

BIOLOGY INITIATIVE PROGRESS

FEBRUARY, 2015

Biology Initiative: *Overarching Goal*

- Overarching Goal: improve the quality and efficacy of biology teaching and learning and to increase the retention and academic success of a diverse group of learners interested in the biological sciences



Biology Initiative: *Target Outcomes*

- Students will progress through a coherent, coordinated curriculum that includes common introductory and foundational courses.
- Students will have timely access to required courses.
- Students, faculty, advisors, and administrators will have a clear understanding of the curricular requirements and options across departments in the biological sciences.
- Introductory and foundational courses will include effective teaching and learning practices that increase student engagement.
- Increased numbers of students, particularly students from underrepresented groups, will be retained and succeed in biology studies at MSU.

Biology Initiative: *Challenges*

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[The Graduate School at Michigan State University - Departments](#)
grad.msu.edu/departments/colleges.aspx?College=NSC -
Biochemistry and Molecular Biology - College of Natural Science Major: Biochemistry and Molecular Biology - Environmental Toxicology 1,2,5. PHD, Major ...

[Faculty - Department of Biochemistry and Molecular Biology](#)
<https://bmb.natsci.msu.edu/research/faculty/> -
Christina Chan, Prof, System biology approaches and tissue engineering platforms, reconstructing signaling and gene regulatory networks; understanding how ...

[Ecology, Evolutionary Biology, and Behavior Program](#)
<https://eebb.msu.edu/> -
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Academics. The MSU Department of Biochemistry and Molecular Biology offers two programs that lead to the Bachelor of Science degree ...

[Human Biology Program | College of Natural Science at Michigan ...](#)
ns.msu.edu/index.php/departments/human-biology-program/ -
The Human Biology major represents an interdisciplinary liberal science degree and is appropriate for students who want a broad background in the fields that ...

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<https://eebb.msu.edu/> -
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[College of Natural Science at Michigan State University | College of ...](#)
ns.msu.edu/ -
College of Natural Science at Michigan State University is home to teaching and research in biological, physical and mathematical sciences. The breadth of ...

[Biology Major - Office of the Registrar - Michigan State University](#)
<https://www.reg.msu.edu/academicprograms/ProgramDetail.asp?...> -
Academic Programs: Biology Major. ... Following this section are the requirements as represented in Degree Navigator, MSU's online advising tool. The Degree ...

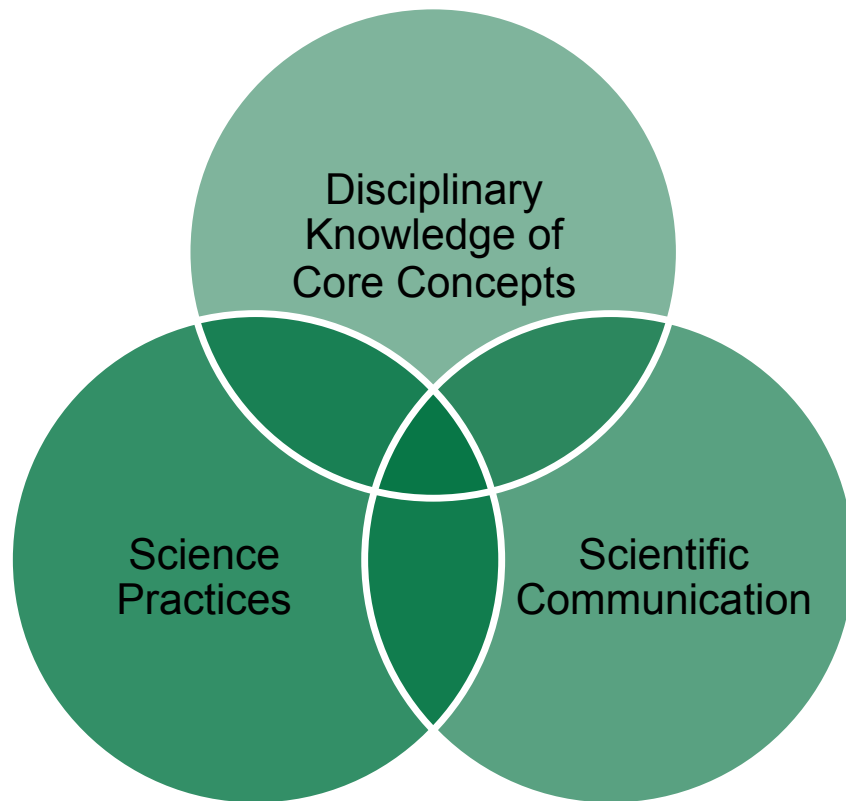
[Cell and Molecular Biology Program - Michigan State University](#)
cmb.msu.edu/ -
The Cell and Molecular Biology (CMB) program at Michigan State University is an interdepartmental Ph.D. program administered by the College of Natural ...

