**Annual Departmental Plan Report**

**Program Information**

Program/Department: *Biology*

Department Chair: Mel Govindan

Department Assessment Committee Contact: Chris Picone

***Please be as detailed as possible in your responses. We will use this information to fulfill our NEASC requirements and this report will help with your next Program Review or aid with your external accreditation. This file is to be kept in the department and an electronic file is due to the Director of Assessment by May 31 each academic year.***

**Program Learning Outcomes (PLOs) (Educational Objectives)**

1. **List all PLOs and the timeline for assessment.**

|  |  |  |  |
| --- | --- | --- | --- |
| **PLO #** | **PLO – Stated in assessable terms.** | **Timing of assessment (annual, semester, bi-annual, etc.)** | **When was the last assessment of the PLO completed?** |
| ***1.*** | *Demonstrate content knowledge of the AAAS BioCore, with topics in:*   * *Evolution* * *Transformations of Energy and Matter* * *Information Flow, Exchange and Storage* * *Structure and Function* * *Systems* | *Annual* | *Spring 2019* |
| ***2.*** | *Evaluate the strengths and challenges of the Biology program by using student surveys.* | *Annual/Bi-annual* | *Spring 2019* |
| ***3.*** | *Demonstrate scientific competencies in capstone courses, including A) Conducting original research; B) Reporting results orally and in writing; and C) using scientific literature effectively.* | *Strategy in progress; to be annual* | *Not done in 2019* |

1. **PLO Assessment (Please report on the PLOs assessed and/or reviewed this year, programs should be assessing at least one each year.)**

Using the table below, list and briefly describe the **direct method(s)** used to collect information assessing whether students are learning the core sets of knowledge (K), skills (S) and attitudes (A) identified as essential.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PLO #** | **Assessment description (exam, observation, national standardized exam, oral presentation with rubric, etc.)** | **When assessment was administered in student program (internship, 4th year, 1st year, etc.)** | **To which students were assessments administered (all, only a sample, etc.)** | **What is the target set for the PLO? (criteria for success)** | **Reflection on the results: How was the “loop closed”?** |
|  | *Standardized test we developed based on the AAAS BioCore concepts in our learning outcomes.*  *Note: This assessment tool will be revised in AY2020.* | *Capstone (3rd or 4th year)* | *All in Developmental Biology (N=23)* | *Not yet decided, but see results below and possible targets highlighted by color.* | *Results will be discussed at departmental retreat, Aug 2019.* |

1. **Summary of Findings:** Briefly summarize the results of the PLO assessments reported in Section II above combined with other relevant evidence gathered and show how these are being reviewed/discussed. How are you “closing the loop”?

*In the Spring of 2019 the Assessment Committee tried to get several Biology courses to administer the same standardized test we used in 2017. However, we realized that a few core concepts were not assessed by that test. Upon review, some faculty (not on the committee) then began to question some of the current test questions, and even questions learning outcomes we voted on in 2015. Therefore, we only ended up using the test with a small group who were taking Developmental Biology, a capstone course (N=23 students).*

*The results are presented below, alongside data from 2017. Test Questions are attached as an Appendix.*

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***Summary.*** *This is a new way of assessing our test data, and will be evaluated by the department at our August retreat. It seems that by the time students reach capstone courses, they are not retaining some important concepts in evolution, physiology, and energy flow at the ecosystem level. They are more effectively learning concepts in genetics, cell biology, and experimental design. Although the sample size is low, the results are mostly consistent across 2017 and 2019.*  
*These results will be discussed at our department retreat in August of 2019. We should consider where we can reinforce basic concepts like energy flow and surface/volume relationships across our curriculum.*

