EDUCATIONAL STATISTICS AND RESEARCH METHODS
Ph.D. in Educational Statistics and Research Methods

The ESRM Ph.D. degree program prepares graduates with the skills necessary to conduct both theoretical and applied research in quantitative statistical methods, psychometrics, and educational psychology. Recently, the program has broadened its scope to include comprehensive training in qualitative research methods. The core learning objectives of the program focus on the following areas:

- Identification, development, and evaluation of quantitative statistical procedures.
- Data analysis and communication of findings.
- Critical review of research studies.
- Effective collaboration with peers and professionals.

This program aims to prepare graduates for careers in various sectors, including academic institutions, local, state, and national educational agencies, research and policy organizations, as well as business and industry.

ASSESSMENT CRITERIA:

To evaluate the program's effectiveness, the following competencies are assessed in students:

1. Identification of suitable research designs for specific research questions.
2. Execution of statistical analyses to test research hypotheses.
3. Understanding various statistical procedures' strengths, limitations, and applicability.
4. Critique and evaluation of statistical analyses performed by others.
5. Conducting simulation studies to assess statistical procedures under different conditions.
6. Submission of research proposals or manuscripts to professional conferences and journals.
7. Delivery of oral research presentations.
8. Application of effective pedagogical methods to teach statistical design and processes.

EFFECTIVENESS EVALUATION:

Our commitment to student success is reflected in our comprehensive data collection for program evaluation. This year, we assessed the effectiveness of student training through the aggregation of data from several key performance indicators. These include research projects, candidacy exams, dissertation proposals, professional conference presentations, journal articles, grant submissions, internships, academic and professional awards, and job placements. This robust data collection allows us to confidently evaluate the program's success in meeting its educational objectives and preparing students for professional success.

Assessment Information

During the 2023-2024 academic year,

Admissions:
- ❖ Two students were admitted in fall 2023.
- ❖ Two new students are scheduled to begin in fall 2024.

Current Enrollment:
- ❖ The ESRM Ph.D. program had a total of 15 active students.
  - Two part-time students did not enroll in spring 2024 but will enroll in fall 2024.
  - One student transferred from the math education program in spring 2024.

Student Progression:

Graduation:
- ❖ Two students are scheduled to graduate in the summer of 2024.

Program Stages for Remaining Students:
- ❖ Two part-time students completed their first year of study.
- ❖ Three students took their comprehensive exams in the fall of 2023.
  - o Two full-time students passed and are now working on their dissertations.
- ❖ Three students passed their dissertation proposals in the spring of 2023.
- ❖ Three part-time students are planning to take their comprehensive exams in August 2024.

Job placement:
- ❖ One newly admitted student (fall 2023) secured employment and changed her status from full-time to part-time.
- ❖ Two full-time students transitioned to part-time status after obtaining full-time employment in the fall of 2023.

This structured progression reflects the diverse academic and research development stages within the ESRM Ph.D. program.

COURSE-BASED DATA

The quality of course-based research projects and exams, both in-class and take-home, provides valuable data for assessing the following learning outcomes: 1) identifying appropriate research designs, 2) conducting statistical analyses, and 3) evaluating the strengths, weaknesses, and appropriateness of statistical procedures.

Students were rated on a 5-point scale (0 – 4) where a score of 4 indicated a mastery level of 90% or higher on their project, a score of 3 indicated 80-89%, a score of 2 indicated 70-79%, a score of 1 indicated 60-69%, and a score of 0 indicated less than 60%. Student performance was averaged across the following three knowledge areas, based on courses offered during the 2023-2024 academic year, as detailed in Table 1:

1. Core statistical design courses: Introduction to statistics, experimental design, multiple regression, and multivariate.
2. Measurement and Psychometric: Measurement and item response theory
3. Advanced statistical modeling: Structural equations modeling (SEM), hierarchical linear modeling (HLM), advanced multivariate statistics, and advanced SEM.

The following report is based on 13 records, as one student has two "incomplete" grades. The overall average score, considering 15 records, was 4.00 (see Table 1).