[EEBB -- Faculty List - Ecology, Evolutionary Biology, and Behavior ...](#)
<https://eebb.msu.edu/faculty.p?list=Alphabetically> -
Fungal and oomycete biology, epidemiology, genetics, host-pathogen interactions; diseases
University Distinguished Professor, Ph.D. Michigan State, 1980

Biology Initiative: *Organizational Structure*

- **BI Executive Committee (Biology Board)**
 - Chairs and directors
 - Responsible for collective decision making
- **BI Oversight Committee (Biology Advisory Committee)**
 - Faculty departmental representatives, academic staff, and core course coordinators
 - Provide guidance and feedback
- **Course Committees**
 - Courses taught by faculty from across departments that serve students from diverse majors
 - Evaluate and improve courses
 - Ongoing: BS161, BS162, ZOL341
 - New: ZOL355 and ZOL445

Vision for Undergraduate Biology Education at MSU



Students will integrate critical and scientific thinking skills with foundational knowledge in chemistry, mathematics, physics, and biology to analyze and solve problems, construct scientific explanations, and generate and communicate understandings in the biological sciences.

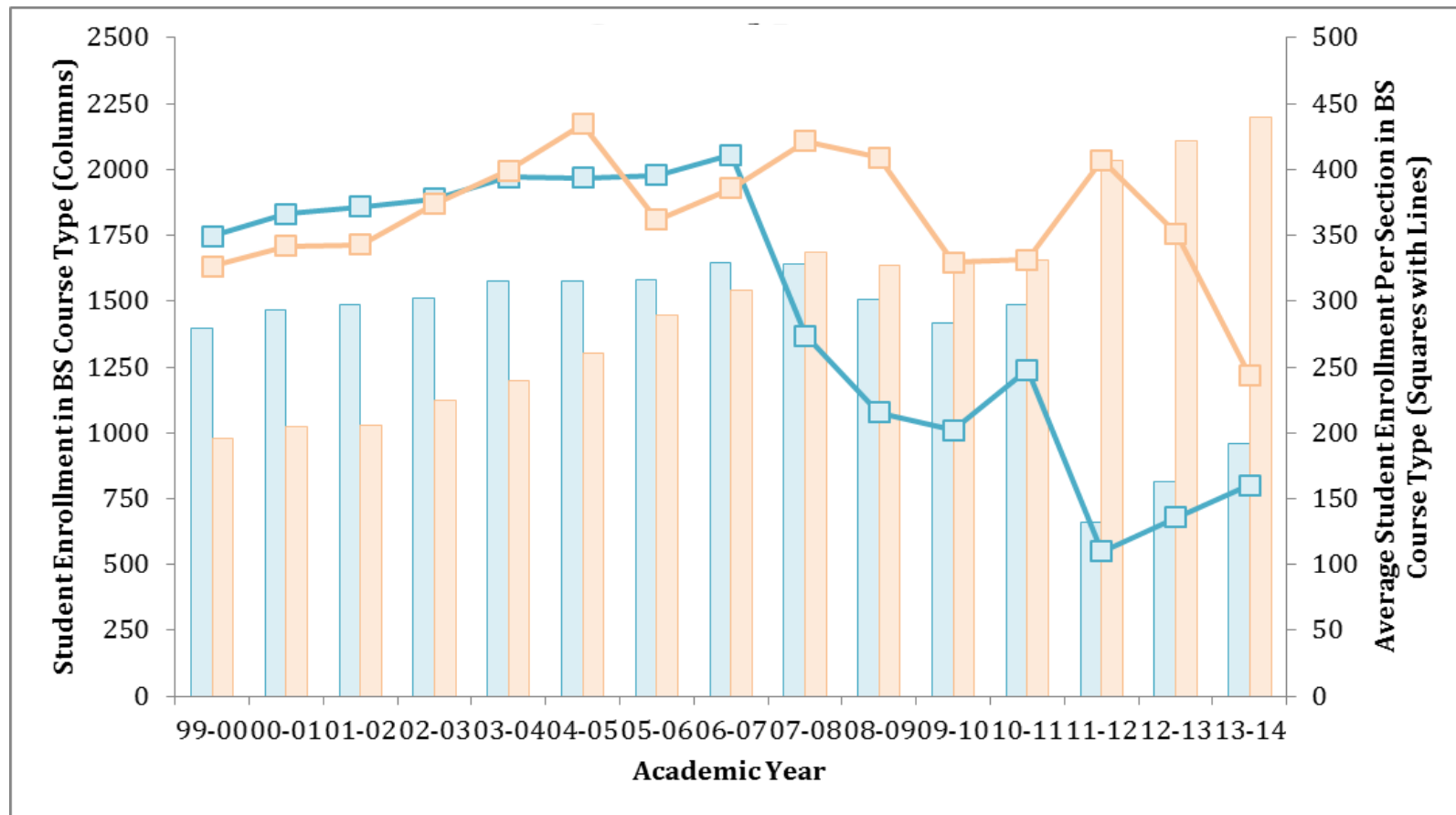
Biology Initiative: *Course Investments*