|  |  |  |
| --- | --- | --- |
| **Other than GPA, what data/ evidence is used to determine that graduates have achieved the stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)** | **Who interprets the evidence?**  **What is the process?**  **(e.g. annually by the curriculum committee)** | **What changes have been made as a result of using the data/evidence? (close the loop)** |
| *In 2019 we did not assess proficiencies in capstone courses. The assessment committee considered the benefits of generic rubrics vs assignment-specific assessment for these skills, and we may do both.* | *In the past, it was the Assessment Committee evaluating capstone projects with generic rubrics. The data were not very useful.* | *In our retreat of August 2019 we need to revisit what we want in a short list of proficiencies. That list will determine how we define capstone courses, one of the tasks we were assigned in our Self Study in 2018. The next step is to decide as a department how to assess these skills. We have made several unsuccessful attempts over the last decade, and we need help.* |
| *This may not fit here, but there is nowhere else on this report to state that we have also surveyed our students in 2016, 2017, and in spring 2019. These surveys are meant to find obstacles to completion and success.* | *The surveys were compiled by the Assessment Chair, and short answers were tabulated.* | *According to the surveys, fewer students are struggling to find open sections of core courses and to find electives. That was a problem clarified in 2016, and we have tried to offer more electives each semester. The number of complaints about poor teaching has also declined slightly.*  *At the same time, there is in increase in students who say a barrier of the Biology major is how difficult it is. We may be admitting a broader range of students, and including more who are not ready for a difficult science major. These survey results and action plans will be a topic for a department retreat in August 2019.* |

**Assessment Plan for Program/Department**

1. Insert the program or department Assessment Plan
2. Explain any changes in the assessment plan including new or revised PLOs, new assessments that the program/department plans to implement and new targets or goals set for student success.
3. If you do not have a plan, would you like help in developing one?

*X. Yes!*

**University Data**

1. **SSC Data**

Indicate **at least one** Student Success Performance Measure that the department/program has identified for planned change or improvement.

Freshman retention, bottleneck courses, graduation rates, at risk student retention etc.

1. What was the focus this year?

|  |  |  |
| --- | --- | --- |
| **Student Success Measure**  **(data point from SSC)** | **Implemented Intervention** | **Update on Implemented Intervention**  **(i.e. change in target, satisfied with outcome, not satisfied, will continue or not)** |
| *Retention tends to be lower in Biology majors than campus-wide. (Known from previous analysis over previous years.)* | *In 2016 we implemented a 2.0 minimum required in two intro courses, and only allowed two attempts. The hope was to encourage students who would not succeed in Biology to quickly find another major, and thus be retained at FSU rather than dropping out.* | *Only 3-4 students each semester are affected by the new rule. We do not expect there will be a measurable impact on retention rates, but the Assessment Committee still needs to examine the data.* |
| *# Biology majors: sharp decline in # of new majors in fall 2019.* | *TBD. This is a topic for a retreat in August of 2019. We will consider the higher # of minorities in Biology, and how to focus on their enrollment, belonging, retention, We need to stress high impact practices like student research. And we need to revisit our vision, mission, and marketing.* |  |

1. What will your focus be for the upcoming year?\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Student Success Measure**  **(data point from SSC)** | **Rationale for selection** | **Planned or Implemented Intervention** | **Current score/ Target Score** | **This measure was selected because of last Program Review or Accreditation (yes/no)** |
| *See above.* |  |  |  |  |
|  |  |  |  |  |

\*Note: Programs may wish to monitor or review the same data point over multiple years.

1. **Trend Data**

Indicate **at least one** Department Performance Measure that the program/department identified for change or improvement.

Number of graduates, number of majors, credit production, substitutions etc.

1. What was the focus this year?

|  |  |  |
| --- | --- | --- |
| **Department Performance Measure**  **(data point from Trend Data)** | **Implemented Intervention** | **Update on Implemented Intervention**  **(i.e. change in target, satisfied with outcome, not satisfied, will continue or not)** |
| *See above.* |  |  |
|  |  |  |

1. What will be the focus next year?\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Department Performance Measure**  **(data point from Trend Data)** | **Rationale for selection** | **Planned or Implemented Intervention** | **Current score/ Target Score** | **This measure was selected because of last Program Review or Accreditation (yes/no)** |
|  |  |  |  |  |
|  |  |  |  |  |

\*Note: Programs may wish to monitor or review the same data point over multiple years.

**Program Review Action Plan or External Accreditation Action Letter/Report**

***Annual Reflection/Follow-up on Action Plan from last Program Review or external accreditation (only complete the table that is appropriate for your program)***

* 1. **Programs that fall under Program Review:**
     1. Date of most recent Review: **Spring 2018**
     2. Insert the Action Plan table from your last Program Review and give any progress towards completing the tasks or achieving targets set forth in the plan.

