Chamberlain, Darryl

Assistant Professor, College of Arts and Sciences

Manager: Karen Keene
Evaluated By: Darryl Chamberlain

2022 Worldwide Faculty Performance Evaluation

Organization: Department of Mathematics, Science and Technology (Karen Keene)

Location: Massachusetts
01/01/2022 - 12/31/2022

Evaluation Items

Criterion I - Teaching Effectiveness: See [Faculty Handbook, Part I: Section 8.3.1](#)

Employee Evaluation

Response:

5 - Outstanding

Quality of expected teaching responsibilities is extremely high. Student Course Evaluations were overwhelmingly positive, with all 16 student comments about the instructor praising instructor's fairness, extensive feedback, and strong communication skills. Instructor evaluation metrics were significantly above the College average for 2 of the 3 courses.

Quality and quantity of work beyond expected teaching responsibilities was far above expectation of an average tenure-track faculty member in the department of Mathematics, Science, and Technology. Significant time was devoted to the following University Strategic Initiatives:

SI.1a Reinforce essential student skills through curriculum;
SI.3a Ensure the relevancy of academic programs to industry;
SI.3b Ensure continuous improvement of instruction; and
SI.3c Expand faculty role in student retention initiatives.

Of particular note was the successful course redevelopment activity in Math 111, the development of an Applied Data Science minor application and outline of a new course for the minor, and extensive participation in teaching development activities.

Student Course Evaluations with Reflection

- MATH 111 (Jan '22) Mean 4.43 vs College 4.52
- MATH 111 (Jan '22) Mean 4.61 vs College 4.52
- MATH 106 (Aug '22) Mean 4.67 vs College 4.49
- MATH 111 EV (Oct '22) TBD

Representative Positive Comments Regarding Instructor (Q10):
- This was my first Math class in 15 years, Dr. Chamberlain made it a very smooth class. Very fair grader, when i got questions wrong on the mid term he did a very good job of going through my work and letting me know exactly where i went wrong and how to come up with the right answer.

- The instructor was extremely fair and open to conversation regarding the coursework. He helped in any way he could be it helpful advise, tips and tricks, or simply just explaining why. He fostered a healthy learning atmosphere and made it easy to contact him if I needed help day or night. His willingness to see me succeed and genuine care reflects highly upon himself, his peers, and ERAU. Great work!
- This professor made math come to life for me. He's a thorough teacher and communicates in a way that is understandable.

Representative Negative Comments Regarding Instructor (Q10):
None. 16/16 comments in "Q10: General comments regarding this instructor" were positive.

Reflection on Student Comments:
Last year, some students commented that I was more of an advisor than a teacher. This year, I made a focused effort to engage with students beyond managing when assignments were due and grading activities. The most successful effort I made was providing additional aeronautic contexts so students could make better sense of the mathematics they were encountering. For example, in MATH 111 after completing the topic "Vectors", I presented a non-required lesson on reading crosswind charts and estimating crosswind strengths before landing with the Rule of Sixths. One student in the course immediately chimed in that they were taught the Rule of Sixths when they first started flying and used it regularly. I believe inserting these types of aeronautic contexts is what the student comment "The professor made math come to life" was referring to. Next year, I plan on continuing to develop these contexts so they can be integrated into MATH 111 for all students to benefit from.

Work Beyond Teaching Responsibilities

Course Development Activities

Math 111 Precalculus for Aviation [SI.1a, SI.3a, SI.3c]
Math 111 is a critical general education math course to numerous majors that has traditionally had a high withdrawal-fail rate (DFW rate). As such, it is an attractive target for improving student retention in general [SI.3c]. Efforts to improve student success in the course this year have focused on improving the discussion activities by focusing on reinforcing essential student skills [SI.1a] and include relevance for the course to aeronautics [SI.3a]. These efforts were positively received by most instructors and students.

