be seen as an exemplar of my ESM competencies. The portfolio is a product of reflexivity, a practice that is usually attributed to qualitative research. Reflexivity requires researchers to turn the lens of analysis back on themselves in order to establish awareness of their past experiences and values, and how these impact what they do. Reflexivity through written reflections is stressed throughout ESM courses and have been fundamental for creating this portfolio. A great debt is also owed to quantitative skills, as well. This portfolio was written and formatted completely in R, a statistical programming language. This allowed me to create a highly customized and consistent document using a language I have become quite proficient in, as documented in my reflections. Code for this portfolio can be found [here](https://github.com/acircleda/esm-portfolio).

In sum, this portfolio was created through a synthesis of qualitative and quantitative skills, which nicely reflects the synthesis of these skills within the ESM program. Likewise, the experiences detailed in this portfolio should clearly demonstrate how my progress through the program has also involved the synthesis of these skills and many others. By the end of this portfolio, it should be clear that I have demonstrated competency in the field of ESM and that I am ready to advance to doctoral candidacy.

# A. Evaluation and Applied Research Experience

***Note****: Listed in alphabetical order.*

## Timeline of Applied Research and Evaluation Experiences



## List of Evaluation and Applied Research Projects

### #TidyTuesday Data Visualization Research

|  |  |
| --- | --- |
| Dates | 2019 Summer - present |
| Status: | Ongoing |
| Data Analyses | Text mining, descriptive statistics, thematic analysis |
| Brief Description | For this project, I worked with Dr. Joshua Rosenberg (TPTE). We downloaded one years' worth of Tweets with the hashtag #TidyTuesday, which is used for weekly data visualization challenges using R. We analyzed participation, code contributions, and Tweet content. We have also developed a secondary survey project examining data visualization development over time. |

### Computer Science Education Needs Analysis

|  |  |
| --- | --- |
| Dates: | 2019 Fall - 2020 Spring |
| Status: | Complete |
| Type: | Needs Assessment |
| Data Collection: | Online survey (Qualtrics) |
| Data Analyses | Quantitative (descriptive statistics, correlation) Qualitative (thematic analysis) |
| Brief Description | This project was a needs analysis for a UTK community-engaged research seed-funded grant project. The project was designed to offer K-8 teachers in East Tennessee professional development opportunities for teaching computer science based on new (2019) state digital readiness standards. |

### Distance Education Needs Analysis

|  |  |
| --- | --- |
| Dates: | 2019 Fall - 2021 Spring |
| Status: | Completed |
| Type: | Needs Assessment |
| Data Collection: | Interviews |
| Data Analyses | Qualitative (thematic analysis) |
| Brief Description | The purpose of this needs assessment was to explore the elements needed for a successful Distance Education Master’s Degree program in Evaluation at the University of Tennessee, Knoxville. |

### Engineering Evaluation Project

|  |  |
| --- | --- |
| Dates: | 2021 Spring - 2021 Summer |
| Status: | Completed |
| Type: | Impact Evaluation |
| Data Collection: | Secondary data |
| Data Analyses | Quantitative (propensity score matching, regression) |
| Brief Description | This project involved the development of an evaluation/research plan for the College of Engineering. |

### Fair Chance Impact Evaluation RFP

|  |  |
| --- | --- |
| Dates: | 2021 Spring - 2021 Summer |
| Status: | Completed |
| Type: | Impact Evaluation |
| Data Collection: | Surveys, interviews, focus groups |
| Data Analyses | Quantitative, Qualitative |
| Brief Description | This project was a proposal in response to an RFP by the Fair Chance nonprofit organization. |

### Higher Education Sustainability (STARS) Ratings

|  |  |
| --- | --- |
| Dates: | 2020 Fall - 2021 Spring |
| Status: | Completed - Submitted for Publication |
| Type: | Applied Research |
| Data Collection: | Secondary Data - Multiple Public Datasets |
| Data Analyses | Multilevel Modeling |
| Brief Description | This project was initially developed for EDPY 667, Multilevel Modeling. I developed a project which looked at the association between the Sustainability Tracking and Assessment Reporting System (STARS) higher education sustainability rating and political and institutional factors at the county and state level. |

### Intensive English Program and Direct-Admit International Student Achievement

|  |  |
| --- | --- |
| Dates: | 2018 Summer - 2020 Summer |
| Status: | Completed - Submitted for Publication |
| Type: | Applied Research |
| Data Collection: | Institutional data |
| Data Analyses | Linear Regression, Equivalence Testing |
| Brief Description | This project was aimed at understanding the effectiveness of UTK’s Intensive English Program by comparing its students who matriculated to UTK with students who entered UTK directly due to higher language proficiency scores. The final manuscript was submitted to the *Journal of International Students* and has undergone one revise and resubmit. |

### International Student Graduation Rates

|  |  |
| --- | --- |
| Dates | 2019 Spring - 2020 Summer |
| Status: | Completed - Published |
| Type: | Applied Research |
| Data Analyses | Descriptive statistics, bivariate correlation, linear regression with robust standard errors |
| Brief Description | This project was developed as part of HEAM 620: Large Data Sets in Educational Research. I utilized IPEDS data to study the relationships between international student graduation rates and institutional expenditures. The culmination of this research is a first-author published article in the *Journal of International Students*. |

### PhD Student Conference Travel and Employment Outcomes

|  |  |
| --- | --- |
| Dates: | 2019 Summer - 2021 Summer |
| Status: | Complete |
| Type: | Survey Research |
| Data Collection: | Online survey (Qualtrics) |
| Data Analyses | Content validity: cognitive interviews  Reliability: test-retest reliability using intraclass correlations  Analysis: Survey Weighting (Raking), OLS Regression, Ridge Regression |
| Brief Description | This project was developed as a proposal in EDPY 682 (Educational Research Methods) during 2019 Summer. The goal of the project is to understand the relationship between PhD students’ conference activities and their employment outcomes. Cognitive interviews to assess validity were conducted in March/April of 2020. Data collection for test-retest reliability began in May 2020. Final analyses were completed in Spring/Summer 2021. Manuscript is being prepared for submission. |

### Sustainable Energy Working Group

|  |  |
| --- | --- |
| Dates | 2021 Spring to present |
| Status: | Ongoing |
| Type: | Survey Research |
| Data Collection: | Online survey (Qualtrics) |
| Data Analyses | Descriptive statistics, survey weighting (raking), and visualizations |
| Brief Description | I am leading the Student, Faculty, and Staff subgroup of the Office of Sustainability's Sustainable Energy Working Group. Most of this work involves the design and deployment of a survey for all students during 2021 Fall. Results will be presented to UTK administration to help decide on future sustainable energy projects on campus. |

### University Air Travel

|  |  |
| --- | --- |
| Dates: | 2020 Summer - 2020 Fall |
| Status: | Complete - Submitted for Publication |
| Type: | Applied Research |
| Data Collection: | Collection of institutional climate, sustainability, and greenhouse gas mitigation policies |
| Data Analyses | Document/Policy Analysis, Thematic Analysis |
| Brief Description | The University Air Travel project refers to a project begun as a 2020 Summer internship with the Office of Sustainability. For this internship, I worked on a document/policy analysis project which examined how institutional climate policies addressed (or failed to address) emissions from university air travel. A manuscript has been submitted to the journal *Climate Policy*. |

## Description and Reflection of Experiences

### #TidyTuesday Data Visualization Research

I worked with Dr. Rosenberg (of TPTE) for this project. It evolved from a shared interest in R, Data Visualization, and Twitter. The first part of this project was to understand who participates in the Twitter #TidyTuesday hashtag. #TidyTuesday is a weekly Twitter challenge in which interesting data sets are posted and users are asked to develop data visualizations in R, in particular using the ggplot2 package.

Through this project, I believe I learned or improved upon three key areas. First, I was able to massively improve my R programming skills. In fact, this was one of my first major R coding projects. I learned how to mine Twitter using the rtweet package and how to analyze, at a lexical level, others’ code using the tidycode package (which classifies code based on functions and allows a linguistic-like analysis of code).

Second, I also learned how to work with others collaboratively using Github. This was also one of my first Github collaborations. This required not only learning a new platform and commands in a new programming language, but also how to work with others’ code. I realized quite quickly that reading other people’s code is not always as easy as reading one’s own. For example, I saw instances of data objects beings named “d,” “t,” “s,” and other non-descriptive names with few comments. I decided that in my own programming and code development, I would try to be as descriptive as possible in my naming conventions (even at the expense of short names of data objects and variables) and comment my code as much as possible, especially if I think others will read it.

Finally, I learned how exploratory analyses can lead to larger projects. While this concept was familiar to me, this was my first time experiencing it for myself. The initial analyses we did prompted deeper questions, not only about participation and how participation may change one’s coding skills but also the role participating in #TidyTuesday may play in learning data visualization. Thus, we decided to expand our research into looking at how data visualization skills may develop when participating in an online community of practice. This project is still ongoing and will be reflected on in *C. Measurement and Instrument Development Experiences*, as instrument development has been the primary focus of this project.

### Computer Science Education Needs Analysis

I met the client (Dr. Joshua Rosenberg, TPTE) at the beginning of the 2019 Fall semester. We connected over Twitter through a shared interest in R, data science, and both being at UTK. When I heard about a grant he had been awarded for developing a professional development (PD) program to help K-12 teachers prepare for teaching computer science, I asked if I could apply my growing evaluation skills (I was enrolled in Program Evaluation I at the time) to assist his project. He was more than happy to have me help. We decided that in order to create an effective PD program, we would need to understand the needs of K-12 teachers. The needs analysis for this program was largely crafted under my direction (see Appendix A for needs analysis and program logic model).

Throughout this evaluation, I learned what it was like to create a refined plan from what was merely an idea. When I joined the project, the only thing that had been done was a proposal for the funding - with very lofty goals included - and a brainstormed list of survey questions. I took that proposal and list, worked with the client to understand the goals of the project and who potential participants were, and created a survey in Qualtrics that was developed around central evaluation questions and designed under best principles for survey design (I was also enrolled in Survey Research at this time). By developing a survey that responded to client and program needs, I was able to put into practice many of the key concepts I was learning in my courses at the time.

I also learned many useful data analysis skills through this project. I used this project as a means of boosting my skills in R. This was the first time I worked with survey data in R. I learned how to import data directly into R using Qualtrics’ API and the qualtRics package. I learned how to produce an R Markdown document, work with interactive tables using the DT package, version control via GitHub, and how to create an RPub. In fact, this project was the catalayst for me becoming proficient in these skills and later being able to teach them myself (see *F. Teaching and Supervisory Experience*).

Data analysis and write up occurred during the Spring 2020 semester (while I was enrolled in Program Evaluation II). Several deliverables were created for this including a presentation of preliminary results (presented at the TN STEM Conference in Cookville, TN), a technical report, and an online, one-page summary ([link](https://rpubs.com/acircleda/CSNeedsResults)). From the results, I was about to suggest concrete ideas for developing PD sessions, and an additional formative evaluation/research plan using a Kirkpatrick model to evaluate those sessions.

One important lesson I learned from the data analysis was the power of qualitative data. I typically prefer to work with quantitative data. However, for this project, I found the open-ended questions of the survey yielded more valuable information than the quantitative questions. While coding and analysis took more time, most of the suggestions for this project came from the open-ended responses. If we were to revise the survey, I would suggest including more open-ended questions to address the evaluation questions.

I was very fortunate in that the client really valued what I brought to the team in terms of rigor (the term they used often) in implementing an evaluation plan. Nevertheless, there were some struggles and issues. While I directed a majority of the needs analysis survey design, a last-minute decision changed most of my 5-point Likert-scale questions to 3-point questions without my knowledge. This was not a major setback but felt I lost nuanced meaning when analyzing responses. In addition, I did not have control over who the survey reached. I suggested getting approval from various school districts in East Tennessee, but for time’s sake, we used an already established list called the East Tennessee STEM Hub. This introduced some bias into the project, as the participants were those already interested in STEM education, and possibly computer science. Additionally, the results ended up being from across Tennessee rather than just East Tennessee.

Although I provided some concrete suggestions for designing PD sessions, based on the initial plans shared for PD workshops, it was not clear if there was any uptake of the suggestions. Specifically, I suggested a focus on raising awareness of standards with specific examples of activities to reach those standards, resources that point to already created materials (if available), and most importantly, integrating CSE with other subjects. It seems these might be included, but not at a satisfactory level. In addition, I recommended having the workshops lead by experienced teachers drawn from the public school community (as was planned in the seed funding proposal and logic model). The proposed workshops would be lead by the client himself or others from non-public school contexts. Unfortunately, due to COVID-19, the PD sessions were postponed, so neither the sessions not the Kirkpatrick evaluation plan were never implemented.

In the end, I learned a number of evaluation design, data analysis, and client relations skills. I feel this project strengthened me as both a researcher and an evaluator, especially in terms of needs analysis and utilizing qualitative survey results.

### Distance Education Needs Analysis

The distance education needs analysis project was a project delegated to my cohort (n = 5, including myself) during our ESM Seminar course. To be honest, I had mixed feelings about the project. On the one hand, I saw its importance. The analysis could provide valuable insight into designing a program responsible for educating dozens of evaluators. On the other hand, it seemed much of the curriculum was already planned out and the use of the evaluation results would be minimal. This, combined with the fact that the project was already pre-designed with minimal input from my cohort, did not make me feel motivated about the project.