*Copied from Self-Study Response, adopted in fall of 2018*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Specific area where improvement is needed** | **Evidence to support the recommended change** | **Person(s) responsible for implementing the change** | **Timeline for implementation** | **Resources needed** | **Assessment Plan** | **Progress Made this Year** |
| *“Clarify expectations and assessment in* ***capstone courses****.”* |  | Curriculum and **Assessment Committees** | AY 20-21 | *“Assessment Committee along with ad-hoc members of capstone courses will generate a draft of expectations and assessments by the end of AY20. The curriculum committee will then review the recommendations and both committees will then bring to entire department for discussion and approval.”* |  | Assessment committee chair hopes to use August 2019 retreat to start the process to develop a short list of capstone proficiencies as LOs. |
| *“Continue to address challenges in* ***our assessment plans.”*** |  | Assessment Committee | Ongoing | *“The committee will develop an action plan to address specific deficiencies within the assessment plan. This plan should include timeline and required resources. Resources may include funding for summer working groups.”* |  | The Assessment Committee chair tried to start a departmental conversation on assessment in spring 2019. We have 3 steps:  1A. Decide (again) on the AAAS BioCore concepts that are important.  1B. Agree to a standard set of test questions for those concepts.  2A. Decide which list of proficiencies are required in every Biology student.  2B. Decide how to assess those proficiences.  3. Consider other measures, such as Employer surveys, alumni surveys, etc. |
|  |  |  |  |  |  |  |

* + 1. If you do not have an action plan, would you like help in developing one based on your last program review and needs of the program?

X Yes!

