EDUCATIONAL STATISTICS AND RESEARCH METHODS

Ph.D. in Educational Statistics and Research Methods

The ESRM Ph.D. degree program prepares graduates for conducting theoretical and applied research in the fields of quantitative statistical methods, psychometrics, educational psychology, and has recently been expanded to include more training in qualitative research methods. The primary learning goals of the program are centered around the identification, development, and evaluation of quantitative statistical procedures, analyses of data, communicating findings, critiquing research studies, and collaborating effectively with others. With the hiring of our new faculty member in 2020 who specializes in a diverse selection of qualitative research methods, we have been able to expand our primary learning goals to include the selection and application of qualitative methods, and the analysis and interpretation of data for conducting research in educational and behavioral sciences. We believe this is an important expansion of our students' skill sets as it provides for a more holistic approach to research and evaluation in our field. Our program is designed to prepare graduates for employment in academic institutions; local, state, and national educational agencies; research and policy organizations; and business and industry.

An assessment of the effectiveness of the program would include students' ability to:

1. Identify appropriate research designs for research questions,
2. Conducting statistical analyses for research hypotheses,
3. Understand the strengths, weaknesses, and appropriateness of different statistical procedures,
4. Critique statistical analyses completed by others,
5. Conduct simulation studies to evaluate statistical procedures under varying conditions,
6. Submit research proposals or manuscripts to professional conferences and journals,
7. Complete oral research presentations,
8. Use effective pedagogical processes to explain statistical design and processes to others.

In order to assess the effectiveness of our student training this year, we aggregated student data from research projects, candidacy exams, dissertation proposals, professional conference presentations, journal articles, grant submissions, internships, academic or professional awards, and job placements.

Assessment Information

In the 2021-2022 academic year, fifteen students were active in the ESRM Ph.D. program. Two students graduated, and the remaining 13 students are in the following stages of their program of study:

- Four students (two full-time and two part-time) finished their first-year of study in the program.
- Two students (all full-time) finished their second-year and are preparing for their comprehensive exam in Year 3.
- Two students (all part-time) are either taking their comprehensive exams or preparing to take them this coming year.
- Five students (all part-time) have passed their comprehensive exams and are working on their dissertations. Three are making active progress and are expected to graduate in 2022-2023.

Course-Based Data

The quality of course-based research projects and exams (in-class and take-home) provide data for the learning outcomes of identifying appropriate designs, conducting statistical analyses, and identifying strengths, weaknesses, and appropriateness of statistical procedures. Students were rated a 4 if they earned a mastery level of 90% or higher on their project, 3 for 80-89%, 2 for 70-79%, 1 for 60-69%, and a 0 for less than 60%. Students' course performance has been averaged in the following three knowledge areas (courses that offered in the 2021-2022 academic year) and is provided in Table 1:

1. Core statistical design courses: Experimental design, multiple regression, and multivariate.
2. Measurement and Psychometric: Measurement
3. Advanced statistical modeling: Structural equations modeling (SEM), Hierarchical linear modeling, Advanced Multivariate Statistics, and Advanced SEM.

The overall average score was ranged from 3.88 to 4.00 with 18 records (see Table 1).

Table 1.
Average ESRM Ph.D. Student Performance for Learning Objectives 1, 2 and 3.

Learning Objectives	N[d]	Average	Min.	Max.
1. Core Statistical Design Courses[a]	7	4.00	-	4.00
2. Measurement and Psychometrics[b]	2	3.50	3.00	4.00
3. Advanced Statistical Designs[c]	13	4.00	-	4.00

Note: [a]it includes three courses; [b]it includes one course; [c]it includes four courses; [d]it represents the number of ESRM Ph.D. students who took those courses.

Active Research, Internships, and Awards:

A summary of their research presentations, articles, grants, internships, and fellowships are provided in Table 2.

Publications: Many ESRM students work closely with faculty members. Nine manuscripts were published or are in-press in 2021-2022. Five manuscripts are currently under review.

Presentations: Doctoral students were active in research activities, with four students participating on 13 presentations at national and international conferences.

Internship: One student applied and was awarded the Educational Testing Service (ETS) internship (note: highly competitive) in summer 2021.

