

**BioResource Research Interdisciplinary Major
Action Plan Following 2015 Program Review**

**Katharine G. Field
BioResource Research Director**

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Introduction

The BioResource Research (BRR) research-based undergraduate major in the College of Agricultural Sciences (CAS) is an interdisciplinary STEM (Science, Technology, Engineering and Math) major. BRR students take a challenging biosciences core curriculum. They choose an option (area of concentration), take upper-division option courses, do a 14-credit mentored research project, write a thesis in the format of a journal article, and give a public seminar. BRR currently has 14 options related to bioresources, in scales ranging from the global to the molecular, and encompassing interdisciplinary areas of global concern to agriculture, such as climate change, bioenergy, and water resources. Students shape their own upper division curricula with advice from their research mentors. BRR also houses the interdisciplinary Bioenergy Minor, similar in structure to BRR but open to students in all majors.

BRR had its program review on January 25-27. Reviewers included Dr. Michael Kahn, Washington State University; Dr. Sarah Schaack, Reed College; Dr. Martin Storksdieck, Oregon State University, Director, Center for Research on Lifelong STEM Learning; Anne-Marie Deitering, M.A., MLIS, Oregon State University, Curriculum Council Representative; and Dr. Joan Gross, Oregon State University, Curriculum Council Representative.

The review team met with the BRR director, adviser, representatives from various campus resources, faculty mentors, students, alumni, Bioenergy staff and GRAs, and CAS deans. They toured the lab of a BRR faculty research mentor and attended the BRR Poster Session, where senior BRR students present their research posters.

The committee's overall recommendation was to maintain the program at its current size. They stated:

"In particular, these elements of the program should be preserved:

- The current requirements for the number of research hours students must spend on the thesis project (480-700 hours) and the final product (thesis).
- The existing structure, which integrates course work starting in the first year that helps students develop the skills they need to: identify and meet with potential mentors; understand research opportunities available to them; understand their role(s) as student researchers; develop writing and presentation skills needed to communicate their research; Build research into the student experience from the start.
- The consistent monitoring of student progress by the program advisor(s).
- The practice of having students and mentors review and sign a contract at the start of the research project.
- The rigor of the core curriculum.
- Admissions standards that make the program accessible to all OSU students, without regard to traditional academic metrics like GPA or standardized test scores."

Specific Recommendations

The specific recommendations of the review team were:

1. Maintain the current size.

2. Increase funding available to offset research expenses for PIs mentoring students.
3. Provide additional academic support resources for students, especially in writing.
4. More staff/faculty support.
5. Better visibility.
6. Build opportunities for students to interact as a program or cohort.
7. Reexamine learning outcomes and assessment practices.
8. Clarity around credit and rewards for faculty participation.
9. Harvest the information learned from the experimental nature of the program.

Plan of Action to Address Review Team Recommendations

We have identified five goals, each related to one or more than one of the committee's recommendations, and specific actions to accomplish those goals.

Timing: We propose to implement the actions over the next 2 years (academic year 2015-16 and 2016-17), meet in the summer of 2017 to evaluate our progress in reaching the goals, and set new actions and metrics as needed.

Goal 1: Identify additional resources to support program, staffing, and students.

This goal arises from recommendations 1, 2, 3, 4, and 6.

Recommendation 1: Maintain the current size. BRR doubled in the last 10 years, although growth has slowed in the last 3 years. Thus it is unlikely that we could strictly maintain the current size without implementing selectivity, especially in the face of growing enrollments. It is difficult to imagine how to impose a selection system to exclude some students, yet maintain the essential BRR, keeping in mind that some of our current BRR students, who are wildly successful, would have been excluded if we had a selection in place.

