IMPAC Annual Report
2003-2004
Science Cluster I: Mathematics
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Summary of Identified Issues

There were two main areas for discussion and recommendations. Each of these areas and many related suggestions were explored at one or more of the regional IMPAC meetings held this year.

I. Course Related Recommendations. The nature of the lower division Linear Algebra Course and its CAN description were discussed, with a focus on ensuring that the course covered more than mere matrix manipulations. Also considered were a variety ways to provide a separate "bridge" or transitional course for Mathematics majors prior to transferring.

II. Recommendations for Improving Communications within the Mathematics Community.

At the regional meetings many issues were discussed related to improving the communication and sense of community between the segments. Some progress was made this year with the final statewide dissemination to students, advisors and counselors of the letters (composed at IMPAC's 2002 statewide meeting) recommending course work for a student prior to transfer. This year's recommendations were made in two categories:

A. University and College Recommendations aimed at improving communications at the Colleges and Universities and

B. Organizational Recommendations aimed at improving intersegmental connections.

Identified trends/Future Directions

Efforts continue at both CSU and UC Mathematics Departments to provide more specific directions for pre-transfer mathematics course work and improve pre-transfer preparation. Development of standards and a possible CAN description for a "bridge" course remain for the coming year. The development of inter-segmental regional mathematics councils and joint sponsored activities based on this year's work should move toward realization in the next year. Finally there is a trend toward more systematic approaches through certification and other pre-transfer schemes that bears watching.

Comments from Statewide Meetings and the General Field

- Better communication could provide information about transfer courses, the nature of mathematical studies in upper division courses, and key people to contact and places to obtain information with regard to the specifics of transfer.
- Many CSU and UC Mathematics programs have a lower division required course that provides a transition from the computational and algorithmic nature of lower division courses such as calculus to the more structural and proof oriented organization of upper division mathematics courses. [Currently 9 CSU and 3 UC campuses have a proof class as either recommended or required in the lower division.]

- Other programs make this kind of course an initial part of upper division course work or have no such course. These courses are generally viewed as beneficial. The problem is how to make this kind of course available to the college students since most community colleges will not offer this kind of course due to projected low enrollments.
- The related recommendations discussed in this report are not mutually exclusive. They are presented primarily for students planning to attend a university that requires a lower division bridge course.

Recommendations for the Discipline

The following recommendations were accepted by consensus among the participants at the mathematics sessions of the statewide IMPAC meetings April 30 and May 1, 2004.

I. Course Related Recommendations.

A. Linear Algebra:

The lower division linear algebra course should include in its presentation some structural aspects of linear algebra. These include, but are not limited to, the statement of axioms and structural definitions for real vector spaces, linear transformations, and linear operators. Use of these structures should be demonstrated with some proofs, though only a reading level of literacy is supposed. Limited writing literacy may be required in verifying structural properties with examples and applying structural results in specific contexts.

B. Lower Division Bridge or Transition Courses Recommendations

1. When possible the student should be encouraged to cross-register in a bridge course at a local university. This course should be articulated amongst the various universities that have these courses as lower division requirements.
2. Universities that offer these bridge courses should coordinate their summer course offerings. This will create opportunities for transferring students to enroll in a bridge course during the summer prior to beginning university studies. Universities should explore offering these courses in a distance-learning model using video and online resources.
3. A consortium of colleges and universities should organize a special summer program (funded by the NSF, a state agency, or some private philanthropy) that would provide the kind of experience with proofs found in these bridge courses along with beginning experience in mathematical research. This program should provide a stipend for the students and recruit students from the California Community Colleges specifically to help develop their mathematical maturity.
4. A new CAN Number and descriptor should be developed for this bridge course. The value of this would be in making the transfer of these courses taken at any of the CSU's by college students acceptable for articulation as appropriate across the CSU campuses.