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

Learning Objectives	N	Average	Min.	Max.
1. Core Statistical Design Courses[a]	5	4.00	-	4.00
2. Measurement and Psychometrics[b]	1	4.00	-	4.00
3. Advanced Statistical Designs[c]	7[d]	4.00	-	4.00

Note: [a]it includes four courses; [b]it includes one course; [b]it includes three courses; [d]this number did not include the student who had "incomplete" grades.

ACTIVE RESEARCH, INTERNSHIPS, AND AWARDS:

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

Publications:
Many ESRM students collaborate closely with faculty members. One manuscript was published in the 2023-2024 academic year, and three additional manuscripts are currently under review.

Presentations:
Doctoral students actively engaged in research activities, with six students contributing to 12 national and international conference presentations. Seven more accepted papers will be presented in July and August 2024.

Internships:
One student successfully applied for and was awarded the highly competitive Educational Testing Service (ETS) - NAEP summer internship for the summer of 2023.

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

Learning Objectives 6 and 7	Number
Research Presentations	12
Accepted Research Presentations	7
Journal Articles (published or in press)	1
Manuscript under review	2
Grant	3
Internships	1
Fellowships[a]	4
Award[b]	1

[a] 1 DDF, 2 DAFs, 1 SREB
[b] Awarded first place in the psychometric research category for the Survey Research in Education special interest group

Training Others and Collaborating with Professionals in Other Fields:

Teaching: Doctoral students acquire valuable experience in employing pedagogical techniques to elucidate statistical processes to others through both course instruction and tutoring sessions in the statistics laboratory. Two of our graduate assistants are responsible for teaching undergraduate sections of ESRM 2403 Statistics in Nursing.

Tutoring: Three graduate assistants from our program offer instructional support and tutoring services for both undergraduate and graduate-level courses in the computer/statistics lab.

Consulting Center: In the 2023-2024 academic year, two graduate assistants collaborated closely with an ESRM faculty member at the research consulting center. This center provides statistical consulting services to assist faculty and graduate students within the COEHP who have inquiries related to their research, grants, and publications.

Other Assistantships & Grant Work: During the 2023-2024 academic year, two ESRM graduate assistants were involved in an externally funded grant project. In addition, one transferred student contributed as a research assistant to an NSF project.

Table 3

Assistantship	Number
Departmental Graduate Assistant:	3
Funded by Grant:	2
Funded by other programs:	1

APPENDIX

ESRM Student Publications (student name in bold)

Published
1. Bueno, X., **Asamoah*, N.A**., LaRoche, K.J., Dennis, B., Crawford, B.C., Turner, R. C., Lo, W.-J., & Jozkowski, K. (2023). People's perception of changes in their abortion attitudes over the life course: A mixed methods approach. *Advances in Life Course Research, 57, 1-15.* https://doi.org/10.1016/j.alcr.2023.100558

Revise and Resubmit
2. **Asamoah*, N. A.,** Turner, R.C., Lo, W.J., Crawford, B.L., & Jozkowski, K.N. (2023). Evaluating item response format and content using partial credit trees in scale development. Submitted to the *Journal of Survey Statistics and Methodology*.
3. **Edeh*, E.,** Liang, X., & Cao, C. (R & R). Probing Beyond: The Impact of Model Size and Prior Informativeness on Bayesian SEM Fit Indices. *Behavior Research Methods*

ESRM Student Presentations (student name in bold)