One feature that makes BRR unique is that it is inclusive, not exclusive. BRR offers the benefits of a research-based major to any student who can maintain good academic standing. These benefits, including improved retention and graduation rates and acquisition of professional skills, help all students, not just selected students. BRR has a very high 6-year graduation rate of ~85%; in comparison, OSU's overall rate is 61.7%, and the 6-year graduation rate for students in STEM majors nationally is 38.8%. Furthermore, >25% of BRR graduates are minorities, compared to roughly 13% in CAS and 15% in OSU. This success, coupled with the way BRR explicitly fulfills OSU's mission and goals (by providing outstanding academic programs and an excellent teaching and learning environment leading to student persistence and success; providing more research/experiential learning opportunities for students; helping to close the graduation gap in students from underrepresented groups), strongly support maintenance of BRR's current admission policy. The Review Team recommended that BRR *preserve* "Admissions standards that make the program accessible to all OSU students, without regard to traditional academic metrics like GPA or standardized test scores".

The Review Team noted: “The program should not grow much beyond its current size, *unless additional resources are available to allow for the same level of advising and student support.*” Therefore, we propose to seek additional resources to support BRR’s current growth rate, which is slow but positive. Linked to this, however, we propose to take no *additional* actions to actively recruit additional students (see Recommendation 5), so that growth will remain slow and organic. Our current recruitment relies on START advising, our website/web presence, and word of mouth; we will not change this (for now), as increasing our visibility might strain the program’s resources.

Recommendation 2: Increase funding available to offset research expenses for PIs mentoring students. Some faculty felt that lack of financial resources limited their ability to mentor students. Therefore, we propose to identify or create more opportunities for research support for students.

Recommendation 3: Provide additional academic support resources for students, especially in writing. We propose to add a 0.25 FTE GTA, to assist with courses and to organize study tables or tutoring as needed.

Recommendation 4: More staff/faculty support. BRR’s current staff consists of a director, funded at 0.15 FTE, and an instructor/advisor, funded at 0.87 FTE, with an additional 0.13 FTE of the advisor’s time paid by one of the director’s grants. Both director and advisor are overextended and work in overload. The director needs assistance with student/mentor initial meetings and progress meetings, student thesis committees, teaching BRR 403, curriculum review and oversight, and assistance with grading in BRR 200. The instructor/advisor needs assistance with grading in BRR 100, 409, 406, and 407, newsletter preparation, and routine office jobs. This infrastructure support would free up more time needed to work with students, as the instructor/advisor currently teaches 4 BRR courses, meets with BRR students a minimum of once a term, represents CAS on committees, and advises two student clubs related to CAS’s/OSU’s diversity initiatives.

The Review Team noted: “A key strength of this (and many similar programs around the country) lies in the “high-touch” mentoring and coaching that students receive”; they furthermore said: “Because of the uniqueness of the program and its benefits to the College and the University as a testing ground and to OSU students as an accessible pathway to rich learning experiences, we strongly recommend that this program be exempted from typical standardized metrics based on student credit hours or size used to evaluate program viability.” The Review Team also observed that: “The structure of the program options provides a framework that allows OSU to create new curricular offerings quickly and flexibly.” However, creating and maintaining BRR’s unique curricular offerings requires considerable time from the director.

Therefore, we propose to add a part-time GTA and an assistant director, and increase the advisor position to 1.0 FTE. We also propose to analyze current program delivery to identify efficiencies to help relieve demands on staff time.

Recommendation 6: Build opportunities for students to interact as a program or cohort.

BRR’s budget comes from the office of the CAS Assistant Dean for Academic Programs, and up until now, we have not had sources of funding that could be used for food, student social events, and the like (e.g., a Foundation account). Therefore, we propose to seek a source of non-State funds, such as a Foundation account, that could be used for student social events. With these funds, we could provide food, facilities rentals, and other expenses need to sponsor regular BRR

events, such as orientation and graduation parties, receptions for parents of graduating seniors, student journal clubs, and the like.

Objective 1.1 Increase CAS support of the adviser's position to 1.0 FTE. [note: CAS Deans have already offered to do this. No further action needed].

Objective 1.2 Add an additional 0.25 FTE of staff support, divided between the director (an additional 0.05 FTE, for 0.2 FTE total) and a new assistant director (0.2 FTE).

Objective 1.3 Add a part-time GTA (0.25 FTE) to support the BRR classes and help with newsletter preparation, office support, and tutoring as necessary.

Objective 1.4 Identify additional financial resources to support faculty mentors mentoring BRR research students.

Objective 1.5 Identify additional financial resources to support student social events, to be used as cohort-building activities.

