

Report for IMPAC Northern California Meeting, January 28, 2005

Mathematics

Martin Flashman, Lead Faculty

Based on Minutes by Robert Hasson

[A list of those attending appears at the end of this report.]

**About CAN:** CAN is the project for common course numbering statewide. Course descriptors are attached to the CAN numbers, so that there is no doubt that a course transferred from a community college will be accepted as an equivalent CSU course

CAN numbers are used by the community colleges and the CSU's for articulation purposes. The UC's do not use CAN, but they do see them in student records.

The present CAN descriptors are like catalog descriptions, which means they are short and lacking detail. CAN is asking disciplines to provide the list of topics, course outlines, to go with the CAN descriptors. The purpose is to make the descriptors more specific.

Last year IMPAC recommended a revised descriptor for linear algebra. CAN is about to receive this descriptor for consideration and implementation.

A question and proposal: Do we need a special conference, perhaps outside of the IMPAC meetings, for people teaching the courses to discuss descriptors and objectives and recommend revisions to CAN? Hopefully the result would be descriptors that are more specific and more up to date. About two years ago a revision for the current descriptors was initiated but was never brought to CAN for final adoption, so the current Mathematics descriptors in are not of recent vintage,.

**About ASSIST:** ASSIST is the website that offers information about articulation agreements for transfer students. Students can find there the articulation agreements between the community colleges and the CSU's and UC's. ASSIST also shows the various majors offered by the universities.

Last year we recommended that ASSIST offer easy access to the university web sites and departmental web sites. ASSIST decided the most complete proposal for this feature would be too hard to maintain, but has made a substantial effort to provide more direct information connected to majors.

In the current beta version layout of ASSIST related to majors, the display of the majors at the universities is confusing. It might be a good idea to have a discipline consultant for each major page.

**LDTP:** LDTP is the CSU project developing lower division transfer patterns for the CSU's. LDTP is now written into state law. Students who follow the LDTP patterns get a preference for transfer to a selected CSU campus or campuses. Such a preference means much less than it sounds, however. The preference doesn't help at impacted campuses, and it is unnecessary at non-impacted campuses. LDTP will target students through the community college counselors. It was suggested that information about the LDTP be sent to the CC Mathematics Departments as well.

**CSU and Teaching Credentials:** The CSU's are developing tighter secondary credentialing programs (the degree of tightness differing from CSU to CSU) to be completed in a total of four years without an additional year for "credential work.". As a result, at the community colleges students wishing to follow these more intense programs must schedule their courses with more care.

In the new secondary integrated programs the credentialing courses and activities are integrated into the BA with at most one extra semester needed. (at least at CSU Sacramento)

Liberal studies mathematics programs can no longer be used to waive examinations for the general elementary teaching credential. This means that the enrollments in such courses can be expected to be lower as students take more traditional majors and prepare for the exams without more general mathematics coursework.

### **Proof and Bridge Courses:**

Background: UC Berkeley's issues can be seen as an example. Berkeley has a lot of transfer students, about 40% of the graduating class in mathematics. It also has several hundred math majors. The representatives from Berkeley see two problems in transfer students.

First, some of the transfer students seem to have a lot of trouble adjusting to the heavy workload at Berkeley. Are the community colleges demanding enough?

Second, a lot of the transfer students are having trouble adjusting to the intensive proof nature of upper division math courses at Berkeley. The Berkeley representatives are concerned that students are not learning enough proof skills in their work prior to transfer to help them to survive in the math major. Also sixty percent of the 500-600 UC Berkeley majors are applied mathematics; and large related majors such as economics, physics, biological sciences, areas of computer science, statistics, and operations research are using what is considered upper division mathematics. Most of these majors require the same two years of lower division math with theoretical applications requiring upper division problem solving/writing skills.

This is really part of a larger discussion about the transition from lower division math courses to upper division courses for majors, a discussion that includes all the CSU's and UC's.