**UARC Peer Review of the Program Annual Report**

Program: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date of Review: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- | --- |
| **Program Learning Outcomes (PLOs)** | | | | | |
| **Criterion** | **Highly Developed (3)** | **Developed (2)** | **Emerging (1)** | **Initial (0)** | **Score** |
| *Program Learning Outcomes (PLOs)* | All or almost all PLOs clearly stated and measurable. | Most of the PLOs clearly stated and measurable. | PLOs written in general, broad or abstract statements OR are not measurable. | PLOs not provided. |  |
| *Expected Timing of Assessment* | All or almost all PLOs have a timeline stated. | Most PLOs have a timeline stated. | Very few PLOs have a stated timeline. | No timelines are given or are To Be Determined (TBD). |  |
| *Assessment Tool Quality* | Assessment tool(s) is/are strong: very good quality and appropriate. | Assessment tool(s) are acceptable: good quality and appropriate | Assessment tool(s) are a good start but could use some strengthening or changes. | Assessment tool(s) are either not appropriate or not discussed. |  |
| *PLO Assessment* | More than one PLO assessed and information is complete in the chart. | At least one PLO assed and information is complete in chart. | At least one PLO assessed, information is not complete in chart. | No assessments completed during the academic year reported. |  |
| *Criteria for Success* | The criteria for student success of each PLO is clearly stated and is appropriate. | Most criteria for student success of each PLO is clearly stated and is appropriate. | Criteria for student success discussed or touched upon but not clearly stated or is not appropriate. | Criteria for student success not provided. |  |
| *Summary of Findings* | Measures used in from PLO assessment fully incorporated with additional evidence to formulate the summary and analysis supports the summary. | Very limited use of data from PLO assessment incorporated with additional evidence to formulate the summary and analysis somewhat supports summary. | Used evidence other than PLO assessment to formulate the summary or analysis of the data doesn’t seem to support summary. | No summary utilizing assessment data is evident. |  |
| **Assessment Plan for Program/Department** | | | | | |
| **Criterion** | **Highly Developed (3)** | **Developed (2)** | **Emerging (1)** | **Initial (0)** | **Score** |
| *Department or Program Assessment Plan* | Assessment Plan provided. Has clearly stated process with reasonable expectations. | Assessment Plan provided. Has somewhat clear process and/or somewhat reasonable expectations. | Assessment Plan provided, the process is not clear and/or the expectations are not reasonable. | No Assessment Plan provided. |  |
| *Activities and Adjustments to/Deviation from the Department/Program Assessment Plan* | Decision to change or not change the assessment plan are clearly stated and decision(s) are appropriate based on the reported results. | Decision to change or not change the assessment plan are described in general terms and may be appropriate based on the reported results. | Decision to change or not change the assessment plan are vague and lack clarity. | No changes are discussed. |  |
| **University Data** | | | | | |
| **Criterion** | **Highly Developed (3)** | **Developed (2)** | **Emerging (1)** | **Initial (0)** | **Score** |
| *SSC Data for Current Review Period* | Intervention undertaken by program/department for at least one SSC data point. Clearly documented results. | Intervention undertaken by program/department for at least one SSC data point. Plan not fully implemented. | Planned intervention by program/ department for at least one SSC data point. No plan implemented. | No SSC data analyzed and/or reported on. |  |
| *SSC Data for Upcoming Review Period* | At least one component of the SSC data selected to assess, rationale provided, targets set and intervention seems to be appropriate based on information provided. | At least one component of the SSC selected to assessed, some of the rationale provided, targets set and intervention seems to be appropriate based on information provided. | SSC data discussed and some or part of the assessment, targets or interventions are emerging but not fully appropriate. | No SSC data analyzed and/or reported on. |  |
| *Trend Data for Current Review Period* | Intervention undertaken by program/department for at least one Trend data point. Clearly documented results. | Intervention undertaken by program/department for at least one Trend data point. Plan not fully implemented. | Planned intervention by program/ department for at least one Trend data point. No plan implemented. | No Trend data analyzed and/or reported on. |  |
| *Trend Data for Upcoming Review Period* | At least one component of the Trend data selected to assess, rationale provided, targets set and intervention seems to be appropriate based on information provided. | At least one component of the Trend selected to assessed, some of the rationale provided, targets set and intervention seems to be appropriate based on information provided. | Trend data discussed and some or part of the assessment, targets or interventions are emerging but not fully appropriate. | No Trend data analyzed and/or reported on. |  |
| **Action Plane or External Accreditation Action Letter/Report** | | | | | |
| **Criterion** | **Highly Developed (3)** | **Developed (2)** | **Emerging (1)** | **Initial (0)** | **Score** |
| ***Only for those under Program Review***  *Annual Reflection on Program Review* | Full Action Plan provided with definitive on-going progress clearly stated. | Full Action Plan provided with some discussion of on-going progress plans stated. | Full Action Plan provided with vague ideas regarding on-going progress plans stated. | Action Plan is either not provided or there no progress or plans stated for progress discussed. |  |
| ***Only for those under External Accreditation***  *Annual Reflection on Report/Letter from accrediting body.* | Key issues and performance standards provided with definitive on-going progress clearly stated. | Key issues and performance standards provided with some discussion of on-going progress stated. | Key issues and performance standards provided with vague ideas regarding on-going progress plans stated. | Key issues and/or performance standards are either not provided or there has been no progress or plans stated for progress. |  |
| Comments: | | | | | |

**NOTE: This rubric is NOT an evaluation of the program/department. It is simply a tool for UARC to use as an aid in reviewing and providing constructive feedback to each program.**

**APPENDIX: Biology Assessment Test Questions (2017, 2019)**

**Please enter all answers on a bubble sheet**

1. Are you a Biology Major? A. Yes B. No

2. Please fill in the bubble for any courses you have already completed at **Fitchburg State**. You can select any number of answers, or none of these.

1. General Biology I (or equivalent)
2. General Biology II (or equivalent)
3. Genetics
4. Ecology

3. Please fill in the bubble for any courses you have already completed **at another college**. You can select any number of answers, or none of these.

1. General Biology I (or equivalent)
2. General Biology II (or equivalent)
3. Genetics
4. Ecology

4. If an organism has a greater fitness than other individuals of the same population, then the organism \_\_\_\_\_\_\_.

1. lives longer than others
2. competes for resources more successfully than others
3. mates more frequently than others
4. utilizes resources more efficiently than others
5. leaves more offspring than others

5. In an imaginary insect species, the dominant allele G codes for dark green color and the recessive allele g codes for light green color. Suppose a population of these insects moves into a habitat with light-colored leaves, such as a grassland. The lighter insects are better camouflaged and can escape predators. What changes would you expect in subsequent generations?