- ZOL341: Fundamental Genetics
 - Increased capacity
 - Reduced proportion of seniors taking the course
 - Reduced class size to facilitate increased student-instructor interactions
 - Ongoing work to develop and maintain a shared vision for the course based on common learning goals and objectives
- PSL310 and 431
 - Added TA support for recitation sections
 - Flipped classroom approach
 - Increased opportunities for student engagement in pedagogies associated with improved student learning
 - Group activities, clinical case studies
 - 80% of the students in PSL431 reported that recitations improved their performance in the course and enhanced their learning

BS161 Course Transformation

- Progress toward horizontal integration as number of faculty members involved in teaching the course expands
 - Regular meetings of the faculty
 - Adoption of a new textbook and on-line resources
- Reduced Section Size
- New Teaching Team Structure
- New Teaching and Assessment Approaches
- Coordination with BS162

Reduced Section Size



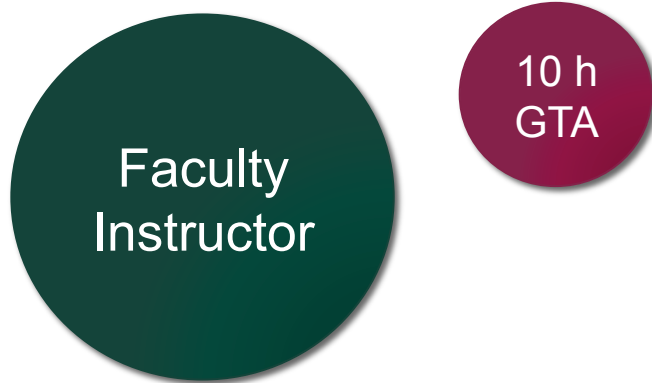
Source: Sarah Jardeleza

BS161 as a One Semester Course

- BS161 and BS162 comprise a two semester curriculum that addresses the big ideas in biology.
 - Many students take BS161 as a stand alone course.
- Short-term solution: Add additional section of PLB105
 - Provides full breadth of big ideas in biology in a one-semester course
 - 200 seats per semester
 - Work with Engineering and Nat Sci to encourage students with non-biology majors to fill the additional section
- Long-term: Develop PLB105 equivalent based on animals/humans in IBIO
 - Engineering and Nat Sci students with non-biology majors
 - May additionally appeal to programs such as Nursing and BLD