Many CSU's offer a bridge course in proof covering issues related as well to logic and sets as a prerequisite to upper division work in mathematics. The community colleges don't offer such a course because they don't have enough math majors for an adequate level of enrollment. UC Berkeley does offer such a bridge course but it is not required of its native students as these students appear to pick up proof skills in the lower division mathematics at Berkeley.

At last year's Northern California IMPAC meeting there was some sentiment for using the Discrete Mathematics course as the course in which proof skills would be learned at the community colleges. Most community colleges now offer a Discrete Math course as a service to computer science majors, but the content is good for math majors, too. However, this idea did not survive the state meeting recommendations primarily because those Universities that offer these bridge course did not feel confident that there was enough emphasis on proof writing in the discrete mathematics courses..

The community college representatives were unclear on what they could do. In a typical calculus class of thirty students at a community college only one or two students will be math majors, so it is hard to fashion such courses around the specific needs of math majors. This is similar to populations of the calculus courses at the CSU's as well. Also, it was unclear to the community college representatives how students are taught proof skills in Berkeley's lower division math courses, so they weren't sure what to try to emulate.

Some felt that communication is a major part of this issue. The community colleges need better communication with the UC's and the CSU's. People offered several ideas for bringing this about. There could be a regional math day offered by the universities. One idea was that a UC or CSU could host a meeting with community college, CSU, and UC faculty. Such a meeting could rotate between campuses. Students could attend such meetings to learn more about mathematics, transferring, and see the university campuses.

### **Items from Last Year's Report:**

*Course recommendations:* The recommendation for the linear algebra CAN descriptor has the course going more into the structural aspects of the course (when is something a vector space or not, when is something a linear transformation or not, etc.). The old descriptor mentions little about structural aspects. The recommendation will be presented to CAN soon.

*The Math for Managers discussion:* At last year's northern IMPAC meeting the business people wanted to put together a course that would essentially combine business calculus and finite math into one course to replace the traditional two-course requirement.

This idea was modified at the state meeting so that a new "Math for Managers" course would cover the core areas of finite math plus a very short discussion of differentiation and integration. Further discussion of this course is on hold while the new CAN procedures are coming on line. In parallel it is clear that at some CSU's business students need a more rigorous grounding in calculus than the proposed "Math for Managers" course would provide. These schools will continue to require both Business Calculus and Finite Math.

Also being discussed are the needs of business majors for a required Elementary Statistics course (or sequence of two courses). It seems clear that this course should cover regression and hypothesis testing, but can downplay probability.

*The bridge course discussion:* The annual report offered a number of recommendations related to a bridge course. The universities should offer it in the summer, perhaps as a distance learning course. With funding from a grant, a consortium of universities and colleges might offer a summer program on proofs plus undergraduate research. Students could be recruited from the community colleges, and a stipend would be offered to the students.

We came up with more ideas. The UC's and/or the CSU's could offer workshops on styles of proof, learning to prove, and course experiences that promote the learning of proof. The possibility of involving MSRI (possibly with solicited NSF support) in these workshops was suggested, if it could be set up there.

Also it would be useful if someone would put together a report based on the departmental web sites of who is teaching the bridge course and what are the course syllabi for these courses. Cindy Stubblebine and Sean Jackson volunteered to do this. [2-18-05 update: Cindy has assembled a report listing bridge courses with links to their descriptions. This report will be posted at the Math- IMPAC web page.]

Finally, it would be good to gather reports on experiences in teaching proof so we can all see what works and what doesn't.

*Computer recommendations for the math major:* The UC Berkeley representatives said it would be great if students were exposed to a computer language. They strongly recommend C++, Matlab, or just about anything else. With knowledge of a computer language a student has a better chance to get research internships and jobs.

In Berkeley's courses, a computer language is used only in the course in Numerical Analysis, but this course is required for applied math majors – 60% of Berkeley's math majors.

