Publications

10-2021

Undergraduate Research in a Fully Online Engineering Program: Building the Framework of Support

Emily Faulconer
Embry-Riddle Aeronautical University, faulcone@erau.edu

Robert Deters
Embry-Riddle Aeronautical University, DETERSR1@erau.edu

Brent Terwilliger
Embry-Riddle Aeronautical University, brent.terwilliger@erau.edu

Follow this and additional works at: https://commons.erau.edu/publication

Part of the Higher Education Commons, Online and Distance Education Commons, and the Science and Mathematics Education Commons

Scholarly Commons Citation

Undergraduate Research in a Fully Online Engineering Program

Building the Framework of Support

PI: Emily Faulconer
Co-PI: Robert Deters
Co-PI: Brent Terwilliger

Undergraduate engineering programs often face low persistence and retention.

- Females and ethnic minorities are underrepresented and show lower persistence
- Certain minorities may be less likely to enroll in online programs
- Lower persistence and retention in online students across disciplines

Undergraduate research may increase persistence and retention.

Online students likely underrepresented due to access limitations

Proposed Solution: a framework of support

RSCH 202

Credit-bearing introduction to research course

Research Mentoring

Long-term partnership with faculty

Resources

Workshops, tutoring, and other resources

RSCH 395

Credit-bearing independent research course

Research on the pilot program was supported by the NSF (DUE – IUSE Level 1)

$295,966

Start Date: 10/15/2020

Duration: 36 months

The first step was to establish a Research Scholars Program at our Campus.

Requirements:

1. Completion of one or more terms of faculty-supervised research, demonstrating "proficient" or "satisfactory" for all research learning outcomes.

2. Presentation of one or more sessions (oral or poster) of original research at a conference or symposium (internal or external).

3. Participation in four or more research skills workshops.

4. Submission of manuscript of original research to *Beyond,* an external peer-reviewed journal, or peer-reviewed conference proceedings.

5. A letter of recommendation from a research mentor that demonstrates progress on one or more research learning outcome(s).

Next, we designed a research independent study course, RSCH 395.

Student Learning Outcomes

1. Evaluate information and its sources critically.
2. Define and articulate a research problem.
3. Design a course of action to solve a research problem using, as appropriate, multidisciplinary approaches.
4. Apply ethical principles in research.
5. Conduct research independently and/or collaboratively.
6. Reach decisions or conclusions based on the analysis and synthesis of evidence.
7. Convert relevant information into various communicable forms (e.g. equations, graphs, and diagrams)
8. Communicate research results.

A quick tour of the course:

Module 1 – Preparing for Research (2 weeks)
- Project Management Plan
- Literature Review
- Research Study Design & Safety
- Discussions & Self-Reflections

Module 2 – Engaging in Research (5 weeks)
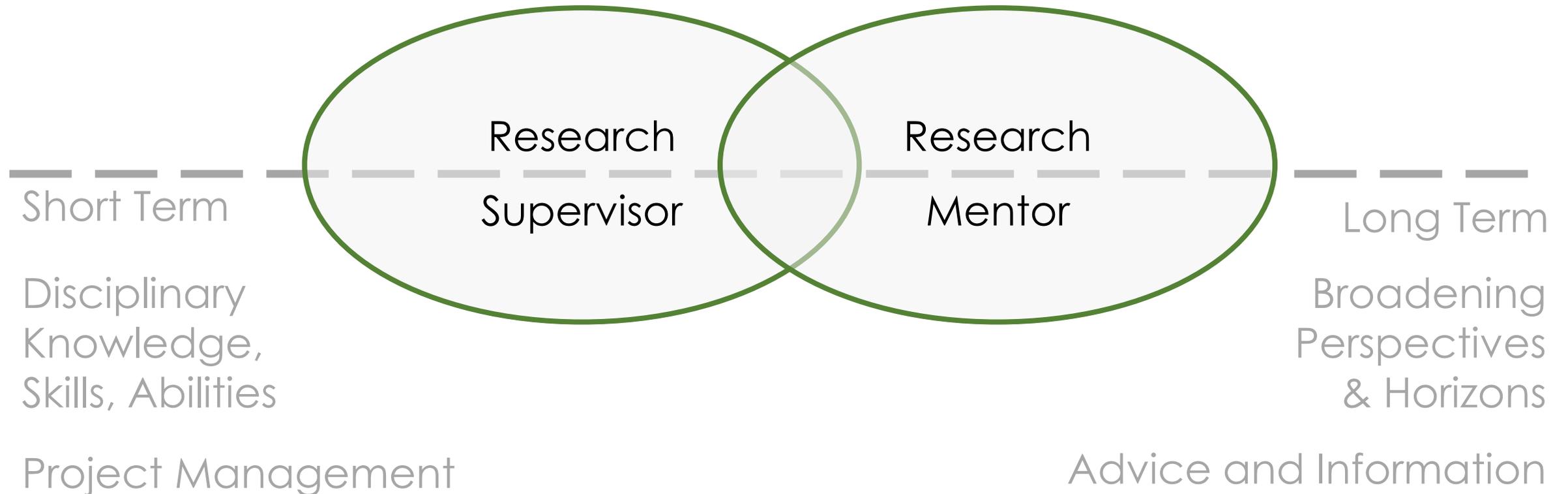- Project Status Reports
- Discussions & Self-Reflections
- Data Analysis