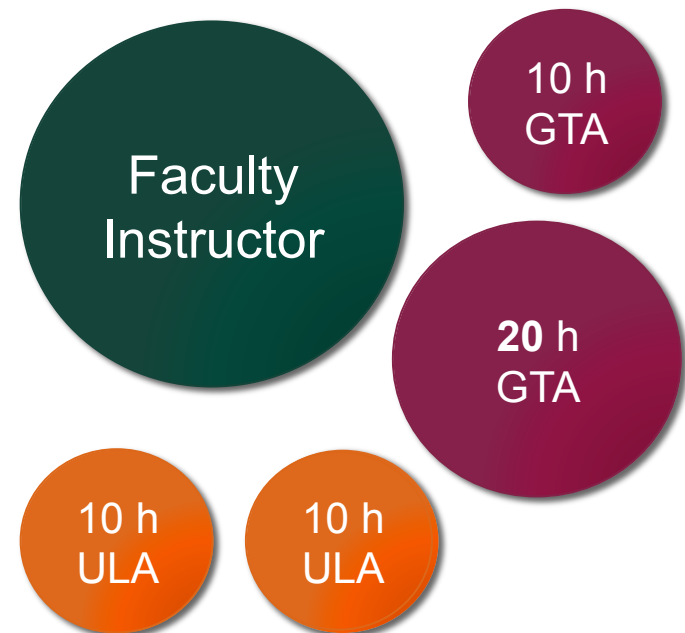
New Teaching Team Structure

Pre-Biology Initiative



~400 students/section

Post-Biology Initiative



250-300 students/section

 = 10 or 20 hour/week graduate teaching assistant  = 10 hour/week undergraduate learning assistant

New Teaching and Assessment Approaches

Pre-Biology Initiative

1. Lectures with active learning
2. Limited instructor-student interaction
3. Limited formative assessment and feedback mostly through clickers
4. Multiple Choice Exams
5. Electronic homework system
 - a. Overused text, many students google answers, which are readily available on-line