Nevertheless, I certainly learned from this project. First, I learned a lot about doing qualitative research. As a qualitative project, the main method was interviewing. While I had some practice in interviewing, this was my first experience at applying it to a non-classroom-based project. I only conducted three interviews (due to lack of response and the project occuring during a pandemic), but I think I improved a number of key interviewing skills. Though we all followed an interview protocol, I made sure to use probing and follow-up questions to help the interviewee clarify and explain their thoughts. Probing and follow-ups of this nature were not in the protocol. I found that during the interviews, while I could have moved on after their comments provided a surface-level answer to the question, I felt that probing deeper (using some of the prompts I learned in Introduction to Qualitative Research) helped me get richer data and a better understanding of what interviewees were trying to say. I think that having these experiences, few as they may have been, will be valuable for any future interviewing I do, few as that may also be, too.

Another skill I was able to exercise was project management. Specifically, flexibility was key here for a number of reasons. First, as a team with disparate interests, availability, and skills, the project needed to remain flexible enough to accommodate us all while still being goal-driven. This meant being strategic about using class time periods for meetings and for delegating or volunteering for work that fit within our wheelhouses while still pushing the project forward. For example, I used my tech-savviness to build one of our participant contact lists (which required automatic and manual webscraping). I also used my data visualization skills to develop the visuals for our final deliverable.

Flexibility in timing was also key. This was a multi-semester project and moved at a very slow pace - something I am not very comfortable with. To me, when a project is slow, my interest wanes very quickly. It nearly died with this project. We were slow in getting organized, getting the IRB approved, building contact lists, contacting participants, getting interviews, analyzing, and writing. The pandemic began around the time we had planned to collect data. This did not affect our data collection methods, as we had always planned Zoom interviews, but it did increase the timeline of our project. Knowing that my participation in the project was still important because it was a group project, and that the results had potential real impact on the proposed program, I remained flexible and, most importantly, patient. I reminded myself of the proverb “slow and steady wins the race.” Cliché as the proverb may be, telling myself this was important as a reminder that there was absolutely no need to rush, and that rushing often leads to sloppy results.

The lessons I learned in flexibility and adapting to team needs amid a crisis while staying goal-oriented are certainly crucial aspects of project management skills. Interestingly, project management skills were some of the key skills interviewees stated evaluators needed to be successful! It was quite “meta” to deal with project management issues in an evaluation while at the same time hearing them emerge during an interview on creating an evaluation program. I certainly concur and appreciated the conceptual reinforcement this project wrought.

### Engineering Evaluation Project

This project was part of the Advanced Evaluation course I took in 2021 Spring. I worked in a group with three other ESM students. When our group initially met the client, a team of representatives from the Tickle College of Engineering, they came to us with a plethora of interesting questions they wanted answered, some of which were unrelated to the others. These questions involved assessing a new admittance policy, understanding retention of female engineering students, and understanding identity formation of new engineers, to name a few. Knowing that we only had part of a semester to complete a project for them, my team worked hard to help Engineering narrow their questions down to the single most important one they had. We did this through multiple client meetings.

These client meetings were excellent learning opportunities for us. As the clients spoke and talked about all the things they wanted to learn, we listened and tried to connect the dots in their question marks to help understand what they were really trying to get answered. The meetings began with questions from all across the research and evaluation spectrum: quantitative, qualitative, needs assessment, process evaluation, and so forth. We helped the client think about how the questions related to their strategic priorities and settle on a key question to be answered.

This question involved their new admittance policy. As of 2021 Fall, they would be admitting their first test-optional cohort, and wanted to know how this group performed compared to previous cohorts that had been admitted based on SAT/ACT scores. As the 2021 Fall semester had not begun yet, we could not actually answer this question. Thus, we negotiated with the client to create an evaluation plan that they could follow and implement once the Fall semester was complete and they had enough data.

The client-evaluator meetings were invaluable for practicing listening, question-asking, and communication skills in order to understand client needs and help determine a satisfactory evaluation approach. The approach itself was robust, detailed, and understandable (see section *B. Statistical Analysis Experiences*). Unfortunately, we recieved no feedback from Engineering on the plan, or if they would implement it. In fact, the first time we submitted it, we recieved no communication. I follow-up again in the summer and merely got a “Thanks” as a response. Given how much effort we put into the evaluation plan, this was a little disheartening.

### Fair Chance Impact Evaluation RFP

The Fair Chance proposal was one of the final products of EDPY 651 Advanced Evaluation. It was also my best evaluation experience to date, even though the project involved only the development of a proposal and not actual implementation.

It was my best evaluation experience because it was a real-world task (responding to an actual request for proposal [RFP]) that required me to synthesize my previous course work in evaluation, statistics, and qualitative research while working as part of a small team. As part of one of my final courses in the ESM program, the assignment felt like a capstone project in which all the skills from my previous coursework was needed. I very much enjoyed the opportunity to synthesize them.

The RFP called for an impact evaluation of one of Fair Chance’s (a Washington, D.C.-based nonprofit) capacity building programs, which assists other nonprofits in organizational leadership and growth. The process of reading and responding to the RFP was a rigorous exercise in creativity, methodological thinking, and project management. The entire proposal required creative thinking in order to help us design an evaluation approach that made sense for the client’s needs. We had to make sure that lenses of social justice, cultural responsiveness, and methods that lead to evaluation use pervaded to proposal.

Creative thinking also lead to methodological thinking, as we had to consider the most logical and efficient approaches to the evaluation design (we chose a mixed methods explanatory approach) and which methods would realistically answer the evaluation questions. My primary role was in this latter regard, and I believe I developed a robust mixed methods evaluation plan that considers descriptive (both quantitatively and qualitatively), inferential, and causal analyses while dealing with small sample sizes and longitudinal data.

In order to develop these approaches, I drew on the successes and failures from previous quantitative projects (especially the PhD Student Conferences project, see below). For example, I thought through what the data would look like if it were open in R Studio, and what steps I would have to take to answer the specific questions presented in the RFP. I stopped short of actually simulating the data but rather ran through specific scenarios in my head, including what data visualizations would look like (as interactive dashboards and as part of a final report) and how this would help the client understand the impact of their program. Likewise, as I was designing an explanatory mixed methods analysis, I thought of potential results and how those could inform the qualitaitve phase of the study. I then thought through the sequence of qualitaitve work and the order in which it should proceed (i.e. from focus groups to interviews in order to mirror a general to specific approach). Logical, step-by-step thought experiments were essential to creating a proposal that received *exceptionally high praise* from Dr. Skolits.

In terms of project management, two different processes were involved. First, there was thinking through the timeline, budget, and communication plan of the RFP. This was lead by my partner and fellow ESM student, Sarah Narvaiz, but required my contribution and feedback, too. Second, was the actual management of the proposal assignment Sarah and I were the only two students to approach an RFP together; all others worked independently. While there are many advantages to teamwork, it also presents several challenges including division of labor, keeping to deadlines, and making sure team members are on the “same page” conceptually. What helped us was that we were in constant contact with each other either through Zoom or through Slack. We set meetings to discuss the evaluation and to agree on approaches; chose roles that suited our strengths; set timelines for drafts, feedback, and revisions; and developed final deliverables together. I believe the fact that we worked as a team and were therefore accountable to someone other than ourselves improved the quality of our project, making it one of the best in the class. In fact, Dr. Skolits referred to our evaluation as “very mature, solid, and I think a highly competitive proposal” and at the same level of quality as actual evaluation firms.

To be fair, not all aspects of the project were positive. What stuck out the most to me was the actual search for a relevant RFP that we could use for our project. I did not enjoy the RFP search process at all. I have already had poor experiences gaining funding for small research projects. Searching for big-ticket projects that may be responsible for funding my entire organization (and my entire salary) is just not for me. The risk and stress is just too high. I know that if I continue to pursue a career in academia, grant writing may be in my future; however, for it to be a primary facet of what I am working on is something that I do not think is in my nature. I am more interested in methods, data, and analysis - not begging for funding. I realize this is a bit dramatic and that it is necessary for many jobs, inside and outside of academia. I also recognize this does not necessarily preclude me from evaluation work, as I could still work as an analyst. Still, the search for an RFP does move my personal Evaluation, Statistics, and Measurement/Methodology needle closer to the S and M and away from the E. It also makes me rethink a future career in academia, where I may need to dedicate more energy to gaining funding rather than to research (or teaching).

Just to illustrate this point, I formerly worked for a self-funded academic institution on campus. If I wanted to attend any professional development session or conference, I had to seek funding outside the organization. This meant an exorbitant amount of time was spent searching, applying, and hoping for funding, leaving actual participation in PD sessions or conference in an ever-present and anxiety-filled “up in the air” status. While I was often successful in gaining funding, this was always stressful. Fast forward a few years and I now work in “industry” (for a non-profit on the peripherals of higher education). One month on the job, when I asked my supervisor if I could attend a conference with a $1,200 registration price, I was never asked to justify attendance, the cost, or anything else. I said, “I’d like to attend…” and my supervisor said, “OK. Book it,” and that was it. No applications. No hoops. That experience made a world of difference in understanding the academia/industry divide and has definitely made me weigh career options more carefully, including the role seeking or maintaining funding will have.

### Higher Education Sustainability (STARS) Ratings

I completed this project during the 2020 Fall semester as part of EDPY 667 Multilevel Modeling. For this project, I decided to analyze the relationship between various factors that may influence higher education sustainability ratings as measured by the Association for the Advancement of Sustainability in Higher Education’s (AASHE) STARs rating system. Specifically, I looked at institutional factors, local political factors, state-level political factors.

This project focused on using secondary data sources. While I have used secondary data sources before (see *International Student Graduation Rates* below), this is the first time I have combined data from several different sources to inform an analysis. These included the aforementioned STARS ratings, presidential vote data (up to the 2016 election), IPEDS data, and legislative composition data, the latter of which I scraped together myself from public sources.

While finding and combining data sets was a great deal of work, I noted that I much preferred the use of secondary data as opposed to survey data collection, especially as I had a recent poor experience with survey recruitment (see *PhD Student Conference Travel and Employment Outcomes* below). In addition, I found the ability to connect these different data sets together was very powerful. The combination of such data gives the ability to answer interesting and important research questions not answerable by a single data source alone.

This project, from start to finish, was a very meaningful project to me, as it represented one of my first forays into a new area of interest: higher education sustainability. This kept me motivated to produce a meaningful project with potential positive impact. I believe my motivation and interest was apparent in my work. I received such positive feedback from Dr. Rocconi that I was committed to turning this into a publishable manuscript, and I invited him to be co-author. Our manuscript has been under review in the *Journal of Cleaner Production* since January. This project also gave me a chance to explore a new body of literature. As I read more about research on the intersection between society, education, and sustainability (especially climate change), I am learning more and more about related public data sets. I hope to explore these more fully in my future work, including my dissertation.

### Intensive English Program and Direct-Admit International Student Achievement

I began working on this project immediately after taking Stats I, before I was officially a student in the ESM program, and while I was employed at UTK’s English Language Institute. From the basic statistics skills that I learned in Stats I, I recognized a way to solve a problem I had been considering at my institute: how effective are we at helping our students succeed at UTK? The best approach to this was to compare students who came to our program first before fully matriculating to UTK (i.e., Intensive English Program [IEP] students) with directly-admitted international students (direct admits). I immediately requested a data set from OIRA to begin piloting an approach to answer this question. My approach was further refined as I began building my statistical skills in Stats II and III, and I finally figured out the best way to answer my research question in the Fall of 2020, after being introduced to equivalence tests.

Throughout this time, I learned about working with institutional data, especially the process for obtaining said data from OIRA. Specifically, I learned the length of time it takes to go from submitting a report request,back-and-forth communications to clarify the request, and finally receiving the data, all of which takes a long, long time. I also learned the issues that may arise when OIRA does not have complete data. In my case, OIRA did not have access to international student language test scores, which are required for direct admission. This was available through a very lengthy process (about a year) in which I had to work with the admissions office to receive the data. Due to the need to connect admissions data to OIRA data, as well as linking it with data from my own department, I needed student names. Thus, I also learned about the FERPA waiver and was able to successfully get one, which I hear is no easy feat.

By the time of Spring 2019, about one and a half years had passed since I began this project, and I was on my second data set, one with added variables and a larger scope of time. I delivered a presentation of preliminary results at the 2019 TESOL Conference to a large room of about 100+ attendees (see section *E. Presentation Experience*. This was probably the best presentation I had ever given, as the audience response was overwhelmingly positive, with numerous questions throughout and afterward. The feedback also gave me ideas on how to improve my analyses.

By Fall 2019, I requested my final data set, one which included all the key variables I needed and the most recent records available. Unfortunately, there was so much missing data for the test scores that I could not use it as a variable in my final models. During the Spring 2020 semester, I wrote up my final results, consulted with Dr. Rocconi to make sure my equivalence testing method was correct, and sought feedback from content specialists (my former colleagues at the English Language Institute) and my peers (students in the Spring 2020 ESM seminar). The manuscript has undergone numerous revisions, has been reviewed by Dr. Rocconi, and was published as a preprint on *EdArxiv*. So far, it has been rejected from *TESOL Quarterly* (after revisions) and the *Journal of International Students*. Most reviewers have been positive about the manuscript, however, in typical Reviewer 2 fashion, there is always a reviewer who wants me to do a completely different analysis with completely different data. These reviewers have taken issue with using GPA as my dependent variable, even though, as I carefully explain in my manuscript and cover letter, the use of GPA allows me to expand upon prior research, almost all of which has used GPA. I am motivated to get this published, as it is personally meaningful to me. However, the constant rejection is discouraging.