1. **Asamoah*, N. A.,** Turner, R.C., Lo, W.J., Crawford, B.L., & Jozkowski, K.N. (May, 2024). Investigating changes in self-described and perceived statewide abortion identity pre and post the Dobbs decision. [Presentation at the American Association for Public Opinion Research annual conference, Atlanta, GA.](#)
2. **Asamoah, N.**, & Liang, X. (2023, Jul). Model Size Effects on Measurement Invariance Testing with Ordinal Indicators [Paper Session]. International Meeting of Psychometric Society, College Park, MD.
3. Bueno, X., **Asamoah*, N.A,** LaRoche, K.J., Dennis, B., Crawford, B.C., Turner, R. C., Lo, W.-J., & Jozkowski, K. (November, 2023). People's perception of changes in their abortion attitudes over the life course: A mixed methods approach. Presentation at the American Public Health Association annual conference, Atlanta, GA.
4. **Chen*, J.,** Lo, W.-J., & **Li*, J.** (August, 2023). Why Exploratory Structural Equation Modeling Should be Used with Caution." Poster Presentation 2023 American Psychological Association, Washington, DC.
5. Dennis, B., Bueno, X., **Asamoah*, N.A.,** Jozkowski, K.N., Crawford, B.L., Turner, R.C., & Lo, W.J. (April, 2024). Abortion education: A grounded theory study exploring how one comes to hold abortion attitudes. Presentation at the American Educational Research Association annual conference, Philadelphia, PA.
6. **Edeh, E.**, Liang, X., & Cao, C. (2023, Jul). Prior Sensitivity of Bayesian SEM Fit Indices to Model Misspecification [Poster Session]. International Meeting of Psychometric Society, College Park, MD
7. **Edeh, E.**, Liang, X., & Zhang, J. (2024). Sensitivity of Fit Measures to Misspecification in ordinal Bayesian Confirmatory Factor Analysis [Paper Session]. National Council for Measurement in Education, Philadelphia, PA.
8. **Harris*, E**., Jordan, L. S., Walsdorf, A. A. & Valdez, C. (April 2023). A Critical Whiteness Discourse Analysis of Family Interactions on Racism and Whiteness.

Presentation at the American Educational Research Association annual conference, Philadelphia, PA

9. **Li, J.**, & Liang, X. (2023, Jul). Comparison of FIML and Multiple Imputation in Proportional Odds Model [Poster Session]. International Meeting of Psychometric Society, College Park, MD.

10. Liang, X., & **Chen, J.** (2024). Assessing Factorial Invariance in the Presence of Latent Distribution Heterogeneity and Unbalanced Sample Sizes [Roundtable]. American Educational Research Association, Philadelphia, PA.

11. Turner, R.C., **Wang*, X.,** Lo, W.J., Bueno, X., **Asamoah*, N.A.,** Crawford, B.L., & Jozkowski, K.N. (April, 2024). Comparison of response option formats for English and Spanish versions of an acculturation scale. Presentation at the American Educational Research Association annual conference, Philadelphia, PA. **[Awarded first place in psychometric research category for the Survey Research in Education special interest group.]**

12. **Wang*, X.,** Turner, R.C., **Asamoah, N.A.,** Lo, W.J., Crawford, B.L., & Jozkowski, K.N. (May, 2024). Comparing 4-point and 5-point scales with equal and unequal intervals in survey response options: A study on acculturation measurement. Poster presentation at the American Association for Public Opinion Research annual conference, Atlanta, GA.

Grant (student name in bold)

1. Liang, X. (PI) & **Chen, J (Co-PI)**. (Oct 2023 - July 2024). Assessing Measurement Invariance in Heterogeneous Groups with Unbalanced Sample Sizes. Department of Counseling, Leadership and Research Methods. $4,808.16

2. Liang, X. (PI), Wai, J. (Co-PI), **Edeh, E.**, & Cao, C. (May 2023 - June 2024). Testing Bayesian Measurement Invariance with Unbalanced Groups: Method Advancement and Application in Gifted Education. WE CARE Field Advancement Grant, College of Education and Health Professions, University of Arkansas. $14,000

3. Wai, J. (PI), Liang, X. (Co-PI), **Chen, J.**, & Lakin, J. (May 2023 - June 2024). Exploring the links between spatial reasoning and vocational or "middle skill" jobs using a machine learning approach. WE CARE Field Advancement Grant, College of Education and Health Professions, University of Arkansas. $2,500

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
Ethen Harris	Doctoral Academy Fellowship (DAF),	2021-2024
Xixi Wang	Doctoral Academy Fellowship (DAF),	2022-2025

ESRM Student Internship:

Ejike Eden   The Educational Testing Service (ETS) Summer Internship 2023