

REPORT on

Statewide Conference on Transfer Articulation in Mathematics

Held Friday, 8 February 2008

Busch Campus, Rutgers University, Piscataway, N.J

The Statewide Conference on Transfer Articulation in Mathematics was sponsored by the Mathematics Association of Two-Year Colleges of New Jersey, the New Jersey Section of the Mathematics Association of America, and the New Jersey Association of Mathematics Teacher Educators. It was called in response to the Lampitt Bill, which was passed by the New Jersey legislature and will become operational in the fall of 2008. The goals of the conference were to understand the new legislation and the resulting policies governing transfer by Associate Degree holders and others from New Jersey's public two-year colleges into New Jersey's public four-year colleges and universities and to articulate concerns arising from the new policy and begin to formulate ways to resolve them respecting the diversity of students and institutions across the state. Each college and university mathematics department in New Jersey was invited to send a team of at most three members to the conference. The conference was opened by Barry Qualls, Vice President for Undergraduate Education at Rutgers and the host for the meeting. His introduction was followed by remarks from Marguerite Beardsley, Director for Academic Affairs for the New Jersey Commission on Higher Education.

The Lampitt Bill

The first session consisted of a panel discussion of the Lampitt Bill. Panel members were Richard Lynde, Provost, Montclair State University, Michael Beals, Vice Dean for Undergraduate Education, Rutgers University, and Teresa Healy, Division Chair, Mathematics, Brookdale Community College. These are notes from the question and answer session following the panel:

- Students making transfers from two-year to four-year institutions will need well-informed advice. If transferring students change their majors or if they have not selected appropriate course-work before transfer they must take responsibility for those decisions and may have to take more than two academic years to complete their BA or BS degrees.

- The Transfer Agreement says that courses on the same topic should be treated as equivalent. However there is no universal pattern in the order of topics for the calculus sequence and there are many different forms of a first course in linear algebra or linear ordinary differential equations. The practice of offering a “bridge course” from lower division mathematics into upper-level mathematics is fairly new and there is even less agreement as to content, pedagogy, and exit standards.
- The term “basic algebra” is not defined in the Transfer Agreement. The Department of Education is trying to establish standards for Algebra I and Algebra II in New Jersey high schools and developing tests to measure student proficiency. The two-year colleges are engaged in attempts to define “elementary algebra” for their sector. The four-year colleges may want to be involved in that process because of the Transfer Agreement.
- The term “math intensive major” in the Transfer Agreement means a major program requiring at least one semester of pre-calculus. We might want to introduce a term for those majors that require a semester or more of calculus or of statistics.
- Although the Transfer Agreement says that four-year colleges must accept for graduation credit courses passed with a D or better in a New Jersey two-year college, if a four-year college requires a C or better for a course to count as a prerequisite or to count toward the major, then that four-year college may impose the same requirement with regard to transferred courses. This raises the issue of how units within the four-year college can know the grades of the transferred courses. Even if the four-year college does not count transferred grades into its grade point average, it would be useful to have the grade from the sending college recorded along with the specification of course-equivalence on the transcript of the receiving college.
- Both sending and receiving colleges have a stake in the academic success of students and thus have an interest in ensuring that courses that satisfy prerequisites actually prepare students for future work. This concern is balanced by recognition that the two-year colleges serve student bodies with very diverse ambitions and very diverse high school preparations. For these reasons the two- and four-year faculties in mathematics could benefit from working toward curriculum agreements and maybe even toward some master list of courses and course equivalences.

- Posting lists of expectations for entry into various majors in the four-year colleges is, according to the Transfer Agreement, a responsibility of the four-year colleges. However, such postings need to be studied and respected by the transfer counselors in the two-year colleges. Further, it should be possible to search these postings so that a student considering a particular major, say Economics, can easily see the requirements of all Economics departments in (public) four-year colleges. Accomplishing this by enhancing New Jersey Transfer may or may not be feasible given programming and financial constraints.
- The Transfer Agreement does **not** say that if even one four-year college offers a given course at the 300-level, then no two-year college can offer it. The intent is that a four-year college **may** accept a 200-level course as equivalent to one of its own 300-level courses, but that a four-year college is not **required** to do so. The clear intent of the Lampitt bill and the Transfer Agreement is to make it easier for AA and AS degree recipients to finish their majors in two more years of study. This intent would be severely undermined if two-year colleges could not offer multi-variable calculus, elementary linear algebra, or ordinary differential equations
- Transfer among four-year colleges is also an issue that would benefit from cooperation among four-year colleges.