This project taught me several important skills. First, I was able to boost my confidence in and knowledge of quantitative methods, especially regression with moderation and equivalence testing. I learned how to work with institutional data, especially the process of obtaining such data. I also learned the importance of doing pilot analyses, seeking feedback, and presenting preliminary results. This entire project also helped me internalize the idea that research is an iterative rather than linear process.

### International Student Graduation Rates

I developed the paper *Are International Students Getting a Bang for their Buck? The Relationship between Expenditures and International Student Graduation Rates* as part of HEAM 620 Large Data Sets in Education (taught by Dr. Ishitani). My project used IPEDS data on international student graduation rates to measure their relationship to institutional expenditures. This was my first introduction to IPEDS (as well as many other large data sets), a resource I have used consistently since then. It was also my first introduction to concepts such as institutional expenditures. We spent the first three weeks of class reading and critiquing articles that use large data sets, and a number of them used institutional expenditures. These were crucial for developing my research questions and forming a major part of my literature review.

What was most salient about the applied research aspect of this project was the use of theoretical frameworks. I admittedly did not have much experience connecting theory to what I had researched previously. The fact that having a theoretical framework was a requirement of the final project, and the further fact that it is a general requirement of most published academic work, heightened my sensitivity to frameworks in the early readings of the class. As I developed research questions about expenditures, I paid special attention to the theoretical frameworks used in similar research that connected expenditures to student outcomes. This was my first introduction to Astin and his inputs-environment-outcome (IEO) framework (Astin, 1991). Astin is a major name in higher education student development research and his framework went a long way in helping me not only frame my research questions but also interpret my results. I have also used Astin’s work in later research.

While my gut reaction is often to develop research questions (and methodology) in the absence of a theoretical framework or with an unarticulated theoretical framework that exists mostly at the sub-conscious level, this experience reinforced the importance of having a sound theoretical (or “conceptual,” if multiple theories are tied together) framework. This speaks to the importance of having a good grounding in the literature of one’s content area. That being said, for someone like myself who is more of a content-area nomad, such grounding is sometimes difficult to achieve. I believe that this project gave me a firm footing in being able to absorb key conceptual models from new content areas relatively quickly, a skill that I will continue to employ.

### PhD Student Conference Travel and Employment Outcomes

This project marked the beginning of a new research interest of mine. Prior to this class, I had been mostly interested in issues surrounding international students in higher education, especially their academic achievement. However, I began to wonder what the carbon footprint of international student travel looked like. My readings in this area led me to discover a rich body of work on academia’s carbon footprint. Most of the research was focused on faculty with few mentions of graduate students. That gap in the research inspired this survey research project.

I developed this survey as part of EDPY 682 Educational Research. My survey was complete by the end of the course and I was excited to get IRB approval and start collecting data, which I did immediately following the course. However, I soon realized I had an instrument that had only been roughly piloted but had no rigorous examination of its validity or reliability. This forced me to rethink my study procedures and restart my project. Through this process, I learned how to conduct cognitive interviews to improve the content validity of an instrument. In addition, I learned a lot more about reliability (see Section *C. Measurement and Instrument Experiences*).

I took Survey Research after designing this survey but before deploying my second pilot to correctly collect reliability data. I am glad I did this, as I was able to take many lessons learned in that class and apply them to my survey. In addition, I was also able to modify my survey distribution plan by making sure to have repeated contacts, customized emails, and to send the survey at ideal times - concepts I picked up during the Survey Research course. When the opportunity arose to apply for small funding through the Friends of EPC Research Grant, I decided to submit a proposal based around this project. I was successful in earning $400 in funding to be used for social media promotion of the survey (direct monetary incentives were not allowed though I would have preferred them).

The funding I received was allocated towards social media advertising (Twiiter and Higher Ed Jobs), as research showed this was a viable means of survey promotion. However, I quickly realized the difficulty of recruiting via social media, especially without fiscal incentives. Realizing I was getting a dismal response rate of less than 1%, I forumlated a new plan to recruit participants and revised the IRB to reflect recruitment via the Grad Cafe (online forum), Reddit, and by direct contact with department heads of various universities.

Direct contact with department heads was by far the most labor intensive method. It required I search for public lists of department heads, scrape names and emails, and then contact them (using FormMule, a mail-merge program based in Googlesheets). Despite being the most labor-intensive, this was also the most fruitful method, which got me the largest number of responses. I was also presently surprised by the number of department heads who replied positively to both my request and my project idea, and were willing to help a stranger cold-emailing them.

Unfortunately, after all funding was exhausted and over 1,500 emails were sent, the sample size for the survey remained small and I could no longer justify any further recruitment efforts, especially with no additional resources. I had to settle on a vastly different analysis plan to account for the small sample size. I also decided to incorporate the Survey of Earned Doctorates, which collects several similar data points to me own and thus allows some post-stratification weighting to improve the accuracy of my results. Analyses are complete and my manuscript is under preparation.

I had sincerely high hopes for this project, as I thought it could address a gap in the literature while at the same time informing graduate students and their advisers about where time should be more heavily invested. Instead of these positive outcomes, I have become pessimistic about survey research and the difficulty of recruiting enough participants, especially without access to ample funding. I have decided not to rely on survey research for my dissertation, as I would not want the future of my final PhD project to hinge on others’ responses to a survey.

If I were to redo this survey design again, I would opt for a narrower participant pool from one field or discipline - this would allow me to target specific professional organizations as an additional recruitment method. I would have also employed some backwards design, thinking not only of the survey questions but the analytical model these questions would inform. I ran into issues of multicollinearity that were difficult to solve. These could have been avoided had I thought more about the results and the best way to analyze them. While I certainly considered which analyses I needed to use, I did not think through what the data would actually look like once in my models, and what issues could arise from that data.I think being able to simulate data and see the strengths and weaknesses of the model could have helped me construct a survey that was easier to complete and easier to analyze.

All was not lost, however. I did learn valuable lessons about survey creation and deployment. I learned the importance of designing a survey that has been piloted and vetted by experts and potential target participants (see section *C. Measurement and Instrument Experiences*). Had I known this earlier, I would not have wasted time and data with a very rough survey early in my development. This experience also taught me that survey recruitment plans need to be well-thought-out and contain multipronged approaches, especially if financial incentives are not available. Most importantly, in reflecting on this project, I see the importance of thinking about analysis and survey design simultaneously, and the need to develop models on simulated or piloted data before fully launching a survey.

### Sustainable Energy Working Group

I joined the Committee on the Campus Environment after completing an internship for the University of Tennessee’s Office of Sustainability (see *“University Air Travel* below). During one of these meetings, it was decided that, in order to meet the university’s carbon-neutral goals (100% by 2060), we would need to begin work now on finding ways to decarbonize its energy usage. Thus, the Sustainable Working Energy group was formed, with three subgroups. Knowing that a survey of student attitudes was going to be needed, I volunteered to lead the Student, Faculty, and Staff subgroup.

While the group includes faculty and staff, the immediate focus has been on students because it is their opinions that administration is most interested in. Knowing the broad goals of the working group, our team got to work on a survey. We independently did research on similar surveys and begin drafting items we thought would be useful in answering the group’s overarching questions. However, after reviewing the first draft of the survey with a faculty member who was organizing the working groups and had attended meetings in the other subgroups, it was clear there was a misunderstanding of goals. First, our original survey focused exclusively on solar power whereas the group wanted to include wind and biofuels as well, though these are unlikely to be utilized on a large scale for our energy needs. Second, and more importantly, our survey questions did not get at the very specific questions that administration wanted answered, namely to show whether students support or do not support sustainable energy project, and, if so, which ones. The head of the Office of Sustainability (Jay Price), and the head of Facilities Services (Terry Ledford), both of whom would be in charge of relaying results to admin, had these very specific questions in mind that our survey draft was not directly answering. Our team sat down with Jay and Terry and meticulously ran through the draft survey we created, adding, rewording, and removing questions until we had a second draft that met their needs and still left us with additional data for other, less pressing questions.

I do not think we wasted time with the first draft of the survey, even though it did not fully represent the needs of the working group. It still served as a good repository of working questions. However, I wish we had been given clearer goals, or, on our part, had sought out the key individuals in the first place to make sure we were designing a survey that would be useful for them to take to administration. Because we were all members of the working group, it did not initially feel like there was a stakeholder to consult when clearly there was. A key lesson here is to more carefully consider who stakeholders are, and rather than assuming we know what they want (even if they are on the same team) to seek out and clarify the purposes of the evaluation.

I think that after the revision with Jay and Terry, we have a much better survey draft. The survey and its related recruitment plan are currently under IRB review. We hope to deploy the survey in 2021 Fall. I am quite excited about the survey, and more so about its usage because I believe the results will be in favor of sustainable energy and provide the insight administration needs to move forward with reaching carbon neutrality goals. I hope that I can see the beginnings of these changes during my remaining time at the university.

And unlike previous survey research projects, this one excites me more because I feel confident we can get an ample number of respondents (~3,000). This is because we have the funding to actually offer enticing incentives - a drawing for multiple high-value VolShop gift cards. In the past, I have mostly been involved in survey projects with no incentives and have gotten dismal results. I sincerely hope that the incentives offered with this survey does what research says they should do: get responses. It would not only be beneficial to the survey itself, but it would also boost my waning opinion of survey research in general.

### University Air Travel

This project began as part of an internship with the University of Tennessee’s Office of Sustainability, where I was allowed to pursue a project of personal interest that would also be of relevance to the university. For this project, I wanted to know how other university’s climate policies addressed greenhouse gas emissions from flying, a growing topic of interest for myself and the greater academic community. It was my hope that such a project could provide useful information about how comparative and aspirational peers addressed this issue and perhaps promote positive changes in UTK’s climate action plan and travel policies.

The focus on policies placed me squarely within a qualitative framework for research, and, having just completed Introduction to Qualitative Research, I felt somewhat confident in my ability to pursue this project. The fact that my analysis focused on documents rather than people made the application of what I had learned a little less harrowing in terms of data collection. While there was plenty of downloading and cataloging, there was no need to recruit, interview, and transcribe data. I quickly learned that document analysis was my kind of qualitative research!

I was able to “play” with several methods of coding until I hit upon a system that worked. At first, I had a number of different codes and subcodes, but after reading about half of the documents, broad categories of codes became salient and the rest of the coding was much easier due to the simplified coding structure.

Though I felt confident in the analysis portion of qualitative methods, I still failed to employ several important research activities. Feedback I received as part of submitting my draft manuscript to fellow ESM students indicated that my work lacked trustworthiness (e.g., reliability). I was the sole coder and my codes may have been overly subjective. I reviewed my qualitative textbooks and decided to address this issue via two strategies. First, I sent a sample of documents and my coding scheme to two fellow students and asked them to code the documents with my codes and, if needed, to make new codes. I checked what they had coded against my own and found a great deal of concordance. I also employed member checking, which turned out to be the best strategy in this case. I sent a copy of my manuscript to every institution included and asked them to verify whether the way they were represented correctly. I received three types of responses, all positive. Most institutions confirmed my representation. Several pointed me to documents that had been updated mere months after I had first downloaded them, and several others were excited by this research. They thought that it had practical value and wanted to share my final draft with their office (which I provided).

I cannot claim to necessarily enjoy qualitative research, but, as mentioned in other reflections, I know it is a form of research that can answer important questions - questions that quantitative research cannot. This project gave me more confidence in employing qualitative research methods and showed me a type of qualitative research I would much prefer - document analysis (which, to be honest, is often coupled with interviews and other sorts of human interactions). I learned that team coding and member checking are easy to employ and important methods for establishing reliability. This directly informed some of my approaches to the *Distance Education Needs Analysis* and my *Fair Chance proposal* (see above).

I also believe the feedback I received from fellow students was invaluable and helped to strengthen my manuscript. At the time of writing, the manuscript was just rejected from *Climate Policy* after major revisions were made. I have resubmitted it to the journal *Travel Behaviour and Society*.