Module 3 – Preparing to Share Findings (2 weeks)
- Project Status Reports
- Discussions & Self-Reflections
- Manuscript Draft
- Research Dissemination Proposal

# The next pillar of support developed was research mentoring.

Short Term

Research Supervisor

Research Mentor

Long Term

Disciplinary Knowledge, Skills, Abilities

Broadening Perspectives & Horizons
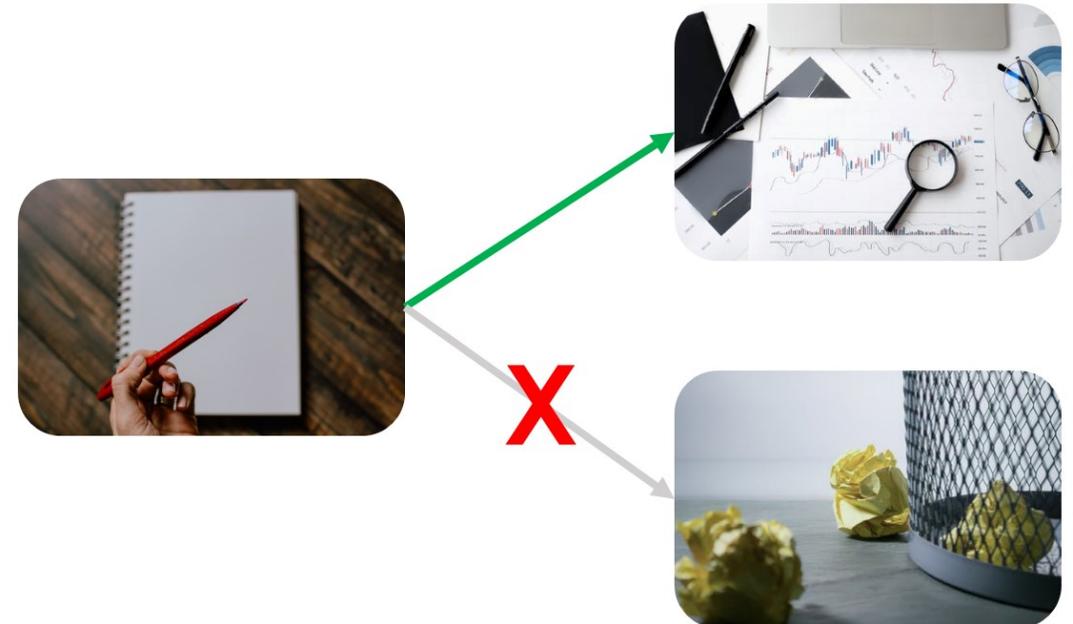
Project Management

Advice and Information

To provide networking opportunities, we established the Research Scholars Workshop Series.