Action 1.1 The director will seek additional staffing resources from CAS Administration, for additional Director FTE and a GTA. To support our request, we will present strong BRR program metrics, including graduation rates, participation of underrepresented students, and program review results, along with a list of staff's current responsibilities.

Action 1.2 The director will seek additional financial commitments from the Provost's and Vice Provost's Office, for staffing FTE. To support our request, we will present strong BRR program metrics, including graduation rates, participation of underrepresented students, and program review results, along with a list of staff's current responsibilities.

Metric of Success: Positive response on the part of the CAS Dean and the Provost's/Vice Provost's Office to increase staffing support.

Action 1.3 The adviser will consult with the Research Office and Office of Undergraduate Research, to seek additional sources of financial support for undergraduate research.

Action 1.4 The director will seek support from the Dean to work with CAS fundraisers for a fundraising campaign to provide research monies for BRR students and their faculty mentors, and a source of funds for student social events.

Metric of Success: Additional research support for students and their mentors, and funds usable for student social events.

Objective 1.6 Increase program efficiency to help relieve demands on staff time.

Action 1.5 In monthly meetings, the director and adviser will analyze current program delivery to identify ways to increase efficiency without compromising the program's strengths. For example, we could streamline some of the tasks performed by the adviser and director, by adding specific material to the BRR introductory classes so this material does not have to be presented individually to each student. **This objective can be accomplished with no additional financial support, and could help mitigate some of the need for additional support.**

Metric of Success: Students receive and retain necessary information in BRR introductory class so as to increase program efficiency while allowing Director and Advisor to focus on other aspects of the BRR degree program.

Goal 2: Increase academic support resources for BRR majors.

This goal arises out of Recommendation 3.

3. Provide additional academic support resources for students, especially in writing.

Many BRR students are enrolled in the same courses each term; for example, a group of BRR students may be enrolled in the Chemistry, Biology, Organic Chemistry, Biochemistry, or Statistics series. This suggests ways to facilitate support for these courses, either through formal tutoring, or formation of study groups. In addition, while good tutoring support is available for general-level courses (e.g., Mole Hole for General Chemistry), it is usually not available for upper-division courses (e.g., Organic Chemistry), but is much needed.

BRR students are required to write a thesis in the format of a scientific journal article. The BRR WIC course, BRR 403 (Thesis) comprises required but ungraded writing assignments (a research proposal, laboratory notebook, and progress report) that students complete over several years, as well as a thesis. In the second BRR course (BRR 200), students learn about and write a research proposal. BRR majors also take Bacc Core required writing courses (one of which must be Technical Writing). Since winter of 2015, a comprehensive pre-post survey of writing skills has been administered to BRR 200 students and BRR graduates, in order to better understand how students are learning to write as science professionals, and use the knowledge gained to better support student writing.

Objective 2.1 Create opportunities for academic support for BRR students.

Action 2.1 The new GTA will organize study tables for courses taken by groups of BRR students, to be held in BRR's Resource Room.

Action 2.2 The advisor will consult with departments in which BRR students take challenging courses to explore obtaining tutoring support in upper division courses. This action can take place with no additional financial support.

Metric of Success: Study tables are organized and subsequently used by BRR students.

Objective 2.2 Support the development of science writers in BRR.

Action 2.3 The director will continue to administer the science writing survey, and analyze its results. The data analysis will lead to recommendations on how to support BRR student writing.

Action 2.4 The director will submit a curriculum proposal to allow students to choose to take *WR 362 Science Writing* in place of *WR 327 Technical Writing* if desired.

Action 2.5 The director will consult with faculty who teach writing about the possibility of courses to better support students engaged in undergraduate research.

Action 2.5 The director will introduce reflective practice on science writing into BRR 200 and at the beginning of BRR 403.

Action 2.6 The director will increase the number of class meetings of BRR 403.

Metric of Success: Since we are administering a writing survey to new students in the program (students enrolled in BRR 200) and graduating seniors, we can track student responses to see whether these actions lead them to feel better supported in writing.

Goal 3: Strengthen cohort interactions and identity.

This goal arises out of Recommendation 6.

6. Build opportunities for students to interact as a program or cohort.

We propose to hold regular BRR events, organize student-led clubs, field trips, and service. However, the objectives and actions proposed below involve the advisor and director taking on additional responsibilities; the amount of time they can spend on this is somewhat dependent on additional program support.

Objective 3.1 Organize a BRR club, to be student-led once established. The club will provide opportunities for field trips, service learning, social events, speakers, and academic-related events.

Objective 3.2 Hold at least one BRR social event per term.

Action 3.1 The director, adviser, along with any new staff including the GTA and assistant director, will meet to discuss how to facilitate the establishment of a student-led BRR Club.

Action 3.2 The staff will hold a meeting with interested students to get the club started.

Action 3.3 The adviser will help the students with the paperwork and protocols needed to establish a student club.

Action 3.4 The director or the adviser will attend club meetings and help find opportunities for field trips, speakers and service learning in which the students are interested.

The following action can take place with no additional financial support:

Action 3.5 The director and adviser will plan and hold at least one BRR social event per term.

Metric of Success: Opportunities to interact as a program or cohort will be measured by frequency of participation.

Goal 4: Revise program learning outcomes and assessment

This goal arises out of Recommendation 7:

7. Reexamine learning outcomes and assessment practices.

BRR currently has seven program outcomes:

- Retain and articulate the fundamental concepts of biosciences and bioresource sciences, and of the physical and mathematical sciences that support these fields.
- Understand the scientific method, including acquisition and integration of knowledge through observation and experimentation, the use of evidence, and hypothesis testing.
- Design an experiment, collect, analyze and interpret data.
- Competently convey the meaning of research results in written and oral format, and demonstrate the ability to communicate with both professionals and the general public.

- Demonstrate competency in their specific disciplines, and master and discuss the most important contemporary issues.
- Think critically and creatively to solve problems.
- Demonstrate professionalism, a strong work ethic and the ability to contribute to a team.

We propose to simplify program learning outcomes and more clearly articulate their assessment.

The following objectives and actions can take place with no additional financial support:

Objective 4.1 Revise and simplify the learning outcomes.

Objective 4.2 Revise and clearly articulate assessment.

Action 4.1 The director will meet with assessment professionals, including the expertise in the Center for Teaching and Learning, on campus for guidance.

Action 4.2 The director will meet with faculty research mentors to discuss learning outcomes.

Action 4.3 The director and adviser will meet to revise rubrics for courses and assignments, where needed, and for the student thesis and final seminar.

Action 4.4 The director will create a scoring guide for the thesis and final seminar, to be filled out by each student's thesis committee, which will assess the program learning outcomes.

Metric of Success: Concise and clearly articulated outcomes that are directly assessable.

Goal 5: Harvest the information learned

This goal arises out of Recommendation 9:

9. Harvest the information learned from the experimental nature of the program

Objective 5.1 Regular of options.

Objective 5.2 Collaborative research on the program, to understand what elements are important and why it works.

Action 5.2 The director will convene committees of faculty in appropriate disciplines to review the option curricula, starting with the options that have not been reviewed recently, and setting up a four-year rotation for option review.

Action 5.2 The director will seek collaborations with faculty in the Center for Research on STEM Education, and College of Education, to study the success of BRR, research-based education, and STEM education for underserved minority students.

Metric of Success: Best practices will be identified and communicated to administrative personnel seeking to improve retention and graduation rates, especially in closing the gap in these rates.

Recommendations we will not address

5. Better visibility

There are numerous opportunities for students to learn about BRR (e.g. word of mouth; START advising; OSU, CAS and BRR web pages; student research presentations on campus). Enough students are aware of the program as evident by the enrollment doubling in the last ten years. Better visibility might exacerbate the overload the staff is currently experiencing. Until the staffing situation can be improved, therefore, we do not propose to add visibility. However, we will add a question on our exit interview to find out how current students found out about the program.

8. Clarity around credit and rewards for faculty participation.

We have already added this information to the packet of information that is presented to every mentor in the student-director-research mentor meeting held when each student starts research. Thus the information will be explicitly presented to every faculty member participating in the program. Furthermore, we have already begun writing thank-you letters to faculty mentors and their department chairs.