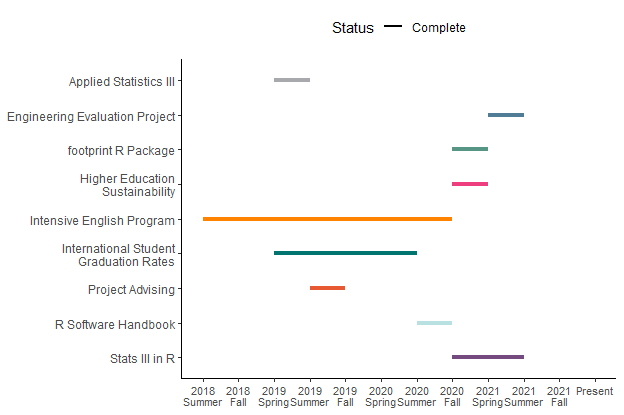
## Materials in Appendix A

1. [Evaluation Proposal: Computer Science Education Needs Analysis](https://drive.google.com/file/d/1PY7MQI44gSy9dnfB0gKz4tuHCTp4ApxS/view?usp=sharing)
2. [Evaluation Proposal: Fair Chance Impact Evaluation RFP](https://drive.google.com/file/d/1l0DQb3vqV87Gukmxta9M9tG37GfbkESf/view?usp=sharing)
3. [Research Proposal: PhD Student Conference Travel and Employment Outcomes](https://drive.google.com/file/d/1NFmD_RAIHE0ndhtLfjGP8dnce94HBZCO/view?usp=sharing)

# B. Statistical Analysis Experience

***Note****: Listed in alphabetical order.*

## Timeline of Statistical Analysis Experience



## List of Statistical Analysis Experiences

### Applied Statistics III: Volunteer State University Sharktank Project

|  |  |
| --- | --- |
| Dates | 2019 Spring |
| Status: | Complete |
| Data Analyses | Descriptive statistics, multiple imputation, factor analysis, t-tests, logistic regression |
| Brief Description | This was the culminating project of Applied Statistics III, in which we (the Statsketeers, a group of 4 students) were given a data set from a survey of student perceptions of a anonymized/fictitious university and had to completely clean, analyze, write-up, and present our findings. |

### Engineering Evaluation Project

See *A. Evaluation and Applied Research Experience*

### footprint Air Travel Emissions R Package

|  |  |
| --- | --- |
| Dates: | 2020 Fall |
| Status: | Complete - Published on CRAN |
| Type: | Software Development |
| Brief Description | The goal of this project was to develop an R package to help calculate air travel greenhouse gas emissions based on arrival/destination airport or latititude and longitude. |

### Higher Education Sustainability (STARS) Ratings

See *A. Evaluation and Applied Research Experience*

### Intensive English Program and Direct-Admit International Student Achievement

See *A. Evaluation and Applied Research Experience*

### International Student Graduation Rates

See *A. Evaluation and Applied Research Experience*

### PhD Student Conference Travel and Employment Outcomes

See *A. Evaluation and Applied Research Experience*

### Project Advising

|  |  |
| --- | --- |
| Dates | 2019 Summer |
| Status: | Complete |
| Data Analyses | Descriptive statistics |
| Brief Description | This project was related to the Evaluation, Statistics, and Measurement department's undergraduate advising survey. My role was to help process the raw data for further quantitative and qualitative analysis. In addition, I analyzed data and prepared the report for the College of Architecture and Design. |

### R Software Handbook

|  |  |
| --- | --- |
| Dates | 2020 Summer |
| Status: | Complete |
| Data Analyses | Data wrangling, data cleaning, descriptive statistics, data visualization |
| Brief Description | The purpose of this project was to develop a handbook (with contributions from Austin Boyd) useful for ESM students learning R. The handbook was both a reference guide and a didactic tool that takes students through installing R, importing data, data cleaning, data analysis, and data visualization. The online version of the book can be accessed at https://bookdown.org/aschmi11/RESMHandbook/. |

### TA for Statistics in Applied Fields III Transition to R

|  |  |
| --- | --- |
| Dates | 2020 Fall - 2021 Spring |
| Status: | Complete |
| Data Analyses | Data wrangling, data cleaning, descriptive statistics, data visualization, missing data analysis, factor analysis, regression |
| Brief Description | Previous version of this course were taught using SPSS. I helped develop teaching/learning materials for teaching the topics using R. I also created learning videos and held R office hours for students taking Stats III. |

## Description and Reflection of Experiences

### Applied Statistics III: Volunteer State University Sharktank Project

This assignment was the capstone project of EDPY 678 Applied Statistics III (2019 Spring), taught by Dr. Rocconi. It was a project that required students to apply all skills learned from Stats I to Stats III to a real-world data set, write up a technical report as if it were for a real client, and present the data in a similar manner. The work was done in groups that consisted of one or two ESM students (myself and a fellow student) and students from outside our department.

My contribution to this project specifically focused on data cleaning, multiple imputation, t-tests, multiple regression, and logistic regression. I feel that by doing each of these, considering and testing their assumptions, and examining diagnostics, gave me a strong grasp of the statistical concepts and my ability to code them in SPSS syntax. I also designed the look and feel of the presentation, especially the color palette, which the audience had a very positive response to (we also wore clothes that matched the colors). Finally, as an additional contribution to this project, I developed an interactive dashboard in Excel for the logistic regression analysis. This was completely supplementary but I learned a lot of advanced Excel skills to be able to do this.

The project was by no means perfect. I was out of town at a conference when the group completed the factor analysis aspect of the assignment. Not being part of that meant I never fully understood what they had done and why, even though I reran their syntax. Factor analysis is both art and science - there are quantitative decisions based on eigenvectors and communalities, but there are also qualitative decisions such as variable inclusion, factor creation, and naming. I suppose that I was able to reproduce the science of their factor analysis, but not the art, as I was not part of the discussions that could have revealed their logic in decision making. There was too much to do for this project, so I did not ask for more explanation. This is, however, something I should have done, as our factor analysis was one of the areas most criticized in the presentation.

In my opinion, the assignment was perhaps one of the most useful assignments I had ever completed at the time. One reason is because this assignment required us to use nearly every quantitative skill we had learned, from data cleaning to advanced methods (factor analysis, logistic regression). By doing so, it gave us a chance to reinforce and, most importantly, gain confidence in these skills By the end of the assignment, I felt very knowledgeable about each and every method we had utilized.

Another reason this was such a beneficial project was because of the group work aspect. Being able to discuss, teach, and give feedback to each others’ ideas for analysis and conceptualizations of methods was immensely beneficial. I took on the role of de facto group leader and helped the group stay organized, manage time, and ensure nearly every analysis was done correctly. I will never forget one of the comments a fellow group member left on anonymous group feedback form: “If the Statsketeers were a body – Anthony was the brain.” I feel that taking on this role not only strengthened my quantitative skills, but also my skills to work with and lead a group. Again, this was a valuable assignment, one which has no doubt left a profound impact on my confidence and even leadership skills.

### Engineering Evaluation Project

One of the main statistical lessons I took away from this project was the need to simulate, or otherwise test, proposed quantitative methods before actually collecting data. In my reflection on my PhD Student Conferences project (see section *A. Evaluation and Applied Research Experience*), I discussed the importance of running simulations to make sure a survey instrument or data analysis plan would work as expected. I certainly applied that lesson to this project.

The main evaluation question the College of Engineering team had was related to their new admissions policy: “Are there differences between test and no-test students in terms of student academic achievement?” One of the issues with answering this question was the severe imbalance between test students (90%) and no-test students (10%). Because we wanted to look at the causal impact of a policy, we knew we had to minimize bias as much as we could. Therefore, we decided on the use of propensity score matching (PSM). In addition, we had to consider how we may handle missing data. This added a layer of complexity to the analysis. Furthermore, to answer this question for math courses, where we only had final letter grades, we needed to consider the use of multinomial regression, which added a third layer of complexity to the analysis.

I wanted to be confident we could combine multiple imputation, PSM, PSM diagnostics, and a generalized linear model for our evaluation plan. So, I tested each approach before writing up our plan. Along the way, I learned about specific R packages that handle PSM with imputation (MatchThem) and specific R packages for visualizing and assessing balance in multiply-imputed PSM data sets (cobalt). I also learned that both OLS and multinomial regression easily handled these complex data sets.

This exercise in methodically walking through potential analysis scenarios ensured that the analysis plan I gave the team from the College of Engineering was based on methods that actually worked. More importantly, I believe this project helped to reinforce the need for pre-analysis when devising a research plan of any kind. This may include simulating data, as I did for a previous project, or just employing new-to-me methods with already existing data, as I did for this project. In this way, I can not only be confident in my plan, but also have at my disposal the packages, code, and practice in interpreting results, all of which can make the actual analysis so much easier.

### footprint Air Travel Emissions R Package

The footprint R package was a passion project borne out of a research interest in climate change and in needing an easy way to calculate greenhouse gas emissions based on a travel data project I was planning to work on. I have previously mentioned several other projects related to my interest in climate change and education (STARS, PhD Student Conferences, Sustainable Energy Working Group, University Air Travel - see section *A. Evaluation and Applied Research Experience*).

In terms of climate change and higher education, academic air travel has been a specific interest of mine. During the 2020 Summer semester, I had planned, as part of a Office of Sustainability internship, to work with UTK travel data. My project would have been to estimate the air travel emissions of faculty, admin, and staff over the past 10 years. Due to issues related to gaining access to this data, the project was put on hold. However, I still planned to follow-up during the 2021 Summer semester. What had become standard practice for me, as detailed in several other reflections, was to imagine what the data would potentially look like and how I would need to go about analyzing it. For this project, I would need some way to take a vector of departure cities and a vector of arrival cities and estimate the greenhouse gas emissions from travel between those two cities.

There are a number of air travel footprint calculators, some using very sophisticated aircraft size and fuel burn records. However, none to my knowledge could be applied over an entire data set of origin/destination within R (or even Excel). Therefore, I would need to create my own. After doing research on the plethora of methodologies to calculate air travel emissions, I decided to use a data set from the UK’s Department for Environment, Food & Rural Affairs (DEFRA), which had an easy to use table that offered per-km emissions estimates for CO2, CO2e, CH4, and NOx at different flight class levels (economy, business, etc.), and for different trip lengths (short, medium, long haul). The research process taught me a great deal about emissions types, differential effects on radiative forcing and climate change, and in general, the different methodologies behind emissions calculations. More importantly, I learned that *all* calculators provide conservative estimates and that it is nearly impossible to get a true measure of travel emissions. Essentially, I would have to be comfortable with ambiguity and a number of assumptions in both the calculation data (e.g. assumptions about plane type, trip length, fuel efficiency, passenger numbers) and in my application of the calculations. For example, lacking true origin data, I would need to make the assumption that traveler left from the city of their home institution. Lacking itinerary information, I need to assume a direct, non-stop flight knowing this is unrealistic. Thus, I can only calculate conservative estimates.

I wrote a function in R that drew on the DEFRA data and calculated emissions based either on longitude/latittude or three-digit airport codes (using the airportr package). I was excited about the function and thought it would be a fun project to turn into an R package, as others may find use from it. However, I had never developed an R package before and was a little hesitant to begin on my own. So I reached out to someone on Twitter who I knew also had an interest in data science and climate change, and who had created at least one R package before. It was a data scientist from the UK (Kasia Kulma, PhD). We followed each other on Twitter but had never interacted. I reached out to her via direct message and was pleasantly surprised she was receptive to the idea and willing to work with a complete stranger. We named it the footprint package a got to work. Less than a month later, we had a fully functioning package published on CRAN (the official R package server).

I learned a lot from her about R package development and version control using Github. Before this project, I had been a very light user of Github, the gold standard version control platform many software developers (including developers of R packages) use. Github has a web interface but most of the actions to control various software branches, merges, uploads, and downloads are done through a command line using the Git language. I have seen knowledge of Github in many job advertisements, so I am thankful this project gave me some beginner- to intermediate-level experience.

The final step of the project was submission of the footprint package to the CRAN package server. Packages are submitted to CRAN and go through a kind of peer review. The peer review is both automated and manual. The automated portion checks that the package works across platforms. The manual review checks to make sure the package is documented clearly and the functions and calculations make sense. My first submission attempt was rejected, as the methodology was not explained clearly enough. My second submission attempt was rejected, as acronyms were not spelled out, more details on the methods were needed, and the example code needed to be fixed. Finally, the third try was the charm and footprint was accepted to CRAN in January of 2021.

I am very proud of this package, which as of 2021 May has been downloaded almost 2,000 times. I am excited that this package created a whole new section on my CV, “Software,” and look forward to adding more projects to this section. I am also very grateful that this project helped me gain a whole new skill set related to software development, which I know will be very useful for my career in the future.

### Higher Education Sustainability (STARS) Ratings

See *A. Evaluation and Applied Research Experience*

### Intensive English Program and Direct-Admit International Student Achievement

See *A. Evaluation and Applied Research Experience*

### International Student Graduation Rates

I developed the paper *Are International Students Getting a Bang for their Buck? The Relationship between Expenditures and International Student Graduation Rates* as part of HEAM 620 Large Data Sets in Education (taught by Dr. Ishitani). I first wrote about this project in section *A. Evaluation and Applied Research Experience*. Besides introducing me to the importance of theoretical frameworks, this project also gave me a chance to apply some advanced statistical concepts while at the same time linking these concepts back to the theoretical framework.

My models were quite straightforward, as I used simple linear regression. Employing this analysis was quite easy, as I was enrolled in Stats III at the same time and had the concepts related to regression and regression diagnostics active in my mind. I also had to do multiple imputation for a chosen covariate in my model (SAT/ACT score). Mulitple imputation was another skill I learned in Stats III and was excited to apply to my own research. Learning how to do regression diagnostics using multiple imputation as well as how to pool data, however, was a concept we didn’t cover in-depth in Stats III, so I struggled a bit to understand how to approach this. Eventually, I found resources on how to calculate pooled regression results and used this for my analyses.

Despite this effort, I decided that my final models did not need the covariates I had imputed. After considering their usefulness, it turned out that they weren’t really specified by the theoretical framework of my model. In particular, as the research focused on international students, including a test they often did not even take seemed unnecessary. While SAT and ACT scores are often included to control for institutional selectivity, they were not part of Astin’s student development theories, which underlied my theoretical framework.

In the end, I removed these variables from the model. I learned a lesson in thinking through not only the possible variables to include in an analysis, but whether they were logical or specified by previous theory. Going forward, especially for my dissertation, this will be an important skills to remember.

### PhD Student Conference Travel and Employment Outcomes

See *A. Evaluation and Applied Research Experience*

See *C. Measurement and Instrument Development Experience*

### Project Advising

### R Software Handbook

The *R Software Handbook* was completed during an internship with Dr. Jennifer Ann Morrow during 2020 Summer. For this internship, the goal was to create a document that ESM students could use to learn R. It had to be both something students could reference or something students could follow from start to finish. Thus, it was part reference manual and part teaching tool. That created an interesting challenge. I had to think about the best sequence to organize each section and its contents in order to build on previous sections and remain both a reference and pedagogical tool. In addition, and more challenging, the text needed to be written in a didactic way that maintained continuity with previous sections and examples. However, it also needed to be easily understood if someone were accessing a section just for reference and had not been following along from the beginning.