All discussion activities were revised to encourage higher-level cognitive interaction with the material [SI.1a]. Two of the most successful such activities were Module 3 Group Discussion: Study Guide Development and Module 6 Group Discussion: Lesson Video Development. In both activities, students chose one recent module and were encouraged to present one or all of the mathematical concepts from the module in an easy-to-read form. These activities prompted students to move beyond individual math questions and communicate patterns of thinking [SI.1a].
- For Module 3, I have attached one exceptional student study guide that was written in the form of a Mind Map [attachment mind_map_factoring.jpg]. The student synthesized the mathematical concept (factoring) as a series of yes/no procedures akin to an engineering or computer science workflow. We see the student thought about the mathematical questions in the homework and provided a high-level summary that other students found extremely helpful.
- For Module 6, I have attached one exceptional student video recorded with powerpoint [attachment mead_mod_6_discussion.ppsx]. Rather than simply summarizing a Module 6 topic (Vectors), they illustrated an aeronautical application of Vectors from their own work, developed a similar homework problem within their applied context, and then solved it for students. While developing mathematical concepts is important, it is equally important that students recognize these concepts in different, non-academic contexts [SI.3a].

Some discussion activities were revised to include aeronautical contexts to emphasis the module's mathematical concept [SI.3a]. The most successful such activity was Module 7 Group Discussion: Calculating Flight Paths. This question presented a hypothetical pilot flying from Daytona Beach to Prescott and needing to compensate their initial trajectory angle based on wind. This problem could be solved in 3 different ways using the topics from Module 6: Vectors and Law of Sines/Cosines, but put the concepts in a familiar context for students to see the relation to their potential future work. One of the instructors in the May 2022 course (the first term the new discussion was run) was so impressed with their students' initial work that they shared it with other faculty in a teaching support group [attachment Flight path graphic.jpg] and said the following:

The new Module 7 Group Discussion Exercise in Math 111 (analyzing an aircraft flight path affected by wind) was a tremendous addition to the course. Cognitive presence was demonstrated significantly in the various ways students sketched, formulated, solved and analyzed the given problem. Several students supplemented the work of others through extensive collaboration and tackling the problem from different angles...literally and figuratively! This was a welcome addition to an "aviation" course which up until recently didn't have many aviation applications or examples. I received the most comments and questions from students (by far) about the discussion exercise. See the attached file created by one of my students...spectacular graphics and analysis!

Applied Data Science Minor [SI.3a]
As one of two faculty in the MST Department with experience in Data Science, I was asked to help develop an Applied Data Science minor. My major contribution to this endeavor so far has been designing and submitting approval of the first course for this minor: Introduction to Programming for Data Science. This course introduces basic programming concepts needed to format large data sets and complete elementary data analysis. These two phases (format data sets and complete data analysis) are two of the four major phases for any data science project. The department believes that the inclusion of an Applied Data Science minor will be a significant return on investment for students looking to compliment a technical bachelors degree with experience in data science [SI.3a].

Teaching-Related Conference [SI.3b]
Attended two teaching-related conferences: OLC Innovate and MAA MathFest. The OLC Innovate conference is a joint conference meant to share best practices, test new ideas, and collaborate on driving forward online, digital, and blended learning. The MAA MathFest conference presents the latest in mathematical research and education. Attending the various talks not only provides knowledge of the most recent results from the Scholarship of Teaching and Learning as well as mathematical educational research, but it also presents an opportunity to workshop teaching ideas. The idea to develop non-required context lessons was suggested by a speaker at the OLC Innovate conference and the specifics of the Module 7 Group Discussion activity were based off a similar linear algebra activity presented at MAA MathFest.

Participation in Faculty Teaching Development activities [SI.3b]
Sought out additional faculty teaching development opportunities both within and outside of ERAU. In particular, numerous workshops and meetings associated with the Mathematics Association of America Project NExT (New Experiences in Teaching) program. Participated in at least one faculty teaching development activity per month.