Post-Biology Initiative

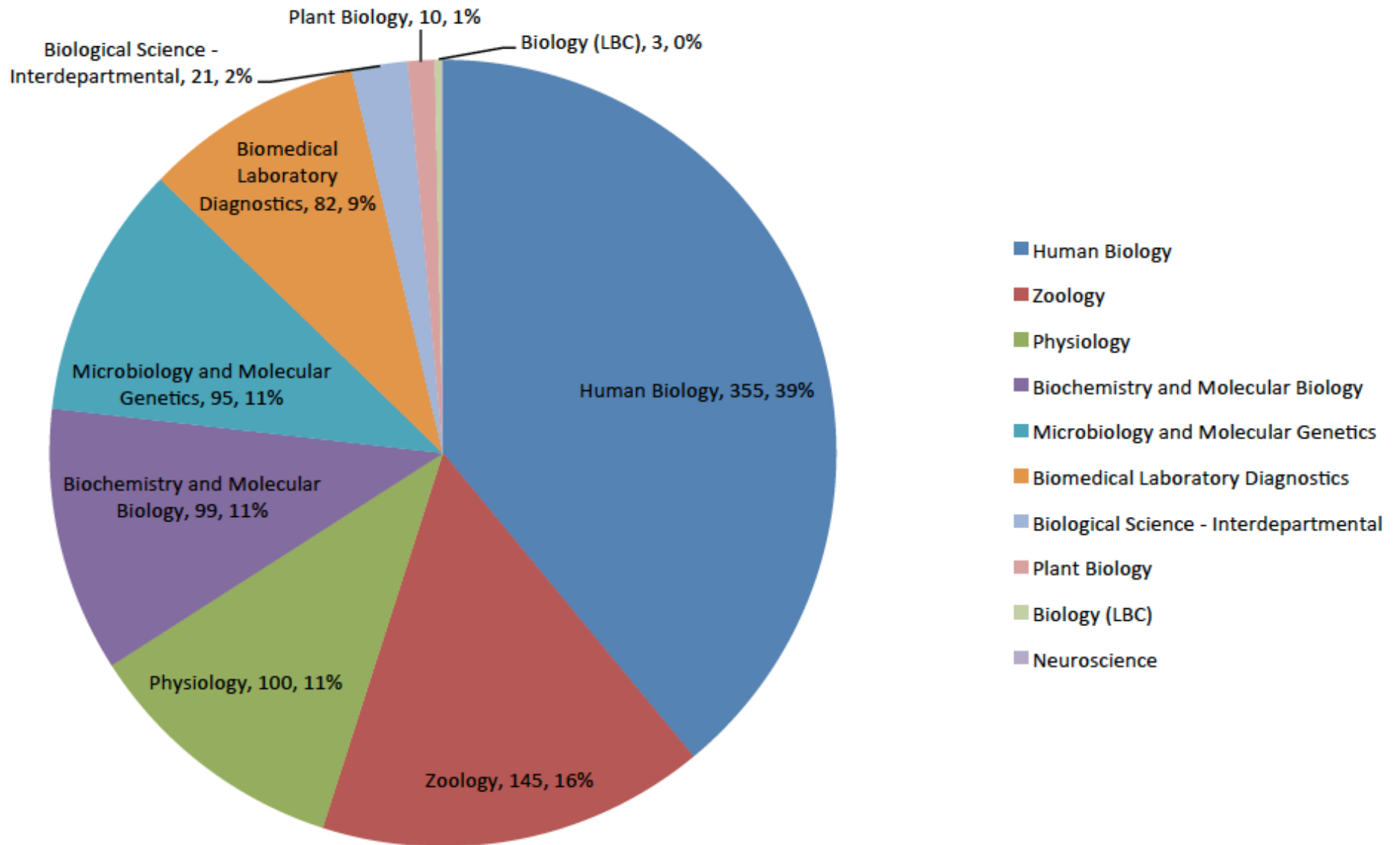
1. Lectures with **increased active learning** including an emphasis on **science practices**
 - a. Example: Entire class periods dedicated to students creating models based on scientific research
2. **Increased** instructor-student interaction
3. In addition to clickers, students receive **feedback on written assignments** throughout the semester
4. **Written response items** included on exams
5. New, 1st edition textbook (co-authored by Susan Singer) with innovative electronic resources

Coordination with BS162

- BI BS162 Committee chaired by Rich Triemer
- Implementing similar process as BI BS161 Committee to develop a shared vision for the course
- Spring 2015 curriculum workshop for BS161 and BS162 faculty
 - Discuss the BioSci curriculum, identify and eliminate redundancies, and coordinate learning goals and curricular materials.

Achieving the Vision: *Next Steps*

- Integrated and coherent curricula (ongoing)
- Evaluate alignment of majors
 - Human Biology



Source: Becky Matz

Achieving the Vision

- Integrated and coherent curricula (ongoing)
- Evaluate alignment of majors
 - Human Biology
- Define the Core Curriculum
 - What comprises the core curriculum? Is there a set of courses that all biology students should take?

MSU Biology- The Curriculum

- Introductory courses in chemistry, physics, and mathematics
- Introductory courses in Cell and Molecular Biology and Organismal Biology
- Core courses in biology
 - *possibilities include genetics, biochemistry, ecology, evolution, physiology, and microbiology*
- Advanced courses
 - Role of capstone courses/experiences

Achieving the Vision: *Next Steps*

- Integrated and coherent curricula (ongoing)
- Evaluate alignment of majors
 - Human Biology
- Define the Core Curriculum
 - What comprises the core curriculum? Is there a set of courses that all biology students should take?
- Develop and implement evaluation and assessment plan
 - Measure progress toward the vision
- Communicate the Vision
 - Improve communication across the biological sciences

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