Enhancing Educational Coherence

The next panel consisted of Janet Caldwell, Rowan University, who discussed the mathematical education of future teachers, Yvonne A. Greenbaun, Mercer County Community College, who discussed transitions into and out of 100-level courses, and Aigli Papantonopoulou, The College of New Jersey, who discussed transitions between 200-level courses and upper-level courses. The following notes on the panel were submitted by Maria DeLucia, Middlesex County Community College, Yvonne Greenbaun, and Aigli Papantonopoulou.

Transitions Into and Out of 100-Level Courses

One of the many missions of the community colleges in New Jersey is to prepare students to transfer successfully to a baccalaureate institution. This has become a daunting task. Enrollment at the New Jersey community colleges comprises approximately 48% of the

total state undergraduate enrollments. Of these, approximately 58% need **at least one** developmental course upon entrance into the college.

The Lampitt Bill, to be operational as of September 1, 2008, addresses the transfer of students from the community colleges to the four-year institutions. Students who transfer with a degree will have credits accepted as one-half of their degree requirements towards a bachelor's degree. Students who transfer without a degree will have the receiving institution's policies that are applicable to native students become applicable to them as well. The 100- and 200-level courses at the community colleges that deal with the same subject matter as the 100- and 200-level courses at the four-year institutions are to be accepted as equivalent.

For students in "non-math intensive" programs, courses at the 100-level usually suffice to fulfill program requirements. It is in the best interests of the community colleges to have courses well aligned to the four-year institutions. Two questions result from this:

- What is a "non-math-intensive program"? For example, Rutgers requires psychology majors to take precalculus.
- At the community college level, when is a student eligible for a 100-level course?

Community college students who take an introductory (also known as basic or elementary) algebra course may or may not be eligible to take a 100-level course depending on the student's major and the structure of the developmental program at the community college. For certain majors, the path is clear: introductory algebra leads to a 100-level course that fulfills the requirement for the program. For other majors, the waters become muddy. Depending on which community college the student attends, an intermediate algebra course may be required to be eligible for a 100-level course that will fulfill the requirements of the student's program. The intermediate algebra course at the community colleges:

- may be a developmental course;
- may be a credit course;
- may or may not be considered transferable;
- may or may not be a prerequisite for a required 100-level course;
- may or may not even exist at the community college; and
- varies widely in content and purpose.

As it currently stands, 60% of the community colleges who offer intermediate algebra offer it as a developmental course; several do not have any intermediate algebra course; and the transferability of the intermediate algebra course for those who have it as a 100-level course varies. This affects which courses intermediate algebra may be used as a prerequisite for across the state. In particular, the prerequisites for statistics and precalculus will need to be reviewed. The idea of “non-intensive math majors” will also need to be reviewed. Education majors should not be put into this group in light of the changing requirements for teacher education.

Thus, the answer to the question of when a student may take a 100-level course is not clear. The general education requirements are changing as we speak. Information on New Jersey Transfer is not always up to date. How “equivalent” is the 100-level course a student takes at the community college to the one needed for the curriculum at a four-year institution? What about decisions made on the basis of course outlines? With a push to specialize course outlines, information that is needed to determine equivalence may be missing in the course description or outline.

Community college faculty members have met as a group to discuss the introductory algebra course and have decided on common content for this course. Some states have gone to a common content, common course numbering process so that the meaning of “equivalent” is clear. The meaning of “common” is that at least 80% of content should agree across the colleges for a given course. It does not mandate pedagogy, books, or timing of topics. Sources involved in this process say it takes about two years to complete, and New Jersey community colleges might need to consider this model. There will be a follow-up meeting of community college faculty on February 22, 2008 to continue the dialog and to discuss getting our developmental sequence in alignment, in particular what the role of intermediate algebra should be. With the uniform Accuplacer cutoff score for mathematics placement being implemented across the state, it becomes necessary to give students across the state a common path that transitions them into 100-level courses and prepares them to transfer well. The key to this is good communication among college faculty members across the state, and continuous review, improvement, and revision of courses as a result of productive input.

