Massachusetts Department of Higher Education

MassTransfer Pathways
Biology and Chemistry Convening
Friday, February 23, 2018, 10:00 a.m.
Fitchburg State University – Hammond Hall
160 Pearl Street, Fitchburg, MA 01420

NOTES

I. **Welcome:** A welcome was provided by Elena Quiroz-Livanis, Chief of Staff and Director of Academic Policy and Student Success. She thanked attendees

II. **MassTransfer Update:** Elena provided an update to the MassTransfer Pathways work and its place in the MassTransfer suite of programs.

A. Biology and Chemistry were among the first six Cycle I pathways developed during the 2014-2015 academic year, with the launch of their maps on the MassTransfer website in fall 2016.
B. The emphasis in developing the MassTransfer Pathways has always been on affordability and degree completion.
C. Elena reviewed the components of MassTransfer to provide an update on their status and context for the Pathways.

1. **MAST Course Equivalency Database:** Contains over 11,000 courses and includes an annual process for updating the database.
2. **General Education Foundation:** A 28-credit Gen Ed Foundation for STEM programs has been initiated, in addition to the 34-credit standard Gen Ed Foundation.

General Education Foundation		
Subject Areas	*Standard*	*STEM*
English composition/writing	6	6
Behavioral and social sciences	9	6
Humanities and fine arts	9	6
Natural or physical sciences	7	7
Mathematics/quantitative reasoning	3	3
Total	34	28

3. **Associate to Bachelor's (A2B) Pathways:** More than 40 pathways developed over four cycles from 2014 to 2018.

Cycle I (2014-2015)	Cycle II (2015-2016)	Cycle III (2016-2017)	Cycle IV (2017-2018)
Biology	Business	Elementary Education	Nursing
Chemistry	Communications	Engineering (Chemical, Civil, Electrical,	Social Work/Human Services

Cycle I (2014-2015)	Cycle II (2015-2016)	Cycle III (2016-2017)	Cycle IV (2017-2018)
		Mechanical)	
Economics	Computer Science	Art (Fine Arts, Graphic Design)	
History	Criminal Justice	Special Mission Institutions (MassArt, Mass Maritime Academy)	
Political Science	Early Childhood Education		
Psychology	English		
	Liberal Arts		
	Mathematics		
	Sociology		
	STEM		

4. **Commonwealth Commitment:** The state's premier transfer program focused on affordability and degree completion; ComCom 1.0 will save full-time students about $5,000; ComCom 2.0, to be implemented in fall 2018, will include part-time students and change the financial benefits to grants and shift the burden from campuses to the Department of Higher Education (DHE).
5. **Reverse Transfer:** Adopted by the Board of Higher Education in December 2016; implemented in fall 2017; enables students who transfer before earning an associate degree to complete their associate degree requirements while working on their bachelor's degrees.
6. **Transfer Principles:** Endorsed by the community college chief academic officers in December 2013; adopted by the Board of Higher Education in June 2017; separate transfer principles for state universities and UMass currently under development; and transfer principles designed to ensure consistency in transfer practices across the state.
7. **Strengths of MassTransfer:** DHE serves as a convener and facilitator; faculty, transfer professionals, registrars and other campus personnel do the work; creates a system approach to transfer; and encourages students to remain within the Massachusetts public higher education system.

D. Elena used the ComCom page to demonstrate the MassTransfer website for the group (http://www.mass.edu/masstransfer/) and encouraged people to email her whenver any errors are discovered (EQuiroz@dhe.mass.edu).

III. **Plan for the day:** Elena explained that the group would divide into two—Biology and Chemistry faculty—and use the morning to review each pathway, led by segmental leaders. The groups will use the afternoon to review the content of the foundational courses in each pathway.

IV. **Biology:** Paul Kasili, associate professor at Bunker Hill Community College; Ryan Fisher, Chair, Biology Department, Salem State University; and Bruce Byers, Senior Lecturer, University of Massachusetts Amherst led the conversation.