Award: best poster award from the American Public Health Association in 2021

Admission: ESRM admitted two students in fall 2021 (one awarded DAF) and one student (awarded DAF) in fall 2022.

***Job placement*:** Three students (two graduated in May 2022, and one passed her comps) were hired by the company/institution in the 2021-2022 academic year.

Table 2.
Student Research Proposals, Manuscripts, Grants, and Internships

Learning Objectives 6 and 7	Number
Research Presentations	13
Journal Articles (published or in press)	9
Manuscript under review	5
Internships	1
Fellowships*	5

*1 DDF, 2 DAFs, 2 SREB [One new recruited doctoral student awarded DAF in 2022]

Training Others and Collaborating with Professionals in Other Fields:

Teaching: Doctoral students gain experience in using pedagogical methods to explain statistical processes to others through course instruction and tutoring in the statistics laboratory. Two of our graduate students teach undergraduate sections of ESRM 2403 Statistics in Nursing.

Tutoring: Three of our graduate students provided instructional support and tutoring to our undergraduate and graduate level courses in the computer/statistics lab. In addition, two of our doctoral students assisted ESRM faculty with their courses and Blackboard management.

Consulting Center: One student who worked closely with an ESRM faculty member at the research consulting center in 2021-2022. This center provides statistical consulting service to help COEHP faculty and graduate students who had questions related to their research, grants, and publications.

Others Assistantships & Grant Work: Two graduate students worked on an externally funded grant in 2021-2022. Our students have been active in collaborating on research projects with students and colleagues in other fields within our university. This is a valuable practice within our field.

Changes Planned Based on Assessment Findings

Student performance in classes has been appropriate for nearly all of our students. The majority of students who are admitted to the program have sufficient skill sets and work ethic to perform well in required and elective coursework.

An area for improvement is our students' training has been the engagement of all students in out-of-class research activities. Our faculty have been effectively facilitating participation in summer research studies in preparation for conference proposals to national groups such as AERA, NCME, APA, and IMPS during the last seven years. Full-time students have successfully mastered and participated in external research projects, presented at national/international conferences, submitted manuscripts for publication, with some also submitting grants and conducting workshops. However, part-time students' engagement in out-of-class research activities has been substantially lower. Students are required to write research papers or make conference-type presentations in their classes, and faculty have been organizing post-course research groups to facilitate proposal submissions. These activities are generally effective in facilitating conference proposals for full-time students, however part-time students who spend less time on campus find it more difficult to meet and participate. Although there is still a barrier to participation for part-time students due to job requirements and family obligations, we are hopeful that some of the online collaborative resources (e.g., Microsoft Team, Zoom) that have been employed during the pandemic might be used as a mechanism to increase part-time student engagement in research collaborations in the future.

A second concern is the slow progress toward completion of the degree during the comprehensive examination and dissertation phases, especially for part-time students. To improve this situation, the ESRM faculty redesigned the comprehensive exam process with a

goal of both evaluating content mastery while also providing a mechanism that facilitates students' development of research design skills, specifically research studies focused on evaluating statistical procedures.

In 2021, we moved from a 12-hour, 4-part assessment of core coursework in 8 quantitative research classes [our previous comprehensive exam format] to a 6-hour, 2-part assessment in the general areas of statistics and psychometrics coupled with the submission of an independently designed mini-proposal presenting the background justification and design of a potential dissertation study. The mini-proposal is not required to be the student's dissertation study, but they are encouraged to focus on a research area of interest that has the potential to be their dissertation as it would facilitate their progress toward degree. In 2021-2022, three students used the new comprehensive exam format. One of those students completed their dissertation and graduated in 2022, and we have high expectations that this format is going to facilitate more students, and specifically more part-time students, toward the dissertation stage. We also hope that it will assist part-time students in becoming more engaged in research early in their program as this helps prepare them for writing the mini-proposal. We developed a student handbook to describe the new comprehensive exam format and provide the grading rubrics used by the faculty for each component of the exam.