At CSU Sacramento some of the teachers of statistics use software in the course, generally Minitab. The use of Mathematica is beginning to happen in some other courses.

At Humboldt State math majors are required to take C++, but other programming languages are acceptable. Students use the language in Numerical Analysis and Number Theory. Professors in some courses use Matlab. In calculus, the freeware program WINPLOT is used in two and three variable calculus.

### **New Ideas:**

At this point in time IMPAC funding is less than it was and may even peter out completely at some time in the future. We used to have four regional meetings each year, but now we are down to two.

Should we arrange meetings outside of the formal IMPAC conferences? Possible venues are the annual CMC<sup>3</sup> meeting in Monterey or the annual Northern California/Nevada/Hawaii MAA meeting, usually held at a San Francisco Bay Area college or university.

If IMPAC disappears next year (a possibility) then a meeting is still needed to keep the community college-CSU-UC dialog going. The universities have a responsibility to give feedback to the community colleges about transfer and to inform the community colleges about changes. The community colleges have a responsibility to seek such feedback and act on it.

### Mathematics Attendees

<b>Callahan, Kevin</b>	<b>Faculty</b>	<b>CSU Hayward</b>	<b>kcallaha@bay.csuhayward.edu</b>
<b>Davis, Lloyd</b>	<b>Professor</b>	<b>College of San Mateo</b>	<b>davis@smccd.net</b>
<b>Flashman, Martin</b>	<b>Lead Faculty</b>	<b>Humboldt SU</b>	<b><u>flashman@axe.humboldt.edu</u></b>
<b>Guerra, Estela</b>	<b>Faculty</b>	<b>Las Positas College</b>	<b>elguzman1@netscape.net</b>
<b>Hasson, Robert</b>	<b>Professor</b>	<b>College of San Mateo</b>	<b>hasson@smccd.net</b>
<b>Henson, Teresa</b>	<b>Instructor</b>	<b>Las Positas College</b>	<b>thenson@laspositascollege.edu</b>
<b>Ho, Ming</b>	<b>Instructor</b>	<b>Chabot College</b>	<b>mho@chabotcollege.edu</b>
<b>Jackson, Shawn</b>	<b>Faculty</b>	<b>West Hills College Lemoore</b>	<b>shawnjackson@westhillscollge.com</b>
<b>Keune, Cynthia</b>	<b>Instructor</b>	<b>Las Positas College</b>	<b>ckeune@laspositascollege.edu</b>
<b>Loukianoff, Victoria</b>	<b>Faculty</b>	<b>Ohlone College</b>	<b>vloukianoff@ohlone.edu</b>
<b>Pauling, Catherine</b>	<b>SAO</b>	<b>UC Berkeley</b>	<b>cpauling@math.berkeley.edu</b>
<b>Ramachandran, D.</b>	<b>Chair</b>	<b>CSU Sacramento</b>	<b>Chandra@csus.edu</b>
<b>Stubblebine, Cynthia</b>	<b>Instructor</b>	<b>Chabot College</b>	<b>cstubblebine@chabotcollege.edu</b>
<b>Teti, Frederick</b>	<b>Faculty</b>	<b>City College of San Francisco</b>	<b>fteti@ccsf.edu</b>
<b>Vojta, Paul</b>	<b>Professor</b>	<b>UC Berkeley</b>	<b>vojta@math.berkeley.edu</b>
<b>Wagener, Kristine</b>	<b>Faculty</b>	<b>Las Positas College</b>	<b>kwagener@laspositascollege.edu</b>
<b>Woo-Hoogenstyn, Yoly</b>	<b>Articulation</b>	<b>UC San Diego</b>	<b>yoly@ucsd.edu</b>
<b>Yokoyama, Kevin</b>	<b>Chair</b>	<b>Redwoods, College of the</b>	<b>Kevin-Yokoyama@Redwoods.edu</b>