A. Members of the group introduced themselves.

B. The group was reminded of the foundational and recommended courses agreed to in March 2015.

1. **Foundational Courses:**

    a. Biology I
    b. Biology II
    c. Chemistry I
    d. Chemistry II
    e. Pre-calculus

2. **Additional Recommended Courses:**

    a. Organic Chemistry I
    b. Organic Chemistry II
    c. Physics I
    d. Physics II
    e. Calculus

C. The group engaged in a general conversation about possible second-year Biology courses. The new STEM General Education Foundation allows an additional six credit/two courses to be included in the second year of the Biology pathway.

1. Many community college faculty described their approaches to the second year of the pathway. They suggested that a list of second-year courses offered at the state universities and UMass campuses would be helpful in developing courses on their campuses.
2. State university and UMass faculty described some of the courses their students take in the second year of the Biology curriculum.
3. Elena explained that if the group identified new foundational Biology courses, she could reconvene faculty to consider the appropriate content for those courses.
4. State universities and UMass faculty expressed some hesitance to accept transfer courses in Biology, especially if they required changes in their curricula.

D. The Biology faculty divided into three groups, with representation from all three segements in each group, to identify possible second-year Biology courses. The group reconvened following lunch at 12:43 p.m. and each group reported on its discussions. The discussions included the following topics.

1. Sometimes finding course-to-course equivalencies can be complicated, if not impossible, so faculty wondered if a “bundle” of options might be more useful.
2. A “bundle” of second-year courses might include the following:

    a. Cell Biology
    b. Ecology
    c. Evolution
    d. Genetics
    e. Microbiology

3. The problem of having community college students repeat courses when courses they take at the community colleges don't transfer to the state universities or UMass campuses.
4. "Front-loading" the Gen Ed courses in the first two years of student, which the current pathway requires.
5. Community college faculty asked if they could get data on the success of their students at the state universities and UMass campuses, especially compared with native students.
6. State university and UMass faculty asked how they could support their community college transfer students better. Some suggested that more opportunities for faculty to talk with students would helpful.
7. A question arose about the adequacy of quantitative skills and experience that students develop at the community colleges and bring to the state universities and UMass campuses.
8. A suggestion was offered that DHE collect syllabi for the five courses listed in item 2 above and shared with the segmental leaders to assess comparability.

E. The group discussed the essential core competencies, components and learning outcomes of Biology I and Biology II and suggested minor revisions.

V. Chemistry: Leslie Farris, University of Massachusetts Lowell, Sally Quast, Middlesex Community College, and Shelli Waetzig, Framingham State University, led the convesation.

A. Purpose: Determine if the list of foundational courses for the chemistry transfer pathway needs to change.
   1. Any recommendations as a result of implementing the pathway for the last two years?
   2. Any additional courses as a result of the STEM General Education Foundation freeing up the schedule to permit two additional STEM classes to be taken at the community college before students transfer?

B. The list of foundational courses was established in 2015: General Chemistry I and II, Organic Chemistry I and II, Calculus I and II, Physics I and II (calculus-based physics, not algebraic physics)
   1. American Chemical Society (ACS) guidelines require two semesters of physics. It strongly recommends calculus based physics, but it is not required.
      a. Most of the state universities require calculus-based physics but not all (ex: Fitchburg) and it was agreed that this sequence would continue to be part of the foundational courses.
   2. The group then discussed whether they should add Introduction to Biochemistry, Analytical Chemistry, or Calculus III as foundational courses?
      a. Introduction to Biochemistry could be a science elective, but it is unlikely a four-year institution would be able to accept it as an equivalent.
      b. Calculus III
         i. There was discussion as to whether community college students were calculus-ready when they begin their studies at the two-year institution. The pathway should not require Calculus III as some Chemistry programs at the universities do not require Calculus III for majors.
         ii. Students should be encouraged to complete the course if they are able prior to transfer.