ERAU Teaching Development
- Course Developer Certificate
- EV-Blended Instructor Training

- RCTLE Professional Development (RCTLE TV)
- Brown Bag Series

External Teaching Development
- **2-day Live Workshops** - Various workshops on aspects of teaching, Mathematics Association of America Project NExT
- **Monthly Virtual Meetings** - Project NExT Monthly small-group meetings on effective teaching practices
- **Virtual Workshop** - Promoting Effective Teaching Practices by Employing Cognitive Science Principles, Mathematics Association of America
- **Virtual Seminar** - Reproducibility and Responsible Workflow in Data Science and Statistics Curriculum, Journal of Statistics and Data Science Education Seminar
- **Virtual Seminar** - Active Learning in a Remote Classroom, Online Seminar on Undergraduate Mathematics Education

Criterion II - Scholarly and Professional Activity: See [Faculty Handbook, Part I: Section 8.3.2](#)

Employee Evaluation

Response:

5 - Outstanding

Scholarly activity is far beyond expectation for a 2nd year Assistant Professor, especially in terms of participation in internally and externally funded research projects. Currently active in 6 research projects: 3 as PI and 3 as Co-PI. Sunsetting an additional research project as Co-PI (Fund3). Total number of academic products: 2 publications, 5 presentations, and 4 publications under review (2 as revise and resubmits written in previous year). This is in stark contrast to the tenure-track expectations of 1 publication per year, 1 presentation per year, and submitting 1 internal/external grant before applying for tenure.

All funded research projects were continuations from previous year (Fund1-3). One previously unfunded project has submitted for an internal grant (Pend1 as PI). Continued unfunded research mentoring of University of Florida student (Unfund1). Recruited as data management and data analysis expert in two new projects (Pend2 and Unfund2 as Co-PI).

Funded Research Projects:
- **[Fund1] PI (solo):** *Autonomous Procedural and Conceptual Interactive Lessons*
  Funding: Internally through ERAU-W SEED grant, 1/1/22--6/31/22. Applying for external funding (NSF grant programs BCSER & CAREER) in 2023.
  Roles: All aspects of the project.
  Brief Description: Development of interactive procedural and conceptual activities by leveraging automated feedback based on how a student responds.
  Preliminary Results: MyLab assignments may yield high scores on procedural assessments, but do not develop mathematical concepts. Students unable to transfer procedural skills to aeronautical contexts.
  Products: Two publications under review. Cataloged common responses to traditional exam questions in Precalculus course for automated feedback.

- **[Fund2] Co-PI:** *Community of Inquiry and Cognitive Load*
  Funding: Externally funded through NSF, 1/1/22-12/31/22 (year 2 of 3).
  Roles: Student Worker Management, Data Management, Data Analysis, Manuscript Writing, Presentations.
  Brief Description: Instructor and course creator interventions to improve students' cognitive contributions in online group discussions for a math and physics course.
  Preliminary Results: Student contributions to math and physics discussion posts are primarily of a social nature. Student cognitive contributions are overwhelmingly at the disseminating facts level. Discussion creation initiatives and instructor interventions have disrupted these initial student contribution patterns and encouraged higher level cognitive contributions.
  Products: One publication and two presentations. Python scripts for data management and data analysis.
- **[Fund3] Co-PI:** *Investigating Alternatively-Certified K-12 Math Teacher Content Knowledge*
  Funding: Internally funded through University of Florida, 1/1/22-12/31/22.
  Roles: Data Analysis, Manuscript Writing, Intervention Resource Design, Presentations
  Brief Description: Analyzing and developing resources for alternatively-certified K-12 Math Teachers in Florida.
  Preliminary Results: Available study resources superficially and inadequately address math content on Florida certification exam.
  Products: One publication under review and one presentation. Initial development of open-source intervention assignments.