Transitions Between 200-level Courses and Upper-level Courses

Aigli Papantonopoulou began by expressing one of the themes common to all of the sessions of the conference – the hope that this the conference represented a beginning of a continuing cooperation between two-year and four-year colleges for the benefit of their students. Everyone concerned is eager to help make the transition for students with an AA

or AS degree from a two-year to a four-year college as smooth as possible. There are two basic issues to be addressed:

- *Advising*

Students in two-year colleges need to be well informed of the requirements of four-year colleges to graduate with a bachelor's degree in mathematics. Before they decide which four-year college to attend, they should know which of the requirements in the mathematics major they have already satisfied and which they have not so they can choose wisely the four-year college they should attend. Mathematics departments in four-year colleges should make all their requirements clear to the advisors of two-year colleges, while two-year colleges through their advisors should make sure that students understand the requirements. Students should be made aware that, even with their 60 or 64 credits from a two-year college, they may not be able to graduate from a four-year college in two years because they will be taking too many demanding mathematics courses at once, while students who start as freshmen at the four-year college can spread more evenly their mathematics and general education courses through four years.

- *Reading and Writing Proofs in Mathematics*

In two-year colleges, courses need to be developed that train students in reading and writing proofs in mathematics. These are courses that help students develop the mathematical maturity necessary to perform well in 300-level courses. Such courses exist in four-year colleges; they are usually 200-level courses and they are prerequisites for all the 300-level courses. These courses prepare students for higher-level courses but they are also the courses that help students decide whether they really want to major in mathematics. The topics in these courses vary; they could include topics from discrete mathematics, linear algebra, or number theory. The syllabi of these courses are not as important as the nature of the courses. Mathematics departments should establish a dialogue and a collaboration to facilitate the creation of such sophomore level courses in two-year colleges.

Some of the concerns expressed by conference participants during the subsequent question-and-answer session are listed below:

- *Why is it that so many high school students cannot pass placement tests?*

There are many definitions for “basic algebra” at the high schools. The New Jersey Department of Education plans to require proficiency in elementary algebra for high school graduation, which may lead to a standardization of topics. As a part of

the American Diploma Project, a pilot program is being set up around the state that includes topics from intermediate algebra for high school algebra proficiency.

- *At some county colleges, credit is given for intermediate algebra. Will the county colleges resolve this issue?*

This is part of a discussion that is ongoing among the county college mathematics departments. As of now, a student could take both intermediate algebra and college algebra for credit, and graduate with no precalculus course credit.

- *What technology is permitted on high school algebra proficiency tests?*

Half of the elementary algebra test is given without a calculator and half allows a graphing calculator but does not require one. Half of the intermediate algebra test is given without a calculator and half assumes a graphing calculator.

- *Why does a transfer student majoring in mathematics have such difficulty at a four-year college?*

Some four-year colleges, for example Monmouth and TCNJ, require a proof-based course to be taken before linear algebra, usually in the sophomore year. A transfer student must take this course in the junior year before taking advanced courses. At TCNJ, the maximum number of courses per year for native students is two. In order to graduate in two years, a transfer student must take more than two math courses per semester. This schedule may not allow time for a student to develop the necessary mental rigor to succeed in an advanced course.

- *How is the HSPA test different from the high school algebra proficiency test?*

The HSPA test includes no symbolic manipulation. A proficiency status on the HSPA test corresponds to approximately a 50% score on the algebra proficiency test, which is too low to use for placement. A highly proficient status on the HSPA test (a minimum of 250 points) corresponds to a 75% score on the proficiency test. Since the elementary algebra proficiency test matches more of the topics in a first-year algebra course, an eighth grade student might pass the algebra test and then not be tested again until taking a college placement test.

- *Is there a movement to standardize algebra topics?*

Representatives from the county colleges have met and will meet again in two weeks to discuss common topics for algebra courses. This does not mean that the courses will have common texts or a common presentation of topics; rather, a list of topics will be agreed upon that represent the minimum ones for that level of algebra. Such a list of topics for algebra courses offered by the colleges will likely

lead to discussions with local high schools about the topics presented in their algebra courses.

- *Who advises students at the county college level?*
The advising and counseling departments at each college do most of the advising. A few instructors will have opportunities to advise students who ask for help. Concern was expressed that some students who list themselves a math majors are leaving the county colleges having taken only precalculus and that some of these students had been advised to enroll in liberal arts mathematics courses instead of precalculus. During this discussion, it became clear that both the advisors and the students should investigate the mathematics course required for their major at specific four-year colleges.