1. No change in frequencies of alleles or phenotypes.
2. Increase of the recessive allele frequency, but no change of phenotype because that allele is recessive
3. Increase of the frequency of the dominant allele and the dark color
4. Increase of the frequency of the recessive allele and light color
5. Increase of the recessive allele and eventually genetic co-dominance

The process of 6.\_\_\_\_\_\_\_\_\_\_\_ generates variation while 7.\_\_\_\_\_\_\_\_\_\_\_ produces adaptation to the environment.

1. natural selection
2. mutation
3. genetic drift
4. gene flow

8. Speciation requires \_\_\_\_\_\_\_\_\_\_\_\_\_.

1. periods of rapid evolutionary change
2. genetic isolation
3. long periods of time
4. geographic isolation

9. Consider the following three species of ectotherms.

|  |  |  |  |
| --- | --- | --- | --- |
| Species | A. *Plethodon cinereus* | B. *Rana catesbiana* | C. *Thamnophis sirtalis* |
| Surface Area = | 16 cm2 | 400 cm2 | 200 cm2 |
| Volume = | 2 cm3 | 500 cm3 | 50 cm3 |
| Surface Area/Volume = | 8 | 0.8 | 4 |

Write the letter (A, B or C on your bubble sheet) of the species that will heat up the fastest if lying in the sun.

10. If the body is too warm, glands in the skin secrete sweat to cool the body. This is an example of:

1. homeostasis using negative feedback
2. homeostasis using positive feedback
3. osmoregulation using negative feedback
4. thermoregulation using positive feedback

11. A tropical rainforest is an example of an ecosystem. Which of the following statements about matter and energy in a tropical rainforest is the most accurate?

1. Energy is recycled, but matter is not recycled.
2. Matter is recycled, but energy is not recycled.
3. Both matter and energy are recycled.
4. Neither matter nor energy are recycled.

12. The organisms at the top of a food web:

1. accumulate all of the energy that existed in the consumed organisms that were lower in the food web.
2. have less available energy than trophic levels below it.
3. have the same amount of accumulated energy as each of the trophic levels below it.
4. have available to it all of the energy of the food web.

13. What does it mean for a gene to be “expressed”?

1. It is transcribed to RNA and then translated into a protein
2. It is mutated to a different form
3. It is inserted into a bacterial plasmid
4. It is inactivated using methyl groups
5. It is quickly replicated during cell division

14. A main form of energy stored inside a cell is:

1. DNA
2. ATP
3. RNA
4. Ribosome
5. CO2

15. Choose the process that requires an input of energy

1. Active transport
2. Movement of water through a plasma membrane
3. Diffusion of glucose across a plasma membrane down a concentration gradient
4. Diffusion of oxygen across the plasma membrane

16. Your bone cells, muscle cells, and skin cells look different because

1. Different genes are active in each kind of cell
2. They contain different numbers of genes
3. Each cell contains different kinds of genes
4. Each cell has a different mutation

17. You want to measure the effect of light waves on plant photosynthesis. You design an experiment that exposes corn plants to light at 4 different wavelengths and measure O2 production as an indication of photosynthesis. In this experiment…

1. corn is the dependent variable and wavelength is the independent variable
2. wavelength is the dependent variable and corn is the independent variable
3. O2 production is the dependent variable and wavelength is the independent variable
4. wavelength is the dependent variable and O2 is the independent variable

18. Which of the statements below best describe the hypothesis being tested in the experiment described above?

1. There is a relationship between O2 production and the variety of corn.
2. There is a relationship between the growth of corn plants and the amount of O2 they produce.
3. There is a relationship between the growth of corn plants and the amount of light to which they are exposed.
4. There is a relationship between the amount of O2 produced by corn plants and the wavelength of light to which they are exposed.
5. There is no relationship between photosynthesis and production of O2 in corn plants.

19. The role of a control in an experiment is to

1. ensure that the experiment is repeatable
2. identify all factors in the experiment that affect the dependent variable
3. provide a basis of comparison to the experimental group
4. evaluate if lab equipment is working correctly in the experiment

20. Have you have already taken this assessment in **another capstone course** this year?

1. No
2. Yes