September 2021: Formulating Your Research Vision
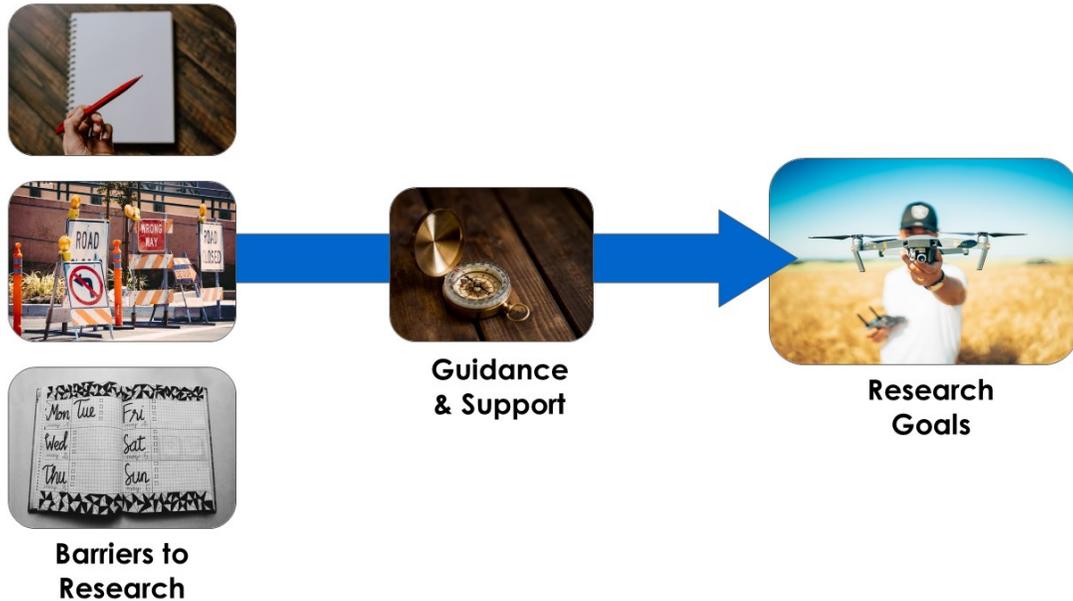
October 2021: Submission & Review Processes

Barriers to Research

Guidance & Support

Research Goals

Upcoming workshops welcome guest speakers from across the institution and beyond.

November 2021: Getting Your Paper Noticed

February 2022: Academic vs. Industry Research

March 2022: Research Next Steps – grad school and/or entrepreneurship

April 2022: Promoting Undergraduate Research on your Resume

Additionally, the program supports research-related communication using an existing initiative.

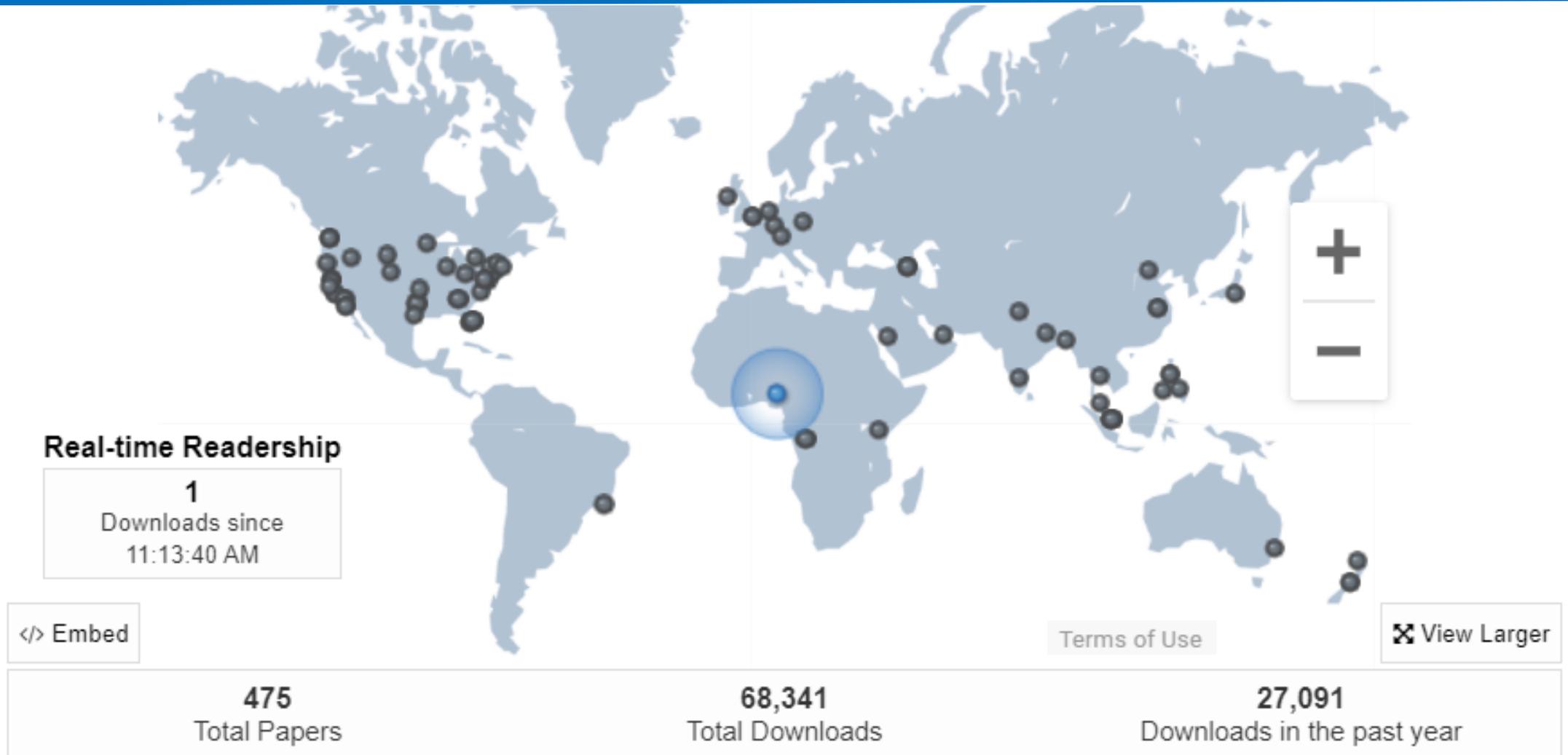Virtual Communication Lab (tutoring) embedded in RSCH 359