I began this project by thinking about how I learned how to use R just six months earlier. I had tried learning R several times prior but often stalled because I had no meaningful application for it. I decided that the handbook should be task-based, with the underlying structure and examples focused on a real-world task: accessing, cleaning, and analyzing messy survey data.

I planned sections on installing and setting up R - often major hurdles for those new to R - and then how to access different types of data. The remainder of the tasks mostly focused on the [R Community Survey](https://github.com/rstudio/r-community-survey), a real-world survey which was coincidentally quite messy.

I used Dr. Morrow’s *12 Steps of Data Cleaning* as a guide for organizing the data cleaning section, but also discussed data formats, pivoting data, and data joins - important data “wrangling” skills all R users need to know. Finally, I included a section on data visualization that showed the basic principles of using the ggplot2 package, used to make high quality visualizations.

One additional challenge during this project was getting my co-author, Austin Boyd, started when he joined the project. He was a welcome addition to the project, contributing the statistical analysis and base R visualization sections. However, I was using a unique format for writing this handbook that allowed text and code to be combined in one document (R Markdown), and the bookdown package to put everything together into a web-accessible book format. I was also organizing all of this work online through Github. I had to get Austin up to speed on these tools so that he could contribute easily. I asked him to look at some of my documents to understand a few basics of R Markdown, and met with him via Zoom to show the basics of using Github through RStudio. There were a few hiccups to collaboration, but we were able to finish the handbook in time for the 2020 Fall semester.

Throughout this internship, I learned or reinforced many important skills. I learned better project and time management. I gained experience in thinking about R in a pedagogical way. I a;sp gained valuable practice working with messy survey data needed to illustrate essential R functions. I had to learn a lot of new R functions and packages which I had not previously needed, and then I needed to immediately explain them in a pedagogical way in the handbook. Though at times I was staying “one step ahead of the students” in a sense, the experience was invaluable for enhancing my R skills and also being able to continuously relate to the challenges of learning R.

One other major takeaway from this project was a reawakening of the desire to teach. I had been an English language instructor for international students for about a decade prior to changing careers to something more statistics related (data analysis and visualization). This meant I was no longer in the classroom and no longer thinking about the challenge and creativity involved in teaching. This project reminded me of what I had left behind. I was therefore very happy to eventually develop related workshops on R data visualization and R Markdown, which has allowed me keep a foot in the teaching world while giving me experience in teaching data science-related skills. It has also made me seek out additional experiences combining R and teaching. See *TA for Statistics in Applied Fields III Transition to R* (below) and section *F. Teaching or Supervisory Experience]* reflections on such experiences.

### TA for Statistics in Applied Fields III Transition to R

For the 2021 Spring semester, I was enrolled in a 33-hour internship with Dr. Rocconi. The purpose of this internship was to help Dr. Rocconi convert his SPSS materials for Applied Statistics III over to R (reflected upon below). In addition, any remaining time would be spent as a TA in the course, holding R office hours and assisting with R-related questions from students (reflected upon in section *F. Teaching or Supervisory/Training Experience*).

My work for the internship began before Spring, during Winter break. I looked through all of Dr. Rocconi’s materials and began developing a guide to R that would be useful as a go-to resource for Stats III students who needed to quickly learn or look up functions that would need to be employed throughout the course. This resource was originally based on an overview of SPSS syntax commands Dr. Rocconi had as a Word file. I kept mostly the same organization and functions, but translated everything to R. I then converted the guide into a portable, interactive webpage that students could conveniently browse. Students could access the document at any time, find a key function using an interactive, floating menu on the left, and see an example of both the code and its output.

I also began working on converting practice assignments and homework over to R. This involved writing R code and modifying Word documents to reflect different R tasks, offer R helper code, or remove tasks that were necessary in SPSS but not in R (and vice versa). Dr. Rocconi later used these as the basis for his own revisions. He typically modified the assignments (reducing or changing tasks) and added onto the code, especially with additional comments and explanation. Though not all of my code or changes were used, I believe they were seen as valuable by Dr. Rocconi, as he could easily use what I made rather than start from scratch.

My work during this internship helped me in several ways. First, by reviewing the Stats III materials, I was able to refresh and recall previous statistical information that I had not remembered or had not used since the semester I took Stats III (in 2019 Spring, two years ago at the time of writing). In a sense, it was an excellent refresher course for me.

Second, when I took Stats III, everything was in SPSS. Although I would currently consider myself an intermediate-level R user, I did not know how to do everything in R that we had done in SPSS. Therefore, there were several methods, functions, and tools I had to learn during this internship. Thankfully, my experience with R gave me a strong foundation on which to do this, so it was not an overwhelming challenge. Still, without the internship, I would not have learned, for example, ANOVA or multiple imputation in R, as I have not used some of these methods “in the wild.” This internship experience has certainly strengthened my R skills, specifically for statistical analyses.

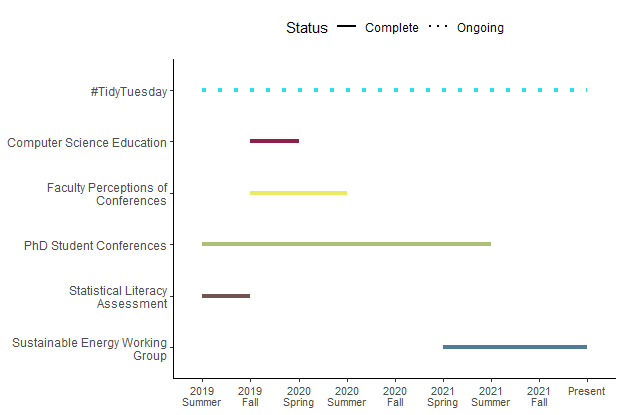
## Materials in Appendix B

1. [Detailed Analysis with Code: Higher Education Sustainability (STARS) Ratings Manuscript](https://drive.google.com/file/d/1pudKUHr2NifTETcYhB6P4xO6pH5gZPAu/view?usp=sharing)
2. [First-Author Quantitative Paper (published): International Student Graduation Rates](https://drive.google.com/file/d/1YvRgqdRBKkphai9J6iELDzpYmfQlTbbb/view?usp=sharing)
3. [First-Author Quantitative Paper (submitted): Intensive English Program and Direct-Admit International Student Achievement](https://drive.google.com/file/d/1kMfTejCqjfdoJlSCiDX8tNoHPaimrkrP/view?usp=sharing)

# C. Measurement and Instrument Development Experiences

***Note****: Listed in alphabetical order.*

## Timeline of Measurement and Instrument Development Experiences



## List of Measurement Tools/Protocols

### #TidyTuesday Data Visualization Research

See *A. Evaluation and Applied Research Experience*

### Computer Science Education Needs Analysis

See *A. Evaluation and Applied Research Experience*

### Faculty Perceptions of PhD Applicant Conference Experience

|  |  |
| --- | --- |
| Dates | 2019 Fall - 2020 Summer |
| Status: | Complete |
| Data Collection: | Survey |
| Data Analyses | Linear Regression, Logistic Regression |
| Brief Description | The purpose of this survey was to understand faculty perceptions of the importance of conference experiences when considering hiring new tenure-track assistant professors, especially recently-graduated PhD job applicants |
| Reliability / Validity | Cognitive interviews and pilot testing |
| Methodology: | Survey questions are adapted from existing published literature |

### PhD Student Conference Travel and Employment Outcomes

See *A. Evaluation and Applied Research Experience*

### Statistical Literacy Assessment through the Media (SLAM)

|  |  |
| --- | --- |
| Dates | 2019 Summer |
| Status: | Complete |
| Data Collection: | Computer Test |
| Data Analysis: | Test Scoring |
| Brief Description | The purpose of this assessment tool was to provide a summative measurement of undergraduate students’ ability to read and critically examine statistical messages in the news media. |
| Methodology | This assessment was developed based on topics common to undergraduate introduction to statistics classes. Questions are mapped to student learning objectives based on a three-tier hierarchy of statistical literacy skills developed by Watson (1997) and outcomes specified by delMas (2002). |
| Reliability / Validity | Item Analysis, Construct validity, Conclusion Validity As a summative assessment, the results of this test serve as a direct measure of students’ statistical literacy skills. Therefore, the use of SLAM to assign an assessment grade is deemed a valid use of the results so long as statistical literacy was part of course instruction. |

### Sustainable Energy Working Group

See *A. Evaluation and Applied Research Experience*

## Description and Reflection of Experiences

### #TidyTuesday Data Visualization Research

Previously, I had worked with Dr. Rosenberg (TPTE) on extracting and analyzing #TidyTuesday participants’ visualization code (see section *A. Evaluation and Applied Research Experience*). Initially, we examined who participated in #TidyTuesday and how their code usage changed over time. This was interesting; however, it told us very little about how their visualization skills changed over time. We wondered whether sustained participation in #TidyTuesday actually improved participants’ data visualizations.

We attempted to assess this by building a survey. The survey was developed through a multi-phase, year-long process. We decided to create a crowd-sourced survey in which survey respondents would rate #TidyTuesday participants’ initial, middle, and final contributions to #TidyTuesday in the defined 6-month period. We developed a list of users who had sustained participation (6 times or more over a 6-month period) and contacted them for permission to use their visualization in our survey. Knowing that getting survey respondents to rate dozens of graphics would be unrealistic, we employed a planned missing data design in which users would be shown a random set of graphics, with the goal of having a large enough sample size to have each graphic at each time point rated multiple times.

We also used prior research to develop an efficient, 3 item rating scale for respondents to assess the graphics. We used a content validity study (Rubio et al., 2003) to make sure the scale made sense. We had a panel of experts rate the survey items, calculated a content validity index, and used this score along with open-ended feedback to revise survey items.

This was a very intensive survey design process. This was the first time I had worked with a planned missing design, a content validity study (I learned about this in Advanced Educational Measurement, which I was enrolled in during the survey design period), and randomization. What’s more, we also had to consider several psychological aspects of the survey itself. While I have learned how to write good questions, how to organize a survey, and question types, this was the first time I had to think about how one question affects the next, especially since the survey task is to rate the quality of visualizations. Clearly, visuals would be judged against one another. We decided to develop two calibration graphics, one purposefully designed to be a poor data visualization; the other designed to be a good data visualization. We showed these side-by-side in an example in order to give each graphic equal viewing time (and priming time) for the participant. We then randomized their display order during the rating process. All of these efforts were meant to mitigate any primacy effects.

We ran a short pilot version of this survey to determine the optimal number of random graphics to show in order to get an adequate missing-to-complete data ratio (less than 50% missing). I simulated data following the planned missing design and wrote a special function to test various sample size and item combinations. This helped us decide on the final number of graphics to display and the sample size needed (minimum 200). We revised our item pool and randomization numbers and launched our survey.

Previous experiences I had with the need for simulated data no doubt led me to employ it in this project. I don’t think a survey should be designed without simulating some of the design or generating test responses. This is important not only to develop analysis steps and a statistical models prior to data collection but to also make sure the responses are actually informative.

The biggest issue with this project was the amount of time it has taken to go from concept to reality. It has never been a number one priority for any involved, and thus, it was worked on sporadically since the project began. This is understandable. However, if we had spent a dedicated chunk of time on it rather than working on it piecemeal, I believe the project would have taken less time than it did. The quality may have also improved as we would not have kept the project on the “back burner” and constantly need a refresher of what we had done and why. I am of the opinion now that if a project is important enough to start, it is important enough to finish in a reasonable amount of time.

Overall, while I learned several new things through this survey (e.g. about randomization and planned missing designs), I felt this survey project allowed reinforcement of previous concepts I have learned related to survey design, reliability, and validity. In fact, I was adamant about making sure we test for reliability and validity prior to fully launching the survey, something that sadly does not happen often. This is something that has been stressed in our program over and over again and I was happy to make sure this fundamental idea of measurement is embodied as much as possible in my work.

Unfortunately, this project also led to my continued negative perceptions of survey work. After all of this effort, amounting to roughly a year, we launched the survey on Twitter, with many likes and retweets. It was tagged to be visible to highly active data science communities on Twitter. We also asked that data science influencers we were familiar with share it with their followers. Despite these efforts, our sample size was minuscule, about 30 after several weeks of promotion. I’ve used the words disheartening and discouraging to describe past failed survey recruitment efforts. This one was likewise dispiriting, compounded by the fact that it was promoted by people on Twitter who have thousands of followers. This has served only to fortify my resolve to rarely rely on survey research unless I have greater assurances for participation (through captive audiences, incentives, etc.).

### Computer Science Education Needs Analysis

See *A. Evaluation and Applied Research Experience*

### Faculty Perceptions of PhD Applicant Conference Experience

As the final assignment of EDPY 583 Survey Research, I designed a survey-based research proposal called *Faculty Perceptions of the Conference Attendance of Recently-Graduated PhD Job Applicants: A Survey*. The purpose of this survey instrument was to understand the value faculty place on conference travel when hiring newly-graduated PhD students. The survey underwent a lengthy in-class development process that entailed background research, construct development, item development, pretesting, and student review.

I received very positive comments on the survey and research proposal and was quite excited to develop a final version of the survey, which I thought would dovetail very nicely with my *PhD Student Conferences and Employability* survey/research. At the end of the semester, I obtained IRB approval to begin cognitive interviews to improve the survey before more in-depth pilot testing.

