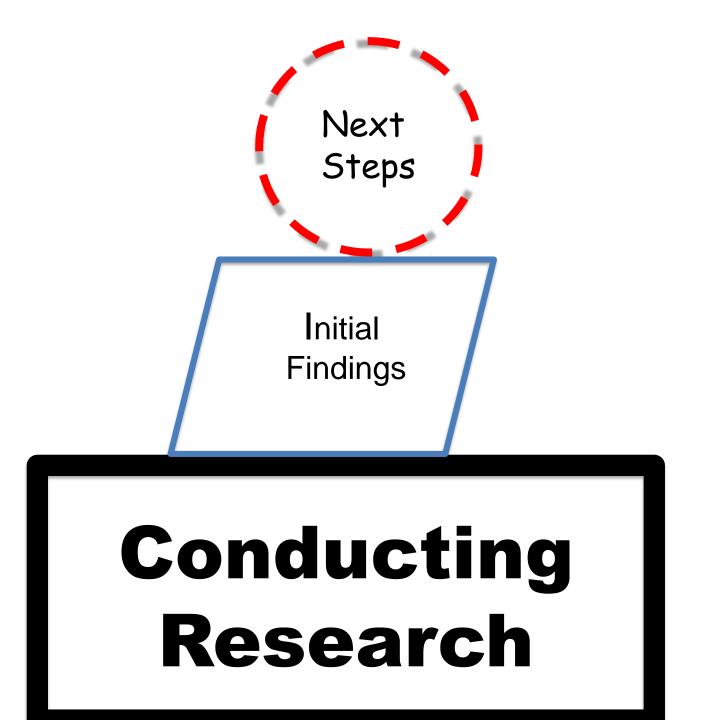
Benefits of evidence-based research: Investigation of STEM retention in chemistry

Dr. Ted Clark, Associate Associated Professor, Department of Chemistry and Biochemistry

Dr. Bridget Lee, Research and Evaluation Consultant

Enthusiasm for learning about "evidence-based" practices is common in STEM disciplines. Often, instructors are motivated to research their classroom innovations and share findings with colleagues, and this in turn leads to continued change. Frequently, however, the research projects are not themselves evidence-based. Findings from an evidence-based research collaboration focusing on STEM retention will be shared, along with the process of how the collaboration was designed.



Seek Professional Help



The Department of Chemistry and Biochemistry has sought to "research" and improve instructional practices for more than a decade...

...A recent collaboration with an educational researcher has taken these efforts to a much higher level. WHO cares about the topic of STEM retention in your department? And WHY do these people care about STEM retention?

Who cares about the topic of STEM retention in your department?

• Identify stakeholders.

Department Chair Instructors & Funding Students agencies

What aspect of STEM retention do you want to know more about? Why might some students choose to <u>change</u> majors from Chemistry/Biochemistry after their first year?

Why do students choose to <u>stay</u> in the Chemistry/Biochemistry major after their first year?

What factors might be affecting these decisions?

How can I find out what I want to know? Activities Outputs Outcomes

Offer introductory course for majors.

Active learning in labs

Classroom undergraduate research experiences

Peer Led Team Learning (PLTL) Directly related to your program activity and usually something you can count.

Students considering a change in major

Students staying in, or leaving, the major

Students graduating in the major The effect or impact of your outputs on people and systems.

Students have relevant info. about the major, and related professions.

Students support one another in the major.

Logic model

| | | | | Outcomes | | | | |
|--|---|--|---|--|---|---|--|--|
| Resources 🚃 | | Activities 🚃 | 🛶 Outputs 💼 | 🔿 Short-term 🗖 | | Long-term | | |
| Department level Research informed Faculty, Staff, Grad Students Achievement, demographic, & retention data Program Manager for First Year Experience/Mentori ng. Students Passion for subject. Goal oriented. High achieving. Beyond the Department Thriving STEM community. Mentoring opportunities. | • | Offer chemistry courses. On-going assessment of courses. Develop long- term assessment plan. Gather baseline data. Expand PLTL program. Develop mentorship opportunities. Develop resources for students. Develop resources for faculty/staff. | Number of students Enrolled in chemistry classes Enrolled in chemistry major Graduating with major Graduating change in major Number of mentor/mente e relationships *Each output counted in terms of gender. | Students have accurate, relevant info About chemistry major. About professions related to chemistry. More students have mentors More students feel like they belong in chemistry courses | • | Students support one another in the chemistry major Faculty/Staff better support students considering a change in major More students graduate with chemistry major More female students graduate with chemistry major | | |

Data Collection

Phase one

Develop a survey to measure student dispositions including:

- Motivation toward Chemistry,
- Epistemological beliefs toward Chemistry,
- Personal interest in Chemistry,
- Attitudes toward their chosen major and coursework in that major.

Lengthy "talk throughs" of the survey with current Chemistry students to clarify the survey and expand to additional areas of challenge and opportunity.

Revision of survey, then additional feedback from faculty.



Data Collection

Phase two

Interview of current Chemistry students in relationship to ideas that had been presented in the first phase. In particular, gender stereotypes in relationship to STEM were discussed in addition to other student dispositions. Educational Research, 5¢

Phase three Administering survey, initial data analysis.

Online link: https://osu.az1.qualtrics.com/jfe/form/SV_9pkz52v3nuf7sRn

Chemistry Student Survey

You are being asked to participate in this evaluation because you are taking or have taken a Chemistry course at OSU.

Purpose: The purpose of this evaluation is to understand your experiences before, during, and after taking a Chemistry course at OSU.

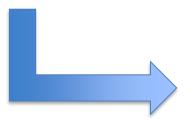
Participation: Your consent does not affect your ability to participate in the course or your grade for the course. If you agree to participate in this evaluation, you will complete a survey and may be asked to complete one interview. The survey addresses your experiences in the Chemistry course and will take approximately 15 minutes to complete. This interview will be audio-recorded, will not take more than 35 minutes, and will be administered by the evaluator. The evaluator may observe, collect, and analyze your work in the course. Besides the survey and possible interview, this will not be additional work beyond the scope of the course.

Risks of being in the evaluation: We know of no risks to you for participating in this evaluation. However, this evaluation may involve risks that are currently unforeseeable.

Benefits of being in the evaluation: There will be no direct benefit to be gained by you for participating in this evaluation. Society may benefit in general from this evaluation by gaining a better understanding of your experiences in chemistry courses.

Compensation: There is no compensation for participating in this evaluation.

Evaluator contact information: Dr. Bridget Lee 512-577-8621 or bridgetkigerlee@gmail.com (Evaluation and Consulting)



Instrument Framework:

- 59 Likert questions
- 7 open-ended questions
- and 5 demographic questions

Think about this Chemistry course you are taking right now. Please read the statement. Then select to what level you agree or disagree with the statement.

| | Strongly agree | Somewhat agree | Neither agree nor disagree | Somewhat disagree | Strongly disagree | Does not apply to me |
|--|-------------------|-------------------|----------------------------------|----------------------|-------------------|----------------------------|
| I feel confident in my ability to learn the material for this course. | 0 | 0 | 0 | 0 | 0 | 0 |
| I am capable of learning the material in this course. | 0 | 0 | 0 | 0 | 0 | 0 |
| I am able to achieve my goals in this course. | 0 | 0 | 0 | 0 | 0 | 0 |
| I feel able to meet the challenge of performing well in this course. | 0 | 0 | 0 | 0 | 0 | 0 |



Initial Findings...and Your Recommendations

- Students indicate they want to change majors with stated reasons
- Gender does seem to play a role in students' experiences in these classes
- Many students felt like they didn't know how to "do a Chemistry major"