3. Advocacy to just focus on the eight already chosen. Freedom comes in with advising with the space of the other two courses.
    a. From a transfer point of view, the 8 still make sense.
    b. For UMass campuses, their maps can recommend Calculus III as a required course for the four year side; website and campuses can show that UMass recommends Calculus III for transfers, but it does not need to be part of the pathway.
    c. Pre-calculus could be one of these. Strong desire to keep it open and not add in more courses.
4. Recommendation: No change to the existing eight foundational courses. The two remaining STEM classes should be either an additional math or science elective to reinforce what students either need (ex: pre-calculus or Calculus III) or students' interests (computer literacy, general biology).

C. Course Components vs Student Learning Outcomes
1. Course Components: The content that needs to be covered in the course(s)
2. Student Learning Outcomes: The knowledge and skills students need to acquire in order to successfully transfer
    a. There is no state-wide assessment to determine mastery.
    b. Campuses can choose to assess this on their own.
    c. Generic because these have been created by consensus. This is a floor and you can put additional content and objectives into your course.
3. Chemistry I – No changes
4. Chemistry II
    a. Nuclear Chemistry: In 2015 about including nuclear chemistry in Chemistry II. The topic came up again and it was ultimately not added to the final list.
    b. Electrochemistry (topic 7)
        i. Currently, there is no student learning outcome for electrochemistry.
        ii. Recommendation: Add "cell potential" to the 4th bullet of General Chemistry II Lecture Student Learning Outcomes, "Distinguish whether a reaction is spontaneous using entropy, Gibb's *free* energy, *and cell potential.*
5. Organic Chemistry I
    a. Free radical mechanisms
        i. The group discussed whether there was a need to specify about free radical mechanisms? If faculty following the content lists, they will get to mechanisms. If they want to talk about some reactions then the list should specify all reactions, *or* faculty can maintain academic freedom to ensure success.
        ii. Mechanisms are already being emphasized by reinforcing it in so many topics already listed.
        iii. The outcomes here are as detailed as they need to be without getting into minutiae.
        iv. Recommendation: No change.
6. Organic Chemistry II
    a. Structure and Chemistry of Macromolecules (Topic 6 in content list)
        i. This topic is included because many students taking this class are biology majors.
        ii. Should the types of macromolecules ("carbohydrates, peptides and proteins, DNA-RNA, and synthetic polymers) be removed?
            A. The words "such as" communicates that a faculty member can choose to covers some, many, or all of macromolecules listed. It also does not

prevent someone from teaching additional macromolecules not listed. These are just examples.

B. The macromolecules satisfy new requirements by the ACS guidelines.

7. Organic Chemistry Laboratory Student Learning Outcomes: Need to include communicate as an outcome as an addition to one that is already existing.
   a. Recommendation: "Critically evaluate *and communicate* outcomes of the experiment based on data collection."(bullet 7)
8. Other Notes
   a. Pre-requisites and co-requisites are connected. Good advising, order, and timeliness of course sequence would have is key here. Order and timeliness of course sequencing is key.
   b. The maps show which courses are linked and that they should take them at an individual institution (instead of splitting course I and II across institutions).
   c. Reverse transfer is not part of the Commonwealth Commitment for non-special mission universities. Concern about this. This is an advising topic.
   d. Organic I Core Component number 7 "nmr" needs to be changed to "NMR."
   e. Northern Essex now has Organic Chemistry I and II (221 and 222).

VI. Next Steps:

A. The Chemistry group adjourned at noon and would not need to meet again.
B. The Biology faculty continued to meet in the afternoon and the group agreed to reconvene later in the Spring.
C. Elena said she would email Biology faculty and ask for syllabi for the five courses identified in D.2. above to her (EQuiroz@dhe.mass.edu).
D. Elena adjourned the meeting at approximately 2:45 p.m.