Pending Funding Research Projects:
- **[Pend1] PI:** *Collective Knowledge Progression and Proliferation in Asynchronous Calculus Discussion Boards*
  Funding: Internally through ERAU-W SEED grant. Decision in Jan 2023.
  Roles: All aspects of the project in equal parts with two collaborators.
  Brief Description: Developing and refining a framework for analyzing how students' knowledge develops and spreads during asynchronous group discussions.
  Preliminary Results: Developed preliminary framework based on student discussions as well as method for presenting student interactions. Patterns for how concepts are integrated into another student's post and the types of arguments that encourage this integration have been identified.
  Products: One publication under review and one presentation.
- **[Pend2] Co-PI:** *Undergraduate Research for Fully Online STEM Students:*
  Impact of Expanded Curricular Options on STEM Attitudes, Identity, & Career Ambitions
  Funding: Externally through NSF. Decision in May 2023.
  Roles: Data Management, Data Analysis, Manuscript Writing, Presentations.
  Brief Description: Follow-up study to improve upon previously-funded NSF project (Research Scholars Program) that developed model for fostering undergraduate STEM research.
  Preliminary Results: There was strong interest by students and professors for an undergraduate program that encouraged research. Pilot provided evidence of efficacy related to workshops and the mentoring program as well as underscored barriers for students to begin research.
  Products: None contributed to so far.

Unfunded Research Projects:
- **[Unfund1] PI:** *Multidimensional Covariational Reasoning*
  Roles: Faculty Advisor, Manuscript Writing, Presentations
  Brief Description: Advising an undergraduate student on their research project. Examining how students reason about two or more quantities at the same time in 2d and 3d real-life scenarios.
  Preliminary Results: Students have trouble reasoning covariationally when time is not one of the quantities.
  Products: One publication and one present. Two digital activities that engage 2d and 3d covariational reasoning.

- **[Unfund2] Co-PI:** *Self-Regulated Learning through H5P*
  <u>Roles:</u> Data Management, Data Analysis, Manuscript Writing
  <u>Brief Description:</u> Investigating student opinion and self-regulated learning behaviors of H5P as a learning tool.
  <u>Preliminary Results:</u> None contributed to so far.

Publications:

- Bailey, T., **Chamberlain Jr., D.**, & Christodoulopoulou, K. (2022). *Undergraduate's covariational reasoning across function representations*. Conference Proceeding of the 24th Annual Conference on Research in Undergraduate Mathematics Education: SIGMAA on RUME.
- Faulconer, E., **Chamberlain Jr., D.**, & Woods, B. (2022). *A Case Study of Community of Inquiry Presences and Cognitive Load in Asynchronous Online STEM Courses*. Online Learning Journal. DOI: http://dx.doi.org/10.24059/olj.v26i3.3386.

Presentations:

- **Chamberlain Jr., D.** & Faulconer, E. (2022, Apr. 21). *How We Manage Large-Scale Data Collection*. Invited by Embry-Riddle Aeronautical University - Worldwide College of Arts and Sciences Brown Bag Lunch & Learn Series.
- Faulconer, E., **Chamberlain Jr., D.**, & Woods, B. (2022, April 13). *Instructional Efficiency in Asynchronous Online Discussions*. Online Learning Consortium Innovate conference, Dallas, TX.
- Paolucci, C., **Chamberlain Jr., D.**, & Vancini, S. (2022, Apr 7). *Investigating alternatively-certified teachers' mathematical knowledge for teaching calculus*. Joint Mathematics Meeting, Seattle, WA.
- Bailey, T., **Chamberlain Jr., D.**, & Christodoulopoulou, K. (2022, Feb 26). *Undergraduate's covariational reasoning across function representations*. 24th Annual Conference on Research in Undergraduate Mathematics Education: SIGMAA on RUME.
- Reed, Z., **Chamberlain Jr., D.**, & Keene, K. (2022, Feb 25). *Argumentative knowledge construction in asynchronous calculus discussion boards*. 24th Annual Conference on Research in Undergraduate Mathematics Education: SIGMAA on RUME.