Mentors advertise relevant workshops hosted through VECTOR

Requested specific video resources be developed on research-related topics:

- ◆ How to write a problem statement
- ◆ How to write research questions
- ◆ How to read a journal article

Rather than coordinate a distinct event for a limited cohort, virtual participation at Discovery Day has been established.

Real-time Readership

1
Downloads since
11:13:40 AM

</> Embed

Terms of Use

✕ View Larger

475
Total Papers

68,341
Total Downloads

27,091
Downloads in the past year

And we tied it all together into a framework of support.

RSCH 202

Credit-bearing introduction to research course

Research Mentoring

Long-term partnership with faculty

Resources

Workshops, tutoring, and other resources

RSCH 395

Credit-bearing independent research course

We are advertising the Research Scholars Program and its components multiple ways.

ERNIE Banner

eUnion

Course announcements

Canvas page for Research Scholars Program

Mass student emails

Outreach to advisors and faculty

Challenges & Lessons: Administrative Hurdles

- ✓ Approval for Research Scholars program
- ✓ Approval to form new course
- ✓ Administrative responsibility and workload allocation when expanding existing mentoring program
- ✓ Revenue differences when substituting an independent study for an elective course
- ✓ College silos

Challenges & Lessons: Recruitment

✓ Internal Support: Find champions and supporters

✓ Build a cadre of faculty – a pool of potential research supervisors

✓ Present specific project opportunities, while communicating the option to choose their own adventure

Challenges & Lessons: Marketing

✓ Ensure clear and consistent messaging

✓ Common repository with updatable and shareable media

✓ Critical details

Challenges & Lessons: Growth & Sustainability

✓ Evolving to address unforeseen challenges

✓ Creating and delivering support materials (hosting and recording webinars)

✓ Formulating student involvement in already established faculty research projects vs. student developed projects