However, I launched my *PhD Student* survey first and had a rude awakening that carried over to this project. As I have detailed elsewhere, my *PhD Student* survey had a dismal response rate, even after spending $400 in recruitment (via Twitter, HigherEdJobs.com) in an effort to attract more respondents. My reaction to the poor response rate for that survey was to implement an alternative plan in which I emailed around 1,500 department heads from around the country. I got most of my responses through this method, but still had a low response rate (final n was 120 whereas I planned to recruit 300 in order to have adequate statistical power).

After my experiences with the *PhD Student* survey, I decided to cancel this project. There were two main reasons. First, and most obvious, is that the response rate of my previous survey left me disillusioned with survey research. I did not want to deal with the anxiety that comes with dedicating so much effort to a project just to get a sample size so inadequate that the research plans simply do not work out. Second, the target audience of the faculty survey was department heads. I felt I had already used up this sample pool. I did not feel comfortable about contacting the same group of people twice regarding surveys. And, it certainly would have been the same group of people. To contact the department heads, I scoured Google for all publicly available department head lists, as this is much more feasible than selecting institutions individually and then searching around to see whether they have a list available or not (more often, it is not). I went dozens of pages deep in Google to get the most complete list I could. There is no feasible way I could develop an adequately-sized second list that did not match almost exactly.

If I restarted this project now, there are a few things I would do differently. First, I would narrow my population from all department heads nationwide to a specific region or group of institutions. Perhaps I would make it a case study of only one institution (e.g. UTK). The potential small sample size may wreak havoc on my statistical models though. I would feel more comfortable with a narrower sample of multiple institutions if I were able to offer incentives. However, as a graduate student, I have not found sources of funding that allow incentives. At the time of developing the survey, I was not thinking of data simulation and analytically testing my survey. Were I to do this project again, I think that I would also simulate data and test my survey design to make sure potential results answer my research question and are actually feasible through my proposed methods.

The experiences I learned from the *PhD Student Conferences* and *Faculty Conference Attitudes* projects have both left me with a negative impression of survey research, which I have mentioned numerous times in previous reflections. This is one reason my dissertation will be focused on a large, publicly-available national data set. It does not make the research any easier, but it does alleviate the anxiety related to data collection - anxiety I do not wish to feel again. Lest I sound like a anti-survey curmudgeon, I do see the value in survey research and have been very happy to work on the *Sustainable Energy Working Group* survey , especially because we have funding for incentives and thus potential for adequate sample sizes. I also recognize that survey research will still be in my future, as I work for an organization that conducts surveys and have looked for jobs at other organizations such as Pew and Gallup.

### PhD Student Conference Travel and Employment Outcomes

See *A. Evaluation and Applied Research Experience*

### Statistical Literacy Assessment through the Media (SLAM)

I developed the SLAM as a final project for EDPY 581: Classroom Measurement. As an English language instructor for 10 years, I had a lot of prior experience developing classroom assessments of topics related to language learning (e.g. reading, listening, speaking, grammar, vocabulary). I decided to develop an assessment for a future context in which I could see myself if I pursue a tenure-track position post-PhD. That is, teaching a basic statistics course.

While I had experience developing formative and summative assessments, I had never developed one in such a systematic way. This assessment’s development began with a deep dive into the background concepts of statistical reasoning, statistical literacy, and statistical citizenship. I discovered a number of definitions of statistical literacy as well as different ways to assess these skills. The final product represents an integration of different frameworks and terminology for understanding statistical literacy.

The biggest challenge in developing this assessment was finding enough real-world media that could be mapped to different statistical topics. I was eventually able to find enough, though many articles were dated. This assessment is only valid on the premise that the instructor is giving students practice with media assessment in class. Therefore, the instructor would also need to procure articles on the same topic. This could have been difficult; however, there is likely a large source of recent material due to the COVID-19 pandemic and the subsequent articles with graphs, statistics, reports on medical trials, etc.

Unfortunately, I have not had the chance to pilot this assessment in a real classroom setting. I look forward to sharing this with others or piloting it myself. Upon doing so, I would submit my experiences and the assessment itself as a manuscript to one of the many statistics pedagogy journals I discovered during my background research.

### Sustainable Energy Working Group

In my first reflection on this project, I detailed the development of a survey to assess student attitudes toward sustainable energy at UTK. I did so through a evaluation lens, reflecting on questionnaire development as a function of client relations skills. I also have taken what I have learned from previous projects regarding piloting and testing analysis models and have purposefully applied them to this project.

At the time of writing, the survey is being reviewed by the IRB and will be deployed sometime next month. While waiting for revisions or acceptance, I have gone taken the survey’s pilot data and developed a skeleton report, including code for key statistics and visualizations. This has allowed me to think through the data we will be getting, how best to organize it, and how best to visualize it. For example, we have several ranking questions. These questions are more difficult to work with than regular Likert-style questions, especially since not all items need to be ranked, and thus, when calculating overall rank, a weighted ranking score needs to be developed. Working with the pilot data, I have been able to develop a valid scoring method that is also easy to visualize. When the final survey gets distributed and actual results come in, it should be relatively simple to run the code and get the actual results visualized.

In addition, by going through the code, I was able to spot issues with how Qualtrics recoded a series of questions on the survey. We included several bipolar questions on a 7-point scale from -3 to 3. However, Qualtircs coded these in a way I still do not understand, which included 11, 13, and 14. I contacted Qulatrics tech support and we were able to get the question coding correctly. I generated additional test results, just to make sure. In addition, I was able to spot several spelling mistakes through coding and have fixed them in the actual survey.

Finally, we plan to use post-stratification survey weighting, specifically raking, to make sure our results are more representative of the UTK population. In anticipation of this, I have simulated a data set of population estimates (e.g. estimates of the proportion of males/females, different racial proportions, different proportions of students from the various colleges) and applied survey raking techniques to generate survey weights for the pilot data. I have then added coding to make use of weights in the analysis. By doing so, I have been able to make sure the raking process works for my data. I also discovered that pivoting data from wide to long is not possible after a weighted survey design is created and so it is better to pivot data first and then apply a survey design. In fact, it is better to apply the survey design multiple times when complicated analyses are being done. Additionally, by working with simulated and pilot data, I have been able to anticipate that I may need to deal with missing data, which is a bit difficult to do when raking. This is because raking relies on marginal population estimates, and there is typically no missing data at the population level. I have found several resources on how to deal with this.

All of these pre-data collection activities have been important in helping me ensure our survey makes sense analytically. I have learned from previous experiences that this is crucial to having not only a useful survey but also useful results The sustainable energy survey has been an excellent opportunity to take what I learned from these previous experience and put them into action.

## Materials in Appendix C

1. [Survey Instrument: Sustainable Energy Working Group](https://drive.google.com/file/d/1ogXJLEvtxLhulF43UTEW-HG_W-9xyjuc/view?usp=sharing)
2. [Interview Protocol: Distance Education Needs Analysis](https://drive.google.com/file/d/1fLIQ0j286_w_BKXgR-72LWojv1_MpRnP/view?usp=sharing)
3. [Assessment: Statistical Literacy Assessment through the Media (SLAM)](https://drive.google.com/file/d/1dSqzienXFhghBZrkkUZzzlvctpFG0-E_/view?usp=sharing)

# D. Scholarly Writing Experience

## List of Evaluation/Assessment/Technical Reports

### Applied Statistics III: Volunteer State University Sharktank Project

Koerber, N., Pacheco-Diaz, N., **Schmidt, A.**, Whittsitt, L. (2019, May). *Volunteer State University student perceptions research: Technical report* [Technical report]. University of Tennessee, Knoxville.

### Computer Science Education Needs Analysis

**Schmidt, A.** (2019). *A needs analysis for the “Planting the Seeds for Computer Science” program* [Technical report]. University of Tennessee, Knoxville.

**Schmidt, A.** (2020). *Key takeaways of the computer science standards need survey* [Technical report]. University of Tennessee, Knoxville. <https://rpubs.com/acircleda/CSNeedsResults>

### Distance Education Needs Analysis

Boyd, A., Christen, N., Jones, N., **Schmidt, A.** York, M. (2021). *Distance education needs assessment* [Technical report]. University of Tennessee, Knoxville.

### Project Advising

**Schmidt, A.**, Rocconi, L., Morrow, J.A., Berry, B. (2019). *College of Architecture and Design’s undergraduate advising 2019 report* [Technical report]. Evaluation, Statistics, and Measurement (ESM) Program Research Group.

Morrow, J. A., Rocconi, L., Butler, B., & **Schmidt, A.** (2019). U*niversity of Tennessee’s undergraduate advising 2019 evaluation end of year report* [Technical report]. Evaluation, Statistics, and Measurement (ESM) Program Research Group.

## List of Research Papers

### Higher Education Sustainability (STARS) Ratings

**Schmidt, A.**, Rocconi, L. (2020). STARS and stripes: Political and institutional factors that affect higher education sustainability ratings [Under review]. *Journal of Cleaner Production*. <https://doi.org/10.35542/osf.io/d5bku>

### Intensive English Program and Direct-Admit International Student Achievement

**Schmidt, A.** (2020). Intensive English program (IEP) student academic achievement: Comparing IEP and directly-admitted international student GPA [Under review]. *Language Teaching Research*. <https://doi.org/10.35542/osf.io/vm37t>

### University Air Travel

**Schmidt A.** (2021). University air travel and greenhouse gas mitigation: An analysis of higher education climate policies [Under review]. *Travel Behaviour and Society*. <https://doi.org/10.35542/osf.io/bmuas>

## List of Publications

**Schmidt, A.** (2020). Are international students getting a bang for their buck? The relationship between expenditures and international student graduation rates. *The Journal of International Students, 10*(3), 646-663. <https://doi.org/10.32674/jis.v10i3.1279>

**Schmidt, A.** (2019). [Review of the book International students in first-year writing: A journey through socio-academic space, by M. Siczek]. *Journal of International Students, 9*(3), 929-932. <https://doi.org/10.32674/jis.v0i0.907>

## Description and Reflection of Experiences

***Note****: Listed in alphabetical order.*

### Applied Statistics III: Volunteer State University Sharktank Project

See *B. Statistical Analysis Experience*

### Computer Science Education Needs Analysis

See *A. Evaluation and Applied Research Experience*

### Distance Education Needs Analysis

Besides data collection via interviews, I made two major contributions to the final deliverable for this project: the write-up and visualizations. I wrote the majority of the final document. Admittedly, the first draft of this document was very rough. However, we were able to get excellent feedback from ESM faculty. As this was a qualitative project, the feedback from Dr. Leah Cain was especially useful. The revisions of this manuscript certainly helped me better understand the qualitative genre and its expectations. This actually helped me when writing my qualitative manuscript for the *University Air Travel* project. Specifically for the distance education needs analysis project, I was better able to describe our sampling methods and our sample itself. I was also better able to describe our qualitative analysis process, including theoretical approach and methods. These types of details are always important for helping build the credibility of one’s work, so I was especially thankful to get more experience with this.

Second, I contributed the visualizations for this project. Actually, visualizations were my first exposure to the results of this project, as I was not involved in data analysis. And to be honest, the initial visualizations provided to me by another team member were not very useful. The final results were broken into major themes for our two participant types (evaluation faculty, evaluation practitioners), each with its subthemes. The original visualizations submitted for this project were whole-page tree maps for *each* theme or subtheme in default Excel colors. This spanned about seven pages and were beyond useless. As someone reading these visualizations as our audience would (e.g. for the first time), I understood very little and could not make comparisons across the seven pages or gain any insights.

I accessed the original data in which the theme and subtheme counts were summarized and turned these into two small sets of bar charts. The first set presented the main themes found overall, and among each of the participant types. The second set presented the subthemes of the top three themes overall. Only the top theme or subtheme in each bar group were colored (Tennessee Orange, of course) and the rest were a neutral gray. No themes with *n* = 1 were included, as they were in the original visualizations. If only one document contained that idea, it is not a theme, is it? The two bar charts each took up a third of a page and allowed easy comparisons within the charts and allowed easy back and forth movement from visualization to text.

One of the lessons reinforced here in terms of visualizations was that when in doubt, use a bar chart. They are easier to read, easy to use, and keep simple data simple.

### Higher Education Sustainability (STARS) Ratings

See *A. Evaluation and Applied Research Experience*

### Intensive English Program and Direct-Admit International Student Achievement

See *A. Evaluation and Applied Research Experience*

### International Student Graduation Rates

I developed the paper *Are International Students Getting a Bang for their Buck? The Relationship between Expenditures and International Student Graduation Rates* as part of HEAM 620 Large Data Sets in Education (taught by Dr. Ishitani). I introduced this project in sections *A. Evaluation and Applied Research Experience* and *B. Statistical Analysis Experience](Statistical Analysis Experience*. I received excellent feedback on my class presentation and final written product. I took the positive reception of my assignment as a sign that I should try to publish it. I submitted it to the *Journal of International Students* and was pleasantly surprised that they wanted to accept it for publication and only had minor revise and resubmit comments, mostly surface-level revisions.

One comment asked for me to explain the multiple imputation methods I employed with more clarity. This surprised me because my final paper should not have included imputed data! It turned out I had forgotten to replace my initial analyses with the final analyses. I revised my paper, removing the initial analysis and updating all results with the correct models. I felt lucky that my point estimates changed very little from from initial to final analyses and that the interpretations and conclusions did not change at all. I was also very thankful for the peer review process and the comments that pointed out my erroneous inclusion of the wrong data! This made me realize how I should not rush to write manuscripts and how important it is to double- or triple-check one’s work.