Publications Under Review:

- **Chamberlain Jr., D.** and Jeter, R. (Submitted Dec 2022). *Utilizing Theoretically-Driven Distractors to Make Diagnostic Multiple-Choice Assessments Possible*. International Journal of Research in Undergraduate Mathematics Education (IJRUME).
- **Chamberlain Jr., D.**, Reed, Z., & Keene, K. (Submitted Dec 2022). *Collective Knowledge Progression and Proliferation in Asynchronous Calculus Discussion Boards*. International Journal of Research in Undergraduate Mathematics Education (IJRUME).
- Paolucci, C., **Chamberlain Jr., D.**, Redding, C., Vancini, S., & Reese, A. (Revised and Resubmitted Aug 2022). *Critical lessons from certification exam preparation materials for mathematics teachers' content knowledge and professional learning*. Journal of Teaching and Teacher Education.
- **Chamberlain Jr., D.** (Revised and Resubmitted Aug 2022). *How one instructor can teach a large-scale, mastery-based College Algebra course online*. Problems, Resources, and Issues in Mathematics Undergraduate Studies (PRIMUS).

Criterion III - Service: See <u>Faculty Handbook, Part</u>

Employee Evaluation

Response:

5 - Outstanding

Service to both Embry-Riddle and nationally are far beyond expectation for a 2nd year Assistant Professor. Highlights of service to ERAU-W include winning a CoAS-wide nomination to ERAU-W Faculty Senate Academic Technology Committee (and then being nominated as the chair of the committee) and assistance in developing an Applied Data Science minor in the MST Department. Highlights of service outside of ERAU-W include being a member on a National Science Foundation grant review panel and being nominated to chair the Mathematics Association of America Subcommittee on Technologies in Mathematics Education.

ERAU Service:

University Level

- **Chair** of Academic Technology Committee for ERAU-W Faculty Senate
- **Grant Reviewer** for ERAU-W Faculty SEED Grants

College Level

- **Member** of COAS Faculty Council

Department Level

- **Member** of hiring committee for tenure-track candidate in Data Science
- **Co-Developer** for Applied Data Science Minor
- **Coordinator** for Mathematics Minor
- **Course Monitor** for MATH 111 & STAT 412
- **Member** of Department Community of Practice

Professional Service:

National Leadership Roles

- **Chair** of the Mathematics Association of America Subcommittee on Technologies in Mathematics Education. *The mission of the Committee on Technologies in Mathematics Education is to synthesize and disseminate innovative research, resources, and practices on technology that lead to effective teaching*

and learning in undergraduate mathematics. Assists in writing MAA Instructional Practices guide.
- **Member** of the Mathematics Association of America Special Interest Group Research on Undergraduate Mathematics (SIGMAA on RUME) Nomination Committee. *The mission of the SIGMAA on RUME Nomination Committee is to solicit nominations and recommend members for leadership roles within the RUME community.*

National Grant Reviews

- **Member** of a National Science Foundation grant panel. Read 9 grants and discussed recommendations with grant panel.

Journal Paper Reviews

- Educational Studies in Mathematics (1)
- Journal of Mathematical Behavior (1)
- Mathematical Thinking and Learning (3)

Conference Paper Reviews

- Annual Conference on Research in Undergraduate Mathematics Education (3)

Performance Plan

Teaching plan:

Areas to consider include the following, quality of syllabus, use of oral and written communication assignments, use of technology, use of library, teaching methods, use of aviation examples, and evaluation of students.

Employee Evaluation

Response: Performance Objectives:
- Maintain students' evaluation of course above averages for College and University
- Improve available resources for instructors teaching Math 111

Scholarly and professional activity plan:

Faculty meeting attendance and participation, meetings with academic and administrative supervisors and colleagues, and other relevant activities.

Response: • Submit for external funding in

University and industry service plan:

Committee and other assignments. Include special appointment duties.

Response: