**Review of the Biology Program at Fitchburg State University, Spring, 2025** 17 May 2025

Kyle S. MacLea, Associate Professor, University of New Hampshire at Manchester

**Context**

I was invited to undertake an external evaluation of the Biology Program at Fitchburg State University, including their two degree programs (B.A. and B.S.) in Biology. I was provided with the 2017-2024 self-study report prepared by the Program within the Department of Biology and Chemistry in the Fall of 2024. This self-study document focused on the period of time since the last program review in Fall of 2017 and the external evaluation by P. Boily of WCSU in May 2018.

I visited the campus on Friday, May 2nd, 2025 and met with the Chair of Biology and Chemistry, members of the faculty, students, and administrators. I subsequently held a virtual meeting with the FSU librarians on Monday, May 5th, 2025, via Google Meet.

This external evaluator's report for the Biology Program is based on my read of the self-study report, my conversations with the stakeholders above, and my own experience at a similar public academic institution in New Hampshire. Below, I detail my evaluation of the academic program and provide some points for members of the faculty to consider as they think about next steps for the Program's evolution.

**Key Points**

The Biology Program at FSU offers both B.A. and B.S. degrees in Biology, with several concentration options in the B.S. Faculty are dedicated and well-qualified, with strong engagement in student research, pedagogy, and retention initiatives. Hands-on, research-based learning is a cornerstone of the Program, supported by grant funding and embedded tutoring. Students express high satisfaction with their education, citing strong mentorship, research opportunities, and connections to careers and graduate pathways. Despite enrollment declines—mirroring regional trends—numbers in the Program appear to be stabilizing and faculty are actively working to improve retention. The facilities on campus are excellent, the equipment is research grade, and technical and administrative support is critical for current operations. Overall, the Biology Program is robust, student-centered, and well-managed, and I anticipate continued success through the work the Program has discussed on strategic, incremental improvements, particularly in the areas of enrollment and retention.

**Summary of Academic Program**

The FSU Biology Program has two Bachelor's degree programs, a Bachelor of Arts and a Bachelor of Science degree, with several concentration options within the B.S. offering (B.S. in Biology with Initial Teacher Licensure, Health Sciences, Biotechnology, Neuroscience and Behavior, and Environmental Biology). A Biology Minor is also offered, as well as a minor in Neuroscience, Cognition and Behavior (shared with Psychological Science).

The B.A. and B.S. degree programs share most of the core requirements, with the B.A. requiring completion of a language requirement and providing flexibility in organic chemistry and in physics, with the requirement for each shortened to one semester, and a substitute requirement to complete one PHYS and one GEOG elective course instead. Otherwise, the two degree programs have identical requirements for core courses, electives, capstone, mathematics, and general education courses. The different concentration offerings change the elective requirements but are otherwise identical. Currently, the Health Sciences concentration is by far the most popular concentration offered, although the other available concentrations, with the exception of Initial Teacher Licensure, remain consistently popular at a lower level.

A connected Chemistry Major (with concentrations in Chemistry with Initial Teacher Licensure or Biochemisty available) is also offered within the Dept. and provides opportunity for cross-training and interdisciplinary student research.

Minors in Biology, Chemistry, and Neuroscience, Behavior and Cognition, are notable and well-enrolled.

During the review period, contributions to graduate programs (M.A., Biology, Post-Bacc Initial Licensure (8-12) and M.Ed. Science Education) were concluded, with the final student graduating in winter of 2023. Low enrollments made these program suspensions and closures necessary and at this time there does not seem to be a need to reverse these decisions.

**Connections with Other Academic Programs**

Biology faculty provide important service to other FSU academic programs, particularly in health-related majors. By the numbers, approximately 1 in 4 students in BIO classes are not Biology or Chemistry majors, with BIO courses serving both the general education curriculum and also the needs of allied health majors, in particular Nursing and Exercise & Sports Science. First Year Experience (FYE) and Honors Program classes are also offered. Anatomy & Physiology and Intro to Life Science are the biggest contributor to these service offerings, but Nutrition, Med Micro, Gen Bio I, and Life Science for Educators are significant offerings, with other courses also taken outside the major at slightly lower levels.

The Program faculty offer courses across 4 of the general education categories: AIA: Integrating & Applying Learning, PL: Procedural & Logical Thinking, PW: Personal Wellness, and SI: Scientific Inquiry & Analysis. This is a very important contribution to the greater University, and the percentage of non-science majors taking advantage of Program offerings gives ample evidence that the Program faculty are providing a substantial service to FSU that is recognized and appreciated by its students.

The Program faculty have many important connections across other majors and programs on campus, particularly, but not exclusively, Chemistry, Nursing, Exercise & Sports Science, Environmental and Public Health programs, and Education. Given Departmental relationships there is perhaps no surprise that the integration with Chemistry appears particularly keen, with many students crossing the two major boundaries to complete minors and engage faculty in cross disciplinary research.

**Faculty**

Faculty in the Biology Program are passionate, dedicated scholars and teachers, with a strong, evident commitment to best practices and high-impact pedagogy. A review of faculty education and experience indicates well-trained faculty across all of the classic subdisciplinary areas needed for a Program of this size. All fields and several subfields are represented, although given the loss of ~5 people across the reporting period, it is inevitable at current Program sizing that leaves and sabbaticals will leave some fields underrepresented for 1-2 semester stretches. It will be very important to proactively manage such situations, and it is recommended that the administration pay particular attention to this issue. While service course impacts taught by fewer faculty (A&P, Med Micro) are particularly likely to impact students, temporary leaves across any of the Program faculty are likely to impact concentrations, student research opportunities, and advising (*e.g.* pre-health) that are also key to providing the student experience that FSU undergraduates have come to expect from the Dept. of Biology and Chemistry.

Enrollment challenges, found across the region and at all comparable institutions including my own, are being thoughtfully considered by the faculty of the Biology Program. This has included an emphasis on providing both advising and services to students at-risk for retention problems. The faculty have also very intentionally integrated embedded tutoring in challenging introductory and core courses and have sought grant funding (*e.g.,* Moderna Charitable Foundation and NSF S-STEM grants) to recruit, retain, mentor, and support students in the Program. Indeed, the faculty have very good evidence that the Moderna 1-year program had substantial positive effects on GPA and retention in the first generation and high retention risk students targeted in the program.

Conversations with faculty and students included lots of discussion around the role of faculty-directed student research as key components of faculty scholarship, student experiential

learning, and course-based hands-on experiences to enhance training. The inclusion of required CURE or other research-based learning in each student's capstone requirement in the Program emphasized the importance that research plays in the Biology Program. All of these are core best practices for the teaching of Biology and it is clear that the faculty take this practice very seriously and that students in summer or academic year research experiences find these experiences extremely valuable and would only like to see greater emphasis on research. (More information will be included in the detailed student feedback below.). To support these research endeavors (through Balfour and then Moderna and NSF, as well as other sources), many faculty in the Program have worked together in grant and proposal writing.

In short, the faculty are extremely dedicated and unified in their support and aspirations for student success.

Support for faculty training and travel is present at around $400 per year per full-time member, with a smart allocation of priority to junior faculty and those presenting at conferences, with additional PD support available each year to faculty as well. It seems that the level of support as reported in the self-study document is sufficient for the needs of the Program. In my own experience, the costs of travel especially to national meetings have been going up every year, and my own institution's level of support for faculty travel is often well under the cost of travel. I'd like to encourage the administration to support more travel of faculty in the Biology Program if necessary, as this is important to maintain the pedagogical and scholarship expertise that is strongly noted within this dedicated faculty group.

**Support and Facilities**

Beyond faculty, department staffing includes a shared administrative assistant and two technicians.

The technicians are critical to teaching lab operations, as they are working (by all accounts at a high level) in prepping and setting up labs, ordering and stocking lab supplies, maintaining and enforcing environmental health and safety regulations (including chemical, biological, and other hazards as well as waste disposal), and monitoring the status of spaces, equipment, and supplies necessary to keep the academic functions running. The upcoming loss of the 10-month Chemistry technician looks to be a very important vacancy to fill quickly and with overlap to the existing retiring staff member to ensure a seamless transition, particularly of the important safety protocols. Speaking with experience in a Program that just lost a long-term lab manager due to retirement (who was subsequently replaced at a lower level and with no overlap to the departing staff member), I highly encourage the administration to ensure the Program is supported during this transition.

While underappreciated in many academic departments, the continued availability of faculty administrative support is an important contribution to faculty productivity in key faculty areas and it is encouraging to see that FSU has retained this support through a shared administrative assistant. I encourage FSU to continue this support for the Chair and faculty in the Biology Program. My own institution has greatly reduced this support and as a result faculty are spending far more time in completing administrative tasks far from their strengths and expertise.

In terms of facilities and equipment, I was impressed with the space available and the quality of that space. Equipment is high quality research-grade equipment, not lower-grade education-only type equipment and some has been recently upgraded based on monies received through proposal writing. Spaces are well designed for their uses as both teaching laboratories and also student-focused research spaces. Equipment will need to be continually refreshed to reflect new techniques and methodologies but also just due to breakage and aging of existing pieces. In my institution, we include part of our lab budget each year focused on repair and/or replacement of these pieces. As is largely true across all types of technology today, repair is often costly and not a good return on investment, except in the cases of very expensive capital equipment. Therefore, for small non-capital equipment, replacement is usually more cost-effective.

The Chair and the Program faculty are to be commended for their prudent management of the operating budget over the period of the self-study. Although budgets have largely remained flat or declined slightly (especially in light of recent inflation), the notable contributions of Strategic Funds from University-wide requests have shown substantial increases, especially post-pandemic. These funds appear to have contributed substantially to maintaining high-level operations and/or for equipment acquisitions or replacements. Because of this (and also due to targeted grant applications beyond this budget), the Program has been able to maintain and improve its equipment and supplies for student and faculty use. This was significantly apparent to me during my tour of the laboratory facilities—the Program is extremely well appointed.

Having met with Jacalyn Kremer and Lori Steckervetz from the FSU Library, it is clear that library resources (including books, periodicals, and video resources) are ample and of significant use for the Biology Program. The automatic embedding of some Library resources into Blackboard LMS is clearly of broad benefit to students. Some recommendations related to working with Library are included below in the recommendations section.

**Students**

I met with 7 students during the student session component of my campus visit. These students were all juniors and seniors, with about half having transferred from other institutions. The students in this session were all extremely engaged and interested in discussing the strengths and weaknesses of the Program in Biology, although a frank evaluation of the comments made by students cannot avoid the conclusion that the students interviewed were extremely positive

about the Program. Though I have some feedback based on the student comments (some of which is advisory, some true recommendations), the overwhelming view I come away with from the student session is that students believe the Program to be well-designed, their futures bright, and their faculty mentors to be invaluable shepherds of their academic progress.

Of the comments made by the students, numerous times the students expressed their enthusiasm for the research opportunities of the program, including CURE-based courses and capstone research projects, as well as summer research inside and outside FSU. One example comment that stuck with me was one student's comment that "No professors seem bored." There were no "black sheep" faculty mentioned—the students felt the faculty were unified and spoke with one passionate, supportive, realistic, flexible, and engaging voice. They felt the Program had "something for everyone" and that there were a lot of opportunities for hands-on learning with new and cutting-edge equipment. And that the Program faculty provided opportunities for students to connect with local biotech companies, summer REU programs, study abroad opportunities, and more. Students appreciated the early-admission and articulation agreement programs such as the LECOM program. I came away with an overwhelmingly positive student perspective on FSU's Biology Program.

**Enrollment and Retention**

Enrollment is a significant challenge. With a slide of Biology majors from 301 in AY17 to 170 in AY24, the number of students, particularly since the pandemic, has taken a substantial hit. This is, however, representative of the University as a whole (though Biology has shrunk as a proportion of the student body from 7.79% to 6.67%). AY24 has shown some small leveling-out or recovery, which is encouraging. However, this decline is likely representative of larger trends seen across the region (*e.g.*, changing demographics) and also due to some local factors. Local factors include unprecedented increases in the previous reporting period which were not sustainable, the new building just before the last reporting period, as well as the effects of the immediate COVID pandemic and its rebound effects. Lack of marketing was also mentioned as possible contributor. Declines in yield of admitted students are a regional and wide-ranging problem observed at my institution as well as many others regionally.

Another contributor to declining enrollment is loss of students from the major or from the University as a whole due to falling retention rates. Biology students have shown disproportionally poor retention compared to FSU as a whole, although the trend of a decline in retention is present across the entire institution. The Program has instituted several strategies to counteract loss of students, including more embedded tutoring, more early opportunities for student research, added First Year Experience courses, and DEI programming. There are some signs of a recent rebound in retention, though rates still slightly lag the University as a whole. But this rebound is encouraging. The Moderna 1-year experiment was one such opportunity that

appears to have been a successful intervention to raise students' GPAs although given its limited time-scale, its effects on long-term retention to major or University are likely hard to measure. Other future opportunities to implement this program again under different funding or sponsor may be a powerful way to investigate the power of this intervention scheme.

**Information and Recommendations**

In discussions with faculty, students, administration, and staff, I've included some ideas of a more informational nature and some specific recommendations. Some of these ideas are very granular and others are more broad. While I think some of these ideas could be useful, it's important to stress that my overall impression of the Biology Program at FSU is to "do more of what you are currently doing." The Program is serving its students very well and while improvements are possible, the current state of the Program is strong and very well regarded (both by me and by your students). Heavy intervention may end up doing more harm than good, so measured steps (like your targeted retention program) may be more important. I do not think large changes are warranted or advisable!