### Project Advising

See *B. Statistical Analysis Experience*

### University Air Travel

See *A. Evaluation and Applied Research Experience*

## Materials in Appendix D

1. [First-Author Paper (published): International Student Graduation Rates](https://drive.google.com/file/d/1b7stdOscVnYz0Wm0xZwGheC2gpmaPTly/view?usp=sharing)
2. [Technical Report: Project Advising](https://drive.google.com/file/d/1CViycBnroU8at2IbfRBjh6sFWLP7MH0r/view?usp=sharing)
3. [First-Author Paper (submitted): University Air Travel](https://drive.google.com/file/d/1wVHWCv70lmPHgvU6YqzrA2kXzu-_kjhe/view?usp=sharing)

# E. Presentation Experience

## List of Presentations at Professional Conferences

**Schmidt, A.**, Rocconi, L., & Boyd, A. (2021, August). From click to code: Insights from instructors and students on moving from SPSS to R in a graduate-level applied statistics course [Oral presentation]. 2021 Joint Statistical Meetings.

**Schmidt, A.** (2020, November). University air travel and GHG mitigation: Examining institutional policies through the lens of #flyingless [Invited panel presentation]. Roundtable of Sustainable Academic Travel: Mapping Travel Policies in FHE.

**Schmidt, A.**, & Rosenberg, J. (2020, March). Becoming “tidyr” over time: Data visualization development in an online community of practice [Poster presentation]. University of Tennessee, Knoxville College of Education, Health, and Human Sciences Graduate Research Colloquium.

Rosenberg, J. M., Hodge, L., Aydeniz, M., **Schmidt, A.** Lishinski, A., Rich, K., Longnecker, J., Mann. M., & Sadovnik, A. (2020, January). A survey of teachers and administrators regarding the implementation of new K-8 computing education standards in Tennessee [Oral presentation]. 14th Annual Tennessee STEM Education Research Conference, Cookeville, Tennessee.

**Schmidt, A.** (2019, March). A comparison of direct admit and IEP student academic achievement [Paper presentation]. TESOL International Conference, Atlanta, Georgia.

**Schmidt, A.** (2019, March). A comparison of direct-admit and IEP undergraduate international student achievement [Poster presentation]. University of Tennessee, Knoxville College of Education, Health, and Human Sciences Graduate Research Colloquium.

## List of Presentations for Clients

Banks, A., Christen, N., Narvaiz, S., **Schmidt, A.** (2021). College of Engineering impact evaluation plan [Client presentation]. 2021 Spring EDPY 651 Advanced Evaluation.

**Schmidt, A.** (2020, October). University air travel and GHG mitigation: Examining institutional policies through the lens of #flyingless [Client presentation]. Committee on the Campus Environment, University of Tennessee, Knoxville.

## Description and Reflection of Experiences

***Note:*** *Listed in alphabetical order.*

### #TidyTuesday Data Visualization Research

This poster presentation was based on a Twitter analytics project I did with Dr. Rosenberg (TPTE) in which we analyzed contributions to #TidyTuesday, a weekly data visualization challenge hosted on Twitter. We used thematic analysis to analyze Tweet content and analysis of coding functions for code that was contributed alongside data visualizations. It was presented at the 2020 Spring University of Tennessee, Knoxville College of Education, Health, and Human Sciences Graduate Research Colloquium.

For this poster presentation, I decided to design my poster following the Better Poster format (<https://www.youtube.com/watch?v=1RwJbhkCA58>) that has become quite popular recently. This poster design is meant to capture audience attention by displaying a key takeaway as a very large sentence which takes up 2/3 of the poster. It is meant to be eye catching and legible from a distance.

Of the two dozen or so presenters that day, I was the only one who chose a Better Poster design. I do not know if I got more foot traffic or engagement compared to other posters; however, I did get *many* positive comments about the design of the poster. In fact, I would say that I discussed the poster design about as much as the actual poster content that day.

I found the Better Poster design clearly displayed the main point, so that those who spoke to me could easily read it and begin asking questions. The design of the poster includes an “ammo bar” section which contains the charts and graphs necessary to help explain the information. Presenters are meant to stand next to the ammo bar. This was certainly a very helpful tool that I could use to explain the research without blocking the remaining body of the poster. The Better Poster design incorporates a QR code to download the poster (or, in my case, takes you to [a related blog post](https://www.anthonyschmidt.co/talk/2020-3-becoming-tidyr-over-time/)), and this, too, was very effective, as I had a number of new site visits that day. I believe my poster content was great, but my poster design was even better. In fact, I won a small award for best poster design from that conference.

I really enjoyed the Better Poster design and found the development of the poster was structured enough that is was easy and fast to design yet still allowed for creativity. I also think that most attendees found my topic to be of interest, especially as many recognized the need for data visualizations. However, my greatest takeaways from this presentation opportunity were related to the poster design.

### Computer Science Education Needs Analysis

See *Section A. Evaluation and Applied Research Experience*

### Engineering Evaluation Project

statistical information explain why without details of methods no client showed up

### Intensive English Program and Direct-Admit International Student Achievement

**Schmidt, A.** (2019, March). A comparison of direct-admit and IEP undergraduate international student achievement [Poster presentation]. University of Tennessee, Knoxville College of Education, Health, and Human Sciences Graduate Research Colloquium.

I presented preliminary results of research for this project at the 2019 College of Education, Health, and Human Sciences Graduate Research Colloquium. This was my first-ever poster presentation. I thought it would be a great opportunity to combine my love for research with my visual design skills. I was able to create a poster that was visually appealing while still presenting research findings in a clear way. Unlike the reflection above where I used the Better Poster design (I had not learned about the Better Poster design at this time), this was organized as a traditional poster, with an introduction, research questions, findings, and discussion sections.

One area I found challenging was the presentation of statistical information, which was mostly t-tests and Cohen’s *d*. I wanted this information to be the focus because it revealed the key results of the research. However, I also knew I would be presenting to a mixed audience and would have to make it as clear as possible to those who are not familiar with statistics. I have now learned from experience presenting at several poster sessions now that most of the information comes through orally, not visually. The visuals are really meant to provide an attraction to the poster and a big picture take away.

I used bar charts to covey mean GPAs between directly-admitted international students and students who had come through an intensive English program. All together, I had 12 sets of bars. In hindsight, this was too many. While I believe I did a great job with orally explaining what the visuals represented, I also believe the charts, though displayed with good color choices (grey and UTK’s fountain as a color highlight) did not do an adequate job in either catching attention or conveying information to those who silently read posters.

While I still think my poster was much better designed than a traditional, text-heavy poster presentation, I think it would have been better if I followed a Better Poster design. A Better Poster design would have forced me to rethink the visual presentation of data. I could have chosen a better format of the data (perhaps a creative and easy to read dot plot) and only the necessary data required to attract one’s attention.

**Schmidt, A.** (2019, March). A comparison of direct admit and IEP student academic achievement [Paper presentation]. TESOL International Conference, Atlanta, Georgia.

Shortly after my poster presentation, I delivered a 50-minute oral version of my research to an audience of about 75 at the 2019 TESOL Conference. Knowing that this conference had a strong orientation towards practitioners (i.e. English language teachers who may or may not have backgrounds in research), I continued to carefully consider the challenge of presenting statistical information. I decided to build into my results section a brief overview of key statistics I would refer to. I explained what *p*-values mean, trying to simplify the concept of null-hypothesis significance testing and explaining that *p* simple equals a “chance” something would appear if there were no true differences. I also explained Cohen’s *d* effect sizes by visually demonstrating how it refers to distance between means.

I believe this quick, two-minute primer and the careful approach to explaining results that I took paid off. I got more positive feedback on this presentation than any presentation I have ever given to date. Much of this feedback came after the presentation, as audience members approached me and asked questions or shared information about their own intensive English program. One audience member, a faculty member at the University of Arizona, said that if I were her graduate student, she would have been very proud of me. I don’t blush easily, but this comment certainly made me do it.

### University Air Travel

**Schmidt, A.** (2020, October). University air travel and GHG mitigation: Examining institutional policies through the lens of #flyingless [Invited presentation]. Committee on the Campus Environment, University of Tennessee, Knoxville.

At the end of my 2020 Summer internship with the Office of Sustainability, I was invited to attend a Committee on the Campus Enviornment (CCE) meeting to share my research on how university climate policies address business travel. The committee consisted of university faculty and staff working on or interested in sustainability across campus. I was excited to share my work with the CCE, hoping that my research would catalyze some action to turn what is termed in UTK’s Sustainability Master Plan a “policy opportunity” to address emissions from business travel into actual policy.

I was given positive feedback on the research and was also encouraged to turn my research into a manuscript for publication. I enjoyed the content and ideas of that CCE meeting so much that I have now become a member and have attended nearly every meeting since. In fact, now I am leading a major survey on students attitudes toward sustainability, discussed elsewhere in this portfolio. The presentation of this research has had a positive impact on my involvement with people and environmental activities across the campus. Unfortunately, though I have brought up the topic of addressing emissions from travel numerous times, nothing has been done yet. However, whenever I do bring it up, the idea does receive positive response. I believe there are going to be some revisions to the Sustainability Master Plan by the CCE and that will be another chance for me to address this issue.

**Schmidt, A.** (2020, November). University air travel and GHG mitigation: Examining institutional policies through the lens of #flyingless [Invited panel presentation]. Roundtable of Sustainable Academic Travel: Mapping Travel Policies in FHE.

I shared some of my air travel research on Twitter using the hashtage #flyingless. The tweet was shared and picked up by some in the circle of academics who use that hashtag. I was invited to join a panel as part of the Roundtable on Sustainable Academic Travel. I presented alongside others who had done similar research on European universities. In fact, I believe the entire audience was European. It seems European universities, especially those in the UK, have taken business air travel emissions more seriously than those in the states. One reason for this - as was discussed during our panel - is that alternatives to flying are simply easier in Europe when compared to the US, as we lack adequate rail services.

I found sharing research in a panel format very appealing. The brief presentations and the chance to engage in interesting dialogue was very enjoyable, especially when compared to a single-author oral presentation. One reason may be because the onus to answer questions is not on a single person, but is rather shared. And, hearing others’ insightful answers can easily spark additional information to contribute during Q&A or additional information to consider in one’s own work. I also enjoyed meeting others who share very similar research interests. I am still in contact with the panel presenters to this day. All in all, I truly enjoyed the panel presentation and hope to be part of one again in the future.

One final thought is that Twitter has been a powerful tool, before and during the pandemic, for connecting myself to people and opportunities I may not have encountered otherwise in my daily course of activities, or even at conferences where networking and “hallway conversations” are held to high regard. For introverts like myself, organizing and collaboration via the internet has been more beneficial and has often led to more conducive in-person meetings than vice-versa. I believe Twitter is an important part of my scholarly activity and this opportunity to do a panel presentation is one example of that.

## Materials in Appendix E

1. [First Author Paper Presentation: Intensive English Program and Direct-Admit International Student Achievement](https://drive.google.com/file/d/1z0FuhcNmtdiEvn7jkPjpwfo12oprFaO6/view?usp=sharing)
2. [First Author Poster Presentation: #TidyTuesday Data Visualization Research](https://drive.google.com/file/d/1YolWVaplCzojN_S1qeEgbgIT3Y20W4Qx/view?usp=sharing)
3. [Panel Presentation: University Air Travel](https://drive.google.com/file/d/1iDIHeLxOi6vQYCb2-iu8DR8FlXcShfAa/view?usp=sharing)

# F. Teaching or Supervisory Experience

## Teaching Experience

### Non-Program Related Teaching Experiences

* 2014-2019 - English Language Instructor, University of Tennessee, Knoxville
* 2012-2014 - English Language Instructor, Pukyong National University, South Korea
* 2007-2012 - English Language Instructor, Secondary Schools, South Korea

### Program-Related Teaching Experiences

* 2021 Spring - EDPY 678 Statistics in Applied Fields III

## Professional Workshops/Trainings

* 2021 Spring - R Markdown (ESM Seminar)
* 2020 Fall - R Basics and Data Visualization (ESM Seminar)
* 2020 Spring - Tableau (ESM Seminar)
* 2019 Fall - Equivalence Testing (ESM Seminar)

## Description and Reflection of Experiences

### Non-Program Related Teaching Experiences

#### Teaching Experiences as an English Language Instructor

I spent twelve years as an English language instructor, teaching English as a foreign/second language to people of all ages and from countries around the world. While the majority of my time as an instructor was spent before ever even conceiving of a PhD, I believe this prior career path fostered important skills in teaching which have bearing on both my time as a PhD student and my future career.

The skills I learned from teaching include how to organize a course and class, behavior management, how to present information at various levels of understanding, and how to assess learning formatively and summatively. I also have a great deal of experience standing up in front of strangers and talking about things they do not yet know or do not know they know - the *sin qua non* of teaching. In addition, I have a great deal of experience facilitating group work, peer teaching, and independent learning. The skills I have mentioned, however, are merely surface manifestations of a deep understanding of pedagogy and learning science. I hold a master’s degree in language education. Much of my training as a master’s student was spent learning about pedagogy, the psychology of learning, and instructional design. Whether I am teaching a class, giving a presentation, or leading a workshop, there are a number of principles I follow to make sure my time teaching is effective.

From the beginning, I make sure to establish a connection with the audience, which may mean simple conversation or a more formal ice breaker. I try to make my content relevant to both their interests and needs, considering what they need to know and presenting it in a way that is engaging. This may mean, for example, presenting information about students’ own cultures to help learn language related to a foreign culture. It may mean using a data set based on Marvel, the Great British Bake Off, or Animal Crossing to engage participants in data analysis. Not only do I strive to make content relevant, but I also try to keep the learning task-based. That means that what they are learning is useful to fulfill a real-world task. They start with a problem (i.e. a messy data set) and need to clean it in order to analyze it and discover some interesting trends or insights. In this example, if students are just learning code or statistics without an end goal in mind, the teaching and learning will be less effective. As a final example, I try to make what I am teaching challenging but not difficult. If the content is too easy or too difficult, learning will not take place and students will become demotivated. However, challenging content or activities that are relevant, task-based, and scaffolded to promote success offer the perfect recipe for learning to occur.