Appendix

ESRM Student Publications (student name in bold)

1. **Ezike**, N., Ames Boykin, A., Dobbs, P. D., Mai, H., & Primack, B. A. (In Press). Unobserved components model: An application to Twitter surveillance about marketing of e-cigarette products. *Journal of Medical Internet Research Infodemiology*.
2. Ames Boykin, A., **Myers,** A.J., & **Ezike**, N. (In Press). Bayesian model-data fit. In *International Encyclopedia of Education, 4th Edition.*
3. **Weese**, J., Turner, R., Ames Boykin, A., Weston, B., & Liang, X. (2022). Reevaluating the SIBTEST classification heuristics for dichotomous DIF. *Educational and Psychological Measurement, 82*(2), 307–329 DOI: 10.1177/00131644211017267
4. **Weese**, J., Turner, R., Liang, X., Ames Boykin, A., & Weston, B. (2022). Implementing a standardized effect size in the POLYSIBTEST procedure. Advance online publication. *Educational and Psychological Measurement.* https://doi.org/10.1177/00131644221081011
5. **Ezike**, N., & Ames Boykin, A. (2021). The diagnostic rating system: Rater behavior for an alternative performance assessment rating method. *Psychological Test and Assessment Modeling*, *63*(3), 273-304.
6. Ames Boykin, A., & **Myers**, A.J. (2021). Explaining variability in extreme response style traits: a covariate-adjusted IRTree. *Educational and Psychological Measurement*, 81(4), 756-780. DOI: 10.1177/0013164420969780
7. **Myers,** A., Ames Boykin, A., Cleveland, E., Schafer-Whitby, P., Holmes, R., Burnett, K., & Ezike, N.S (2021). Analysis of a state-wide Autism Waiver. Advance online publication. *Journal of Autism and Developmental Disorders.* DOI: 10.1007/s10803-021-05376-z
8. **Reimers**, J. A., Turner, R. C., Crawford, B. C., Lo, W.-J., Jozkowski, K. N., & Keiffer, E. A. (2022). Demographic comparisons on data quality measures in web-based surveys. *Personality and Individual Differences, 193*. https://doi.org/10.1016/j.paid.2022.111612
9. Jozkowski, K., Turner, R. C., **Weese,** J., Crawford, B.C., & Lo. W.J. (online first, 2021). Abortion vs. sexual assault: People's perceptions of Kavanaugh's nomination to the Supreme Court of the United States. *Journal of Sex Research,* https://doi.org/10.1080/00224499.2021.1984377

ESRM Student Manuscripts Under Review (student name in bold)

1. Dobbs, P. D., **Ezike**, N., Ames Boykin, A., **Myers**, A., Colditz, J., & Primack, B. A. (Under Review). Twitter sentiment about the US federal tobacco 21 law: A mixed methods analysis. Health Education & Behavior.
2. Ames Boykin, A**., Ezike**, N., Mai, H., Dobbs, P. D., & Primack, B. A. (Under Review). Predicting sentiment of tweets towards electronic cigarettes using the unobserved component model. Journal of Medical Internet Research.

3. Ames Boykin, A., Leventhal, B. C., **Ezike**, N., & Thompson, K. (Under Review). Bayesian Monte Carlo simulation studies: Practice and implications. Psychological Methods.
4. Turner, R., **Reimers**, J., Lo, W.-J, Jozkowski, K.N., & Crawford, B. (Under Review). Data Quality Indicator Effectiveness with Unidirectional vs. Bidirectional Scales.
5. **Reimers**, J., Turner, R., Tendeiro, J., Lo, W.-J, & Keiffer, E. (Under Review). The Effects of Aberrant Responding on Model-Fit Assuming Different Underlying Response Processes

ESRM Student Presentations (student name in bold)