In speaking with faculty, students, and with Library, I heard some ideas mentioned that I think could represent food for discussion.

1. Given the loss of faculty positions over time, the importance of retaining teaching lines (and the selective addition of new positions) is more critical than ever. Fewer faculty strain course offerings and run the risk of breaking under the pressure of heavy service offerings like A&P and Med Micro. For student success to increase, another faculty line is warranted, especially given strain on these courses; further, a new faculty member should be research oriented, which would provide additional student research opportunities, preferably in an area less served by current faculty research disciplines.

2. Marketing and admissions, especially targeted towards the science majors, and special opportunities in FSU Biology, would be especially beneficial. Some of this should continue efforts made by faculty in terms of targeted local outreach. At my institution we've begun requiring faculty to participate in 1-2 outreach activities per year. Based on my read of the self-study, FSU Biology faculty may already reach this standard, but if not, it might be a good voluntary goal subject to other service responsibilities? Regardless, advertising for Biology by the professional University offices responsible for that work should be encouraged as well. Particularly:
    a. LECOM and other early admission programs
    b. Grant "stories" or special equipment acquisitions

c. Stories about students and their success, particularly those from target populations, *e.g.,* targeting Latino populations as part of the emerging Hispanic-serving institution focus
d. Share biotech networking events to local K-12, Community College, Industry, and other partners and students
e. The new Biotech Advisory Board can be a great way to receive info and to disseminate it to those partners
f. All of this can be web content but some could also be distributed on paper or QR code as vignettes for each major at Admissions events—student stories play very well
g. Educating the Admissions staff on what you do can only help. Could you assign one faculty member as a liaison to Admissions to funnel info and have periodic meetings with them?

3. Continue your important work on student retention. You have great ideas and have had some success. As much as it's possible to continue to acquire funding for this purpose, I would recommend you continue to seek this funding (*i.e.,* similar to your Moderna or Balfour money). Embedded tutoring is critical. Helping advise students to other majors quickly if courses are failed is also a valuable strategy, although do consider if 2.0 is the needed cutoff or whether other cutoffs could be used. (1.7? What would that look like?)

4. Do an exit survey of your students (we are starting this). Could be as simple as collecting a non-school email and a first plan of job or school or something more extensive to collect feedback (like one open-ended comment box for students to give ideas). You might want to do this well before the FDS survey, say, January of the final semester, to not conflict with FDS data collection but also to ensure you can stay in touch with alumni. Invite every alum to connect with a LinkedIn group? We have not done this well, but we do require every student to create a LinkedIn page. You could include that link to a student's profile in an exit survey too?

5. Biology library research guides get ~63% less use than average research guides at FSU. Greater integration of library research guides (through more course-specific guides or greater use of the Biology subject research guide) could be a way to increase information and data literacy . The Library is highly interested in greater collaboration. Something we have seen in our program is that bridging the "valley of death" between 1st year writing courses and final year capstone experiences is difficult if there are no scaffolded opportunities to build info/data literacy and writing skills along the way. How much this is already included in your sophomore/junior year course offerings is difficult for me to see as an outside reviewer, but as much as it is possible to consider how to scaffold the

development of these skills, I would recommend some consideration.

6. Classes of very large size (60-80) are not in keeping with best practices and the culture of FSU Biology. I'd like to recommend you continue with a focus on smaller classes taught chiefly by your residential faculty rather than adjuncts. Given your previous program review feedback, I'd like to make it abundantly clear that your focus on student engagement at manageable class sizes (54 or fewer students per class, most much smaller than that) will both better manage disproportionate faculty load in service classes and also keep classes small, which aids in retention, student success, and a feeling of place in the Program. It's clear your students feel a strong connection to faculty—let's keep it that way.

7. A few folks mentioned that "Independent Study" was rarely very independent. We've used terms like "Directed Research" in the past to encompass that concept of a student working under a faculty member to capture the concept of a student working under a mentor if that is helpful.

8. If it is possible under the terms of the CBA, make sure your "load" assigned to research based experiences represents the true time devoted to student research supervision (or at least is a better representation than may exist now). This is a constant struggle at many institutions, mine included, but it's worth a collaborative look by faculty and administration to make sure faculty research supervision work is counted in some realistic way in faculty load (when we know this is a very high impact practice and your student surveys bear this out).

