

Computer Science Session Notes

Faculty Attendees

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The start of the morning session included an overview of the MassTransfer Pathways process and desired outcomes, with an emphasis on the effort to create greater clarity for students and ensure that recommended coursework will ensure transfer student success. The group had a deeply robust conversation regarding coursework across the major and in the first two years in particular. Much of the first part of the morning conversation allowed the group to articulate particular challenges.

Some of those challenges are:

- Different programming languages offered at different institutions, challenging ensuring preparedness of transfer students who may have taken a different programming language at their 2 year institution than is offered at the four year transfer institution.
- UML faculty noted challenge for students taking data structures after taking a computing course at a different institution.
- Potentially false assumption that skills are language independent.
- Determining level of math that is required in the first two years.

- Difficulty creating a one to one course mapping, given that certain topics are taught in different courses at different institutions.
- Challenge for community colleges trying to offer several sets of courses to prepare students for program requirements at different institutions.
- Concepts that may become language independent after a student has completed a four year program are not understood sufficiently after two years for that student to be immediately successful in a different language.
- Possible solution—Umass Lowell will often have a student sit in on a course to have a better understanding.
- A specific concern in attempting to accommodate interest in Java and other languages while also focusing on C. The concern is that the coursework is then spread too thin.
- The C, C++ coursework at UMass Lowell, which differs from Java offered at others campuses, was brought up as an example of challenge addressing programming for students who may pursue paths at different four year institutions.
 - Shamsi Moussavi from MassBay CC noted that in their articulation, with UML the first three CS courses are packaged, and they advise students not to transfer before finishing this block of courses, in order to be prepared for coursework at the four year level.
 - Michael Penta from NECC offered a suggestion based on coursework offered at NECC to prepare students for UML or another institution:
 - CS1-Java
 - CS2-object oriented data structures
 - CS3-C and C++ data structures
 - Sal at Bristol also discussed some solutions at his institution. Bristol offers a C course that maps to the first course at UML, which includes some java, but may areas in C. He noted that UMass Dartmouth also requires a C course with unix/linux combination.
 - Michael Black at Bridgewater State also articulated the nature of the data structures taught there, with half students as transfer students, and a mixture of students with background in C++ or Java. He articulated a need to accep that and adjust, and that students can handle it—so he teaches the course in C++, but gives students 2-3 weeks to get background in the language if they have not yet worked in C++.
- Another challenge voiced is for faculty at institutions where students have transferred to understand the content and rigor of a course at another, as courses are only reported using a brief paragraph of a few sentences.
- Ultimately, the group seemed clear that one to one course matching would likely be impossible to determine, but potentially blocks of courses including essential course content could be articulated in order for students/institutions to created a set of foundational courses that would be aligned with four year institutions across the state.

After exploring some of these challenges, the conversation shifted to making a determination as to which courses could be agreed upon as the foundational courses for the first 60 credits.

There was consensus around some math requirements:

Foundational Math for Computer Science

- Calculus I
- Calculus II
 - (with a presumption that these calculus courses are engineering level calculus courses).

There was also consensus that Discrete Math and Linear Algebra were offered at most community colleges, and should be strongly encouraged. Four year institutions asserted that they would accept these credits for the major if they are proven sufficiently rigorous. However, the group agreed that these courses are not necessarily required during the first two years in the major, therefore, are not “foundational” for the purposes of MassTransfer Pathways.

Foundational Lab Science for Computer Science

The group also came to a consensus that foundational courses for Computer Science should include a sequence of two lab science courses. There was some discussion of the need to allow students to choose whether they take a sequence in Chemistry, Biology or Physics, particularly to allow students the flexibility to pursue specialties within computer science which require an understanding of one of these particular areas. E.g., Bioinformatics.

However, some campuses (specifically Worcester State University and Framingham State University) require physics specifically. Representatives from those institutions noted that perhaps they may need to work with their departments to discuss this particular requirement.

As such, the general consensus in the group was that the next course requirements would include the following (with a need to further discuss the physics requirement at some institutions):

A sequence of two lab science courses:

- Chem I
- Chem II

OR

- Physics I
- Physics II

OR

- Biology I
- Biology II

Computer Science/Computing Courses/Block

The consensus around the group was that in order to structure a set of foundational courses in the major, a block of 4-5 courses would be necessary, to accommodate different sequencing of subject matter at each institution.

The following were topics that were suggested should be covered in such a block:

- Object oriented programming
- Procedural Programming with Memory Management
- Data Structures
- Assembly language
- Computer organization and architecture
- Digital logic

Some other topics discussed were linux/unix, memory allocation, and pointers.

There was some discussion of the sequencing at UMass Amherst as it differs from CS programs on other campuses. Gordon Anderson discussed some of these differences, particularly relating to the architecture course, and different structure of object oriented programming, as well as the assembly language course. The group will likely need to address some of these differences at UMass Amherst as well as other campuses in order to articulate a two year foundational path.

Ultimately, a deeper focus on these areas will need to be discussed and a clear block determined at the spring meeting. The discussion at that meeting will include the results of a syllabus review of coursework at all institutions.

Computer Science at the pre-collegiate level

One topic that was also discussed briefly was the courses accepted from the high school or at a pre-collegiate level. Faculty discussed the CS Principles course, International Baccalaureate course, and the current AP CS course (focused on java).

In general, it seemed that most campuses will offer credit for some type of introductory course, some version of which is offered at most institutions. Because of the introductory nature of such a course, it is not included in the set of required foundational courses. The group expressed some interest in discussing this issue further.