Afternoon Sessions

Following the panel discussions, participants attended one of two breakout sessions on programs in mathematics for students in their first two years of college.

Preparing For Disciplines Requiring Some Mathematics or Statistics

This session dealt with liberal arts math courses and general requirements for a two-year degree. Some of the questions raised by the participants were:

- *What will be the prerequisites for a liberal arts math course?*
Liberal arts math courses from two-year colleges will transfer to four-year colleges even if the courses don't have intermediate algebra as a prerequisite. This is in accordance with the Presidents' Council, not the Lampitt Bill. The Presidents' Council has decided that a course will transfer if it has elementary algebra as a prerequisite.
- *How will this agreement affect teacher education?*
Both kinds of colleges need to work on developing appropriate courses for teacher education. In particular, there is a need to change the math courses required for elementary education majors.
- *What will be the impact of the new general education mathematics, science, and technology requirements under the new agreement?*

To address the need for at least 12 credits in this area, some colleges are adding one credit to some of their general education math courses. This enables students to take one 4-credit math course and two 4-credit science courses or two math courses and one science course to fulfill the requirement. If the majority of math courses at a college carry only 3 credits, students would be left with few alternatives from which to choose. Should these colleges add more content and increase the course to 4 credits or should they create a 1- or 2-credit course to fill in the gap? One four-year college suggested adding a 1-credit IT course. The number of credits is not an issue for some four-year colleges because they will accept 10 or 11 credits in place of the 12, but the two-year colleges will still need to fit the 12 credits in to the overall 60 credit limit.

- *Should there be specific content in a liberal arts math course?*

The content of a liberal arts math course doesn't matter for students majoring in some areas; however, some particular liberal arts math courses can be useful for certain majors such as social science and elementary education. Many future elementary teachers start their careers at the community colleges. Monmouth and TCNJ require two math courses for elementary teachers, but won't accept the math course that Brookdale offers for future elementary teachers. Four-year colleges need to notify two-year colleges about their requirements. New courses may be developed at the two-year colleges to address the need for transferability. However, some two-year colleges are too small to offer a plethora of liberal arts math course for specific majors.

Although four-year colleges are required to accept courses from two-year colleges, whether the course is accepted as a general education or a major requirement is left to the four-year college. How will this be done?

It is up to the major department in the four-year college to determine whether the course satisfies a requirement of the major. This will normally be done based upon whether it is a prerequisite for other courses in the major. At some colleges courses cannot be counted both for general education and as program requirements.

- *Will statistics transfer as an elective or as a major requirement?*

It is up to the four-year college to determine whether the course will count towards the transferring student's major. There is a need for both kinds of colleges to work on improving statistic courses. There were three areas of concern: statistic courses needed for teacher preparation, the kinds of courses needed for statistic majors, and statistic courses that social science majors need.

- *A statistics course that doesn't require intermediate algebra as a prerequisite might not be accepted at a four-year college in place of a similar course with an intermediate algebra prerequisite. Does that mean that the transfer student needs to take the prerequisite at the four-year college and then take the course again?*

It depends upon whether the statistics course is a program requirement or a general education requirement. A program requirement would need to be met, but general education courses will be accepted. There was a suggestion that two-year colleges might consider offering two different levels of statistics.

At the conclusion of this session, the participants agreed that communication is important in terms of what math courses students need to take. We need future statewide discussions in the following areas: Teacher education, statistics, and social sciences. We also need information from four-year business colleges.

Preparing for Disciplines Requiring Lots of Mathematics

The focus of this session was to look at math-intensive majors and to discuss steps for future sessions.

- The definition of 200- and 300-level courses needs to be made clear. For example, it must be decided whether a 200-level course is considered to be a prerequisite for a 300-level course. Without a definition, advisors will be confused about how to advise transfer students. If the course is not mentioned in the legislation, then it is at our discretion to develop more accurate guidance for faculty and advisors. Concerns were expressed about differential equations and linear algebra. Despite the numbers given to these courses at the four-year colleges, if these courses are deemed “equivalent”, should they be accepted for transfer credit? These decisions greatly affect the mathematics majors at community colleges.
- *If a course is designated as a 300-level course at a four-year college, may it be taught at the community college level?*
For example, differential equations has a 300 level designations at some of the four-year colleges. The answer given was “yes and, if the course is equivalent, it should transfer.” Some felt that in light of a comment made by Mike Beals, the receiving college has the discretion of whether or not to transfer such courses.
- *What is the meaning of “equivalent” course?*

Courses like differential equations and linear algebra can be taught as theoretical courses or as service courses. The topics may be the same but the perspective and emphases can be very different. Some felt that the four-year colleges should clarify the content of their courses, especially those that intersect with the community college curriculum. Everyone agreed that the content, title, and numbering of courses needs to be consistent.