✓ Consider responsibilities, deliverables, and common actions

Challenges & Lessons: Technology

- ✓ Enable new capabilities and/or address previously identified challenges

- ✓ Accessibility

- ✓ Familiarization (individual, group, organization, field) through training and documentation
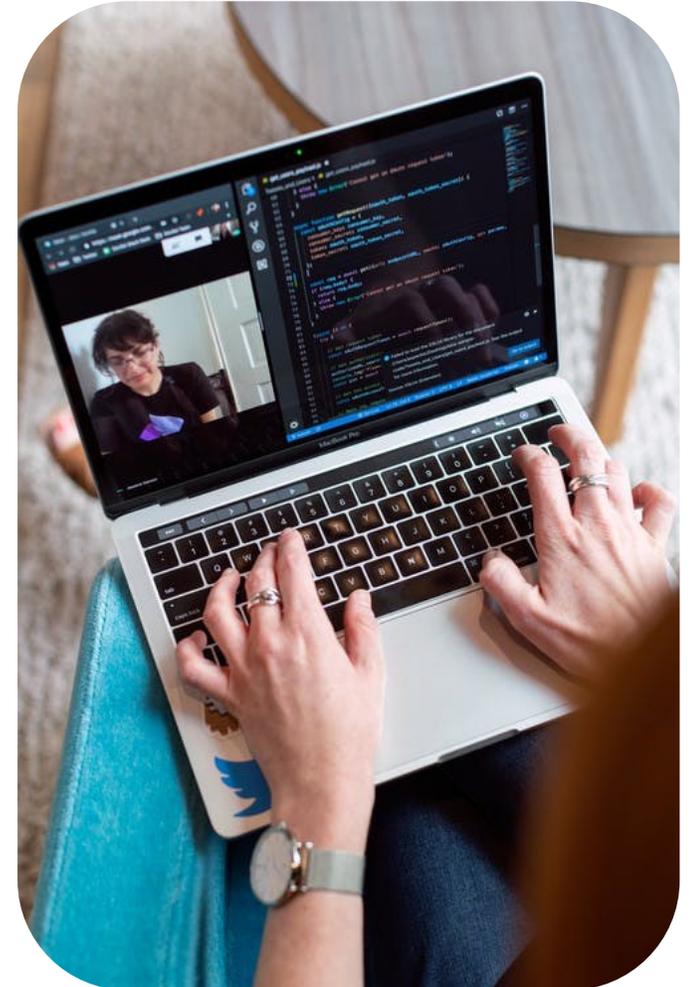
Program Evaluation: Research Productivity

Measure	Benchmark	Method
Publication of peer-reviewed scholarly work by Research Track students (BSET-R)	70% will submit a manuscript as a co-author by graduation	Direct inquiry
Entries in Scholarly Commons by BSET-R	70% will have at least one entry in Scholarly Commons	Direct inquiry
Presentation at an external conference by BSET-R	70% will present at an external conference by graduation	Direct inquiry
Presentation at an internal conference by BSET-R	70% will present at Discovery Day by graduation	Direct inquiry
Secure internal funding for research by BSET-R	50% will secure internal funding for their RSCH 359 experience	Direct inquiry
Achievement of the Undergraduate Research Certificate	50% will earn the award at graduation	Program Data

Program Evaluation: Mentoring

Measure	Benchmark	Method
Positive experience as a BSET-R mentee	90% report a positive mentoring experience	COMPASS Survey
Positive experience as a mentor	90% of faculty report a positive mentoring experience	COMPASS Survey

Program Evaluation: Faculty Development

Measure	Benchmark	Method
Faculty completion of research supervision related professional development	100% of supervising faculty complete activities developed for supporting undergraduate research	LMS Data
Faculty completion of research mentoring related professional development	100% of mentoring faculty complete activities developed for supporting undergraduate research	COMPASS Data

Program Evaluation: Student Outcomes

Measure	Benchmark	Method
Improved persistence of BSET-R	70% will take at least four (4) courses during the academic year	Institutional data
Improved retention of BSET-R	80% will stay in the BSET program after 1 year	Institutional data
Improved academic performance of BSET-R	80% will have a B-average or better	LMS data
Improved STEM identity of BSET-R	70% will report an improved STEM identity	Survey
Improved STEM attitudes of BSET-R	70% will report improved STEM attitudes	Survey
Improved transferable skills of BSET-R	70% will demonstrate improved transferable skills	LMS data & Institutional Data
Mastery of research learning outcomes by BSET-R	90% demonstrate "proficient" or "satisfactory" mastery at completion of RSCH 359	LMS data
Positive impacts for at-risk students	70% will report a positive impact	Institutional data; LMS data; Surveys

Questions?

faulcone@erau.edu

terwillb@erau.edu

detersr1@erau.edu