9. I recommend faculty consider contributions of their collaborative student research work (and lab pedagogy development) to less traditional publications or faculty-to-faculty resources. At my institution, we encourage faculty to contribute to online shared resources (like QUBES) that we count within our P&T guidelines. Micropublications (like genome announcements or μpublication papers) are another popular route for PUIs where long-form publications would take many years. I also like pre-prints as something worth considering when peer-reviewed publications are not needed but we wish to get new student research out quickly. This came up in a discussion with faculty so I'm including it here if any are interested.

10. While students were really very positive about the program, some concrete concerns or ideas were shared. This is FYI as the students themselves recognize that some of this is unsolvable or beyond the scope of what the Program controls.

a. Multiple students mentioned a pharmacology capstone course would be of interest.
b. Some students mentioned desire for more animal phys or organismal/zoology courses, or that existing courses be offered more often.
c. Some students missed the advanced neuroscience and plant/botany courses.
d. Students suggested faculty poll them on specific course requests.
e. Students mentioned inconsistencies when a course was offered by multiple professors (biochem and physics were mentioned).
f. Students wondered if the Biotech Networking type day could be expanded to include enviro services or similar jobs or internships. Similarly the career fair was viewed as mainly health oriented with very few biotechs there.
g. Some students didn't really know how to get involved in research.
h. Some students said that they didn't know and had never heard of the direct entry / early admissions health programs like LECOM.
i. Most students expressed some mild concern over days with no lunch break between classes and that meant a 12:15-12:30 swarm at the vending machine for anything lunch-like. (Corrolary to this was the back-to-back classes proved challenging for final exams later on, although students recognized that they wanted to pack in classes for fewer trips to campus.). (Bigger vending machine? More lunch options?)
j. Couple students mentioned the science building doesn't have a water bottle filler but other campus buildings do.
k. One student mentioned having to drop a concentration because a needed course wasn't available in their last semester. Is it possible to "waive" or give an alternative course option for students in this circumstance? This seems like an issue that could have been solved in advising, so I wonder if the student didn't ask.

11. I've often wondered about hitting up alumni for support for student research. I read the May 2022 FSU Chemistry external evaluator's report, and I don't think I can really top his recommendation here: "many are unaware of a general observation that STEM alumni tend to be much more strongly tied to their home departments than to the University as a whole. Thus, they are more likely to provide time or funds to support those departments than they are a general fund. Recent alumni are not likely to be in a position to help financially, but bring back those working in the sciences to speak to current students (all four years) to talk about their experiences: what kinds of jobs are available, what things made them prepared for the jobs they have, what do upperclassmen need to do to secure jobs, … Students respond better to 'peers' (those who were sitting in the same desks they are currently) than generic 'career presentations.' Your alumni may also be able to help financially indirectly. Those working in industry may be aware of new instrument purchases by their companies. What's happening to the old instrument? Most

instrument replacement programs in industry are on a much shorter time-frame than in academia and companies would rather donate the old instrument to a school (for the tax deduction) than to just scrap it." (Turnbull, 2022)

12. We have in our M.S. program used a "co-op" model for students in Biotech (see below for M.S. description). It's been really successful, especially for our domestic students. We've been looking to add the 6-month biotech industry co-op to our undergraduate program in our next program modification next year. It might be something to consider!

13. I wanted to throw out one "out there" recommendation. You have a growing interest from students in biotech. We are a PUI but launched the Masters degree in Biotech above in 2020. It's been phenomenally successful. A lot of the coursework we offer as "Dual Credit" courses where we offer a senior-level course and a grad-level course at the same time and place but the grad students or accelerated "4+1" type students have to meet higher requirements. It's helped us ensure courses don't get canceled, it's been very popular with our home-grown honors and other students and has also brought in part-time local students who are working and international students who pay higher per-credit rates. It's really helped us balance budgets and offset declines in undergrad enrollment, and it's grown into a top-12 grad program across all of UNH. I know you have other universities in Massachusetts that offer this type of degree and you all know your Program and your needs much better than me—but this is just an idea and I thought I'd throw it out there to consider!

14. I mentioned to the Chair that we use our plant growth chambers to grow plants for Bio Club plant sales to fund activities. You might consider this if you like. It's been very popular with students who enjoy doing the plant work on the backend or on the front end with selling. And it makes money for Bio Club to do fun things.

Finally, I'd just like to emphasize again that I think the Program is doing very well based on all the assessments I've done as part of my reading and my visit. With proper attention to the enrollment and retention problems, I think the future is bright. Congratulations on an excellent Program that adheres closely to best practices and has demonstrated substantial self-reflection in the self-study document provided to me.