- *Does the title of a course truly reflect its content?*
Does “Introduction to Linear Algebra” at a four-year college mean the same thing as “Linear Algebra” at a two-year college? Should courses be defined as equivalent if they have 80% of their content in common? Even the names of courses that are the same may be misleading. What is Calculus I? It is a 3-credit course at some colleges and a 4-credit course at others. These courses cannot be equivalent, even though they have the same title.
- The history of transfer in New Jersey has been a disaster. There have already been lawsuits because students with a 4.0 GPA could not get credits transferred. Many felt that the appeals process for transfers will be a problem and that there may be more lawsuits from students on the horizon. Students may sue the college from which they received their associate’s degree over problems with transferring credits. Failure to cooperate in designing consistent programs could also affect funding.
- TCNJ and Monmouth offer a proof-based course that develops students’ ability to read and write mathematics. The community colleges may want to develop a similar course as it may facilitate our students’ transition to a four-year college. Many transfer students have a hard time adjusting to the rigor involved in advanced mathematics courses where they are expected to read and write proofs. Representatives from the four-year colleges offered to work with two-year college faculty to help develop such a course.
- Most participants felt that technology should be used judiciously, and that the technology should not be a replacement for teaching the mathematics.
- A representative from Rutgers reminded us that our goal is to have students **not** fail the first course they take at a four-year college. To do this, perhaps some sort of readiness test may be used to indicate whether students have forgotten some material and need to firm up those topics before taking further courses.

At the end of the session, the participants outlined some possible follow-up actions:

- a course-by-course review of title and content,
- devoting time at the spring and fall meetings of the MAA, the MATYCNJ, and the NJAMTE for further discussion,
- recommending that students take the entire calculus sequence at one college,
- updating NJ Transfer on the web, and
- forming a small committee to recommend more information that should be available on the web.

This session ended with the comment that our student populations differ and that we are not working in isolation. We need to work together.

Closing Plenary Session

The conference closed with brief reports from the breakout sessions and a discussion of next steps that could be taken. These included:

- *Follow-up Committees*

A small committee should attempt to find a way of listing math requirements by discipline and by college on the web. It may be possible for New Jersey Transfer to incorporate this information. This is a response to an expressed concern that students at two-year colleges need as much information as they can find to plan their programs in order to limit the number of years it takes to graduate.

A small committee consisting of faculty from both four-year and two-year colleges should write guidelines for a sophomore proofs course that would be accepted by four-year colleges as a prerequisite for advanced courses. Transfer students should take such a course prior to enrolling in a four-year college so they can start taking advanced courses the first semester of their junior year. Again, this is a response to the concern that it often takes transfer students more than two years to complete a degree.

- *Dissemination of Conference Reports*

State MAA and MATYCNJ meetings should concentrate on further discussion of the articulation issue. In particular, it would be useful to have a conference report in time for the fall 2008 MAA-NJ meeting. Since faculty find it difficult to take time off from classes to discuss issues, meetings of state-wide organizations offer

good opportunities to do this. The South Jersey Math Alliance would be happy to sponsor a further meeting.

- *Advising*

The advisors in the two-year colleges will become much more important in the future and they will need to have close communications with the four-year colleges. Students need to know which courses satisfy program requirements and what grade requirements are. Finding out how other disciplines are responding to the legislation may give the mathematical community some insight into how we can make sure that students have access to the information that they need.

- *Compliance, assessment, and appeals*

Oversight of compliance with the legislation appears to be through the New Jersey Presidents' Council and assessment is up to the Commission on Higher Education working through collegial research arms.

- *Grades*

Courses in which a student receives a grade of D or better will transfer as credit but will not satisfy prerequisites or program GPA requirements. Grades need to be displayed on transcripts and transcripts should be machine-readable. Perhaps two-year colleges should all provide electronic transcripts.