Though much of my experience in teaching has been in the realm of English language education, I believe my experiences are quite transferable to evaluation, statistics, and measurement. I have been complimented numerous times, especially after in-class presentations, that “you can tell I am a teacher” because of the way I organize and present information. More recently, I have had chances to teach data science skills (especially R) in workshops and as a TA in Stats III. I believe many of my teaching skills were easily applied there and no doubt made those experiences better for myself and for the learners involved.

### Program-Related Teaching Experiences

#### Applied Statistics III: Volunteer State University Sharktank Project

During 2021 Spring, I was a teaching assistant in EDPY 678 Statistics for Applied Fields III (aka Stats III). This was part of an internship in which I helped develop or adapt materials for teaching statistical concepts through R. As a teaching assistant, I had R-specific duties (see section *B. Statistical Analysis Experiences*).

For instance, I held R office hours, originally 1 hour every week but after the first month this became by appointment only. I also offered help via email and Slack. In the beginning of the semester, as students were still learning R, I had several students set up appointments so they could troubleshoot issues or ask questions. I also made several short videos about key functions students would need to master in order to be successful for the rest of the semester. I would often get student questions via Slack, usually from the same three or four students. I also posted R tips about useful functions via Slack, too. These were inspired by others’ questions or something I may have run across in my own work or via Twitter.

There were no bad parts of my experience. However, I was concerned around the middle of the semester when students were no longer reaching out to me. I wondered why students no longer needed help from me. I do not believe it was lack of effectiveness on my part, as the students who reached out to me were positive and gave me excellent immediate feedback. Perhaps their data cleaning/wrangling skills may have been good enough to allow them to focus more on the statistics and analyses? I never did find out.

Overall, the experience of working with students one-on-one, helping them learn something I am passionate about, was a very rewarding experience. I have not been a teacher since 2019 Fall. While there are MANY things I do not miss about teaching, helping others understand something is not one of them. In fact, thinking of ways to present information so that it is understandable and actionable is a creative challenge I have always enjoyed, something I alluded to in my discussion of my teaching experience above. For example, making the R videos was one way I was able to do this. The videos required quite a bit of planning to help make the grammar and logic of R code comprehensible. It certainly paralleled my experiences of teaching English as a second/foreign/additional language. Indeed, one students commented that they loved how I “translated” R into easy to understand English in my videos.

The experiences in this internship certainly amplified the experiences I felt during the R workshops I helped lead (see below) and have further cemented a desire to work at the intersection of R and education, whatever that may mean.

### Professional Workshops/Trainings

#### R Basics and Data Visualization (2020 Fall)

After my work on the *R Software Handbook*, fellow ESM student Austin Boyd and I worked together to lead a two-session training on R for ESM students. We divided the workshop into R Basics and R Data Visualization. I developed and led the R Data Visualization training. However, Austin and I collaborated on the design of materials for both workshops. We used data sets related to Marvel in order to introduce fundamental R data cleaning, analysis, and visualization skills in a light and familiar context.

This was my first opportunity to teach R, something I have great passion for. I enjoyed designing and implementing the training. I enjoyed thinking about the end goal of the workshops and the steps/skills learners would need to get there, and then how to introduce those steps. We decided to use a mix of examples and fill-in-the-blank activities, which provided enough scaffolding so that workshop participants could work with large chunks of code yet focus only on the key aspects we were trying to teach. I had built in to my session “free time” to play around with the code in order to foster independent practice and provide personalized feedback to participants. Unfortunately, we did not have the time to do that. If I were to lead this workshop again, I think I would have had less examples in order to build in this free practice time.

My biggest takeaway from this experience was how much I liked teaching “data science,” or at least one aspect of it: coding for visualization. This has made me consider the educational aspects of coding more seriously and what careers may be available that integrates the two, including careers in academia.

#### Tableau Training (2020 Spring)

I became interested in Tableau during 2019 Spring, but was disappointed that there were no trainings available on campus for the program. I spent the semester and part of the summer learning how to use it in my free time. I also understood, from research into data analysis software trends and attendance of the Tableau conference, that Tableau was an important skill to learn. I believe it was an important factor in helping me obtain a new job, as it gave me a competitive advantage over other applicants since Tableau is a “hot” data visualization skill to have. I wanted to share my knowledge with fellow ESM students and, thus, I volunteered to lead a hands-on Tableau practical experience training.

It was initially going to be face-to-face, but due to the COVID-19 pandemic, it was moved online. For this training, I created a longitudinal data set (3 years) by combining IPEDS data in Tableau Prep (a free data wrangling program provided with Tableay). The preprocessing of the data required several joins and pivots, which I did not cover during the workshop. However, I provided my original files and Tableau Prep Flow (similar to code or syntax but solely for the Tableau Prep GUI) for those interested in learning more.

Before making an example dashboard, I thought carefully about what someone new to Tableau would need to learn. I decided that an introduction to the Tableau environment, how to make basic chart types, how to style these charts and manage their interactivity, and how to combine charts into a dashboard were key skills. I designed several examples and meticulously documented how I designed them and what key skills these examples focused on.

During the training, I was surprised at the number of students who attended the workshop. Leading the hands-on workshop through Zoom was not necessarily easy. I held the training with the presumption that participants had only one monitor and needed time to switch back and forth from their Tableau to the screen share. In addition, not being able to see everyone’s faces meant I could not use facial expressions as cues for understanding or misunderstanding. To get around these limitations, I made sure to do things slowly and to use the participants who did leave their videos on as checks for understanding. In addition, I remember calling on other individuals just to check their progress and whether they needed more time. These were teaching skills I often relied upon and quickly transferred to an online format.

While this was the first training I had ever led for colleagues, as a teacher, I had a lot of experience teaching new software to students and walking them through how to use it. However, this was undoubtedly the most complex software I had ever utilized in a training. In addition, this was the first time I had lead a training online. I was quite excited and nervous. In the end, the feedback I received suggested that my training was well-planned and beneficial. I took this as a good sign and feel my confidence in teaching statistical or visualization software has increased. I looked forward to one day leading R and data visualization trainings.

#### Equivalence Testing (2019 Fall)

I helped lead an equivalence testing practical experience training in the 2019 Fall ESM seminar. Before being assigned this topic, I had never heard of equivalence testing. However, after having it assigned and diving into the readings about it, I not only found it to be an extremely powerful method that our students should learn about, I also saw immediate application to my own research (see *Intensive English Program and Direct-Admit International Student Achievement,* sections A and B).

I worked in a group of four students, however myself and Austin Boyd seemed to be the most interested in the topic. I collected numerous articles on the topic and shared them with the group. I also primarily design the presentation. I also prepared hands-on exercise materials in R. I designed the R materials so that they could be run by a beginner, and they could be run using the RStudio Cloud platform. Since we knew not everyone was familiar with R, we also planned similar materials using Excel.

The presentation itself was a little disappointing, as few students had attended, and even fewer seemed engaged in the material or the hands-on activities we had prepared. In addition, I am not confident everyone in the group understood what they were presenting about. They did not speak with confidence, even the false confidence that comes when you are BSing something, and most did not participate in the Q&A afterwards. Still, in the end, I was grateful for the opportunity to learn about and try to teach a somewhat advanced statistical method, as well as the chance to develop exercise materials in R. This experience improved my quantitative methods skills, my programming skills, and was a crucial aspect of my research project on intensive English program students.

## Materials in Appendix F

1. [Teaching Material: TA for Statistics in Applied Fields III Transition to R](https://drive.google.com/file/d/1aVtZsuhUUHYVYmJET9Jp_tEUbO9epz27/view?usp=sharing)
2. [End-of-Course Evaluations: TA for Statistics in Applied Fields III Transition to R](https://drive.google.com/file/d/1jjHex_OnxVpWjzjZpXquyyn0V84f9vzY/view?usp=sharing)
3. [Training Materials: Data Visualization in R](https://drive.google.com/file/d/1f2vUg4ciLFmSGfj3TKnkKNyoa2iBu9lD/view?usp=sharing)

# References

Astin, A. W. (1991). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education*. Rowman & Littlefield Publishers.

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research*, *27*(2), 94–104.

# Appendices

## Appendix A – Evaluation and Applied Research Materials

### [Evaluation Proposal: Computer Science Education Needs Analysis](https://drive.google.com/file/d/1PY7MQI44gSy9dnfB0gKz4tuHCTp4ApxS/view?usp=sharing)

### [Evaluation Proposal: Fair Chance Impact Evaluation RFP](https://drive.google.com/file/d/1l0DQb3vqV87Gukmxta9M9tG37GfbkESf/view?usp=sharing)

### [First Author Research Proposal: PhD Student Conference Travel and Employment Outcomes](https://drive.google.com/file/d/1NFmD_RAIHE0ndhtLfjGP8dnce94HBZCO/view?usp=sharing)

## Appendix B – Statistical Analysis Materials

### [Detailed Analysis with Code: Higher Education Sustainability (STARS) Ratings](https://drive.google.com/file/d/1pudKUHr2NifTETcYhB6P4xO6pH5gZPAu/view?usp=sharing)

### [First-Author Quantitative Paper (published): International Student Graduation Rates](https://drive.google.com/file/d/1YvRgqdRBKkphai9J6iELDzpYmfQlTbbb/view?usp=sharing)

### [First-Author Quantitative Paper (submitted): Intensive English Program and Direct-Admit International Student Achievement](https://drive.google.com/file/d/1kMfTejCqjfdoJlSCiDX8tNoHPaimrkrP/view?usp=sharing)

## Appendix C – Measurement and Instrument Development Materials

### [Survey Instrument: Sustainable Energy Working Group](https://drive.google.com/file/d/1ogXJLEvtxLhulF43UTEW-HG_W-9xyjuc/view?usp=sharing)

### [Interview Protocol: Distance Education Needs Analysis](https://drive.google.com/file/d/1fLIQ0j286_w_BKXgR-72LWojv1_MpRnP/view?usp=sharing)

### [Assessment: Statistical Literacy Assessment through the Media (SLAM)](https://drive.google.com/file/d/1dSqzienXFhghBZrkkUZzzlvctpFG0-E_/view?usp=sharing)

## Appendix D – Scholarly Writing Materials

### [First-Author Paper (published): International Student Graduation Rates](https://drive.google.com/file/d/1b7stdOscVnYz0Wm0xZwGheC2gpmaPTly/view?usp=sharing)

### [Technical Report: Project Advising](https://drive.google.com/file/d/1CViycBnroU8at2IbfRBjh6sFWLP7MH0r/view?usp=sharing)

### [First-Author Paper (submitted): University Air Travel](https://drive.google.com/file/d/1wVHWCv70lmPHgvU6YqzrA2kXzu-_kjhe/view?usp=sharing)

## Appendix E – Presentation Materials

### [First Author Paper Presentation: Intensive English Program and Direct-Admit International Student Achievement](https://drive.google.com/file/d/1z0FuhcNmtdiEvn7jkPjpwfo12oprFaO6/view?usp=sharing)

### [First Author Poster Presentation: #TidyTuesday Data Visualization Research](https://drive.google.com/file/d/1YolWVaplCzojN_S1qeEgbgIT3Y20W4Qx/view?usp=sharing)

### [Panel Presentation: University Air Travel](https://drive.google.com/file/d/1iDIHeLxOi6vQYCb2-iu8DR8FlXcShfAa/view?usp=sharing)

## Appendix F –Teaching and Training Materials

### [Teaching Material: TA for Statistics in Applied Fields III Transition to R](https://drive.google.com/file/d/1aVtZsuhUUHYVYmJET9Jp_tEUbO9epz27/view?usp=sharing)

### [End-of-Course Evaluations: TA for Statistics in Applied Fields III Transition to R](https://drive.google.com/file/d/1jjHex_OnxVpWjzjZpXquyyn0V84f9vzY/view?usp=sharing)

### [Training Materials: Data Visualization in R](https://drive.google.com/file/d/1f2vUg4ciLFmSGfj3TKnkKNyoa2iBu9lD/view?usp=sharing)

## Appendix G – ESM Coursework and Matrix

### [Final Plan of Study](https://drive.google.com/file/d/1dQffaRe3ot5yjEVe46Wq2ZRP3SLkwX74/view?usp=sharing)

### [ESM Program Matrix](https://drive.google.com/file/d/1b6dCK3ATfQ4Ns2Ng2ml4qCd9ENdzu3sz/view?usp=sharing)

## Appendix H – Scholarly Writing Sample

**Schmidt, A.** (2020). Are international students getting a bang for their buck? The relationship between expenditures and international student graduation rates. *The Journal of International Students, 10*(3), 646-663. <https://doi.org/10.32674/jis.v10i3.1279>

[Click here to access the PDF of my scholarly writing sample on Google Drive](https://drive.google.com/file/d/1MiVkyzl4HsQpJBMsdIUJzrOYa8UuD4ma/view?usp=sharing)

## Appendix I – Brief Curriculum Vita (no more than 5 pages)

[Link to Curriculum Vitae in Appendix I on Google Drive](https://drive.google.com/file/d/1Z5nrVg9D-nSeenIvl-8scrD_UoqDvBrT/view?usp=sharing)