1. **Asamoah**, N., Turner, R. C., Lo, W., Crawford, B., & Jozkowski, K. (2022). *Evaluating the Rasch Tree Method for balanced and unbalanced DIF.* Accepted for presentation at the annual International Meeting of the Psychometric Society, Bologna, Italy.
2. Ames Boykin, A., Leventhal, B., & **Asamoah**, N.^{S} (2022, July). *Evaluating item parameter drift for Bayesian longitudinal item response theory models*. Annual Conference International Meeting of the Psychometric Society (IMPS), Paper presentation; July 11-15, 2022. Bologna, Italy.
3. **Ji,** L., Liang, X., Cao, C., Lo, W.-J., Abbot, P., American Educational Research Association. "Model Fit Evaluation in Exploratory Structural Equation Modeling" American Educational Research Association, San Diego, CA, United States. (April 2022).
4. **Ezike**, N., & Ames Boykin, A., (2022, April). *Posterior predictive model checking of the hierarchical rater model.* Annual Conference of the National Council on Measurement in Education (NCME), Paper presentation; April 21-24, 2022. San Diego, CA.
5. Ames Boykin, A., Leventhal, B. C., **Ezike**, N., & Thompson, K. (2022, April). *Bayesian Monte Carlo simulation studies: Practice and implications.* Annual Conference of the National Council on Measurement in Education (NCME), Paper presentation; April 21-24, 2022. San Diego, CA.
6. **Asamoah**, N., Turner, R. C., Lo, W., Crawford, B., Jozkowski, K., & McClelland, S. (2022). *Applying Partial Credit Trees as a multi-indicator DIF screening tool in scale development.* Presentation at the annual meeting of the American Educational Research Association, San Diego, CA.
7. **Asamoah**, N.A., Turner, R.C., Lo, W.J., Crawford, B.L., Jozkowski, K.N., & McClelland, S. (2022). *A comparison of national historical and personal retrospective trends of perceptions about abortion*. [Presentation at the American Association for Public Opinion Research annual conference 2022].
8. Hadfield, J.I., Bueno, X., **Ezike,** N., Lo, W. J., Turner, R. C., Crawford, B. L., & Jozkowski, K. N. (2022). *Are there racial/ethnic disparities in support for abortion access? Exploring the role of abortion law knowledge and political engagement*. [Presentation at the American Association for Public Opinion Research annual conference 2022].

9. **Myers**, A. J., Ames Boykin, A., Dobbs, P. D., & Primack, B. A. (2021, October). *Investigating topics and trends in hookah messaging on Twitter via probabilistic topic modeling*. Paper presented at the 148th American Public Health Association Annual Meeting, Denver, CO; November.

    Awarded APHS Best Student Poster Award at the 2021 APHA Conference
10. Dobbs, P.D., **Myers**, A., Ames Boykin, A., Schisler, E., Colditz, J. B., & Primack, B. A. (2021). *A Mixed methods analysis of Tobacco 21 sentiment on Twitter*. Paper presented at the 148th American Public Health Association Annual Meeting, Denver, CO; November.
11. **Li,** J., Lo, W., Liang, X., Cao, C., Abbott, P., & Ezike, N. (2021, Aug). Dealing with Missing Data in the Path Model with MixedContinuous Variables and Categorical Outcome[Poster Session]. Paperpresented at the annual meeting of the American Psychological Association, Virtual. (International)
12. Ames Boykin, A., Leventhal, B. C., **Ezike**, N., & Thompson, K. (2021, July 19-23). *Simulation studies in psychometrics: State of the practice*. International Meeting of the Psychometric Society (IMPS), Virtual, Originally: Baltimore, Maryland, USA.
13. **Ezike**, N., Turner, R. C., Lo, W.-J., Crawford, B., & Jozkowski, K. N. (2021, July). *Comparing estimation procedures for omega reliability with non-normal ordinal data.* Poster presented at the International Meeting of the Psychometric Society, Virtual Meeting.

ESRM Student Fellowships:

Nana Amma Asamoah	Distinguished Doctoral Fellowship(DDF),	2020-2024
Merlin Kamgue	Southern Regional Education Board-State Doctoral Scholars Program (SREB)	2019-2024
Ejike Eden	Southern Regional Education Board-State Doctoral Scholars Program (SREB)	2021-2026
Ethen Harris	Doctoral Academy Fellowship (DAF),	2021-2024
Xixi Wang	Doctoral Academy Fellowship (DAF),	2022-2025

ESRM Student Internship:

Nnamdi Ezike	The Educational Testing Service (ETS) Summer Internship 2021