II. Improving communications within the Mathematics Community
A.   University and College Recommendations.
  1. Each University department should designate one or more faculty or advising staff members as transfer advisor(s). The advisor(s) will be responsible for matters related to transferring students –such as transfer course approval and program planning.
  2. Each College department should develop a structure (using resources such as MESA, matriculation funds, and other grants) to assist students planning to transfer.
  3. Each University department should designate one or more faculty members responsible for articulation agreements. University departments should keep recognized feeder colleges informed on relevant changes to requirements and courses.
  4. Each University department should maintain a web page to provide prospective transfer students relevant requirements and advice for transferring as a mathematics major. This page should be linked clearly from the department home page and should address at least the main issues from the IMPAC letters of advice for transfers while indicating how to obtain details on articulation agreements through ASSIST or otherwise. It should give the name and other relevant information of the department's designated transfer advisor(s).
  5. Each College and University department should work with their campus articulation officer to maintain current articulation and contact information with ASSIST.
  6. When possible University departments will provide information through the web describing required courses for the major including course outlines.

G.   Organizational Recommendations
Recommendation Regional cooperation should be developed between individual campuses and where possible by the formation of intersegmental mathematics councils. These councils would meet at least once annually to develop programs and disseminate information. [These might initially meet during IMPAC meetings, but eventually would be independent of IMPAC.] Some areas for possible cooperation include:
- College Math club guest speakers from the university.
- College faculty taking courses or participating in university seminars.
- Sabbatical leave positions for College faculty at Universities.
- Math contests at the university that the local college students are invited to enter.
- Math Transfer Day: Math departments at the university campuses could sponsor jointly a regional math transfer day where advising would be available and faculty from feeder colleges and students could come together to participate in joint mathematical activities: poster sessions/ lectures/ demonstrations- a REGIONAL MATH EXPO.
- Presentations at CMC^3 and CMC^3S Professional Meetings related to University major curriculum developments.

Recommendations for Support Courses
At some regional meetings and at the statewide meeting the Business discipline proposed developing a hybrid course in mathematics for business majors to replace currently offered courses in Finite Mathematics and Business Calculus. Mathematics participants viewed these proposals as overloaded with more content than could be reasonably treated

in the number of units allotted. At the Statewide meetings suggestions on how to reduce the Business proposals to a manageable amount of material were considered with the final suggestions being closer to the existent CAN description of business calculus. Though no final specific recommendation was made, the general sense of the mathematics participants was that these efforts needed further work to bring them closer to what is actually being required at the Universities rather than trying to develop and legislate a new course statewide.

Topics for Further Discussion
Review of programs and courses for teachers at all levels is a subject for future discussion. Also the development of stronger enrollment connections such as the UC Dual Admissions Program and the CSU POL efforts to provide stronger links to college and university admissions should be discussed further with their implications.

Recommendation Forwarded/ to be forwarded to CAN:
The CAN description for Linear Algebra should be modified to reflect a limited treatment of the structural aspects of linear algebra.
Current:
      CAN: MATH 26
      Title: Linear Algebra
      Description: Matrices and linear transformations; vector spaces; determinants; eigenvalues and eigenvectors.
      Prerequisite: CAN MATH 17/18. 3 semester units or 4 quarter units.
Recommended modification:
      Description: An introduction to computation and algebraic structures for real vector spaces, matrices and linear transformations; determinants; eigenvalues and eigenvectors.

Recommendation Forwarded/ to be forwarded to ASSIST:
A web page should be developed containing information and links for all university mathematics departments. The information on this web page will be maintained as current by each department in cooperation with the campus articulation officer. This web page will be developed in cooperation with ASSIST and placed in an easily found location on the ASSIST web site and possibly mirrored elsewhere at the CSU and UC system transfer information web sites. The web page will include the following information for each University Campus:
      A Contact Person / Advisor with E-mail Address and Phone.
      A link to the Mathematics Department Web Page and a Recommended Phone Contact Number.
      A link to Any Mathematics Department Transfer Information Web Page

Outreach presentation made by members of this group:

Organization	Date/ Place	Presenter	Number Present
AMATYC	November 15, 2003	Martin Flashman	80