Priorities and goals in the math department
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The Emporium offers great opportunities, but also many modes of failure. Avoiding failure will require realistic understanding of the constraints and careful navigation around them. Further, moving instruction from largely autonomous classes to a complex integrated environment will require substantial reorganization of the department. This memo explores some of these topics. Section headings are:

A) University priorities
B) Costs
C) Credits and efficiencies
D) Multimedia and distance learning
E) Program assessment
F) Individual assessment
G) Departmental structure
H) Research

A) University priorities
This development is taking place inside the University, so in the end will be judged by contribution to and compliance with University priorities. These priorities must be understood realistically: we cannot afford to be romantic about what the mission ought to be, nor can we rely on the public declarations of the administration. What matters is what they do, not what they say. From an operational point of view the priorities are:

1) economics;
2) student happiness and success;
3) quality of education;
4) research

The are ordered in the sense that what happens at one level only matters if performance at higher levels is satisfactory. Some illustrations:

-- Cost overruns will not be forgiven no matter how happy the students are, or how good their education is. Similarly, arguments that more resources are needed to raise quality are rarely successful. Usually they provoke rhetoric about "doing more with less", and "challenges", not more resources.

-- Low class evaluations and/or high failure rates are not acceptable as the price of maintaining quality.

-- An active research program is not an acceptable excuse for low classroom performance. In contrast, near-total classroom involvement is acceptable if that is what it takes to keep students happy.

Note "faculty happiness" is not on the list. The administration seems to accept stress as a promoter of high faculty performance, even if they reject the same approach for students.

It is important to realize that these priorities are largely forced on the University administration from outside (state legislature, SCHEV, public attitudes, etc.). For the most part they are not in a position to negotiate even if there are good arguments that the
priorities are "wrong" or counterproductive. Nor is this some dark plot that could be resolved by a change of administration. These will be the rules of the game for the foreseeable future. We can pursue other agendas (e.g. section H) within these constraints, but failure to take the constraints very seriously may lead to hardships including budget cuts and increased workloads.

B) Costs
After the startup period, balancing the economics will be first in line as a potential killer. Accordingly we begin by considering the costs; credits against these costs are discussed in the next section.

1) Facility: The most obvious costs are rent, upkeep, computer maintenance and replacement. To address just one of these, depreciation on the equipment exceeds $1,000 per day. This seems to be an "unfunded liability", neither counted as operating expense nor covered by some reliable program or plan. What will happen when a huge infusion is needed to replace the computers? We may be bailed out by back-channel or "re-startup" funding, but rather than count on this it may be better to do a full accounting of these costs.

2) Staffing: We already have many personnel outside the usual academic pigeonholes: systems maintenance, floor helpers, tutors, and floor supervisors. This list will grow as usage and complexity grows, and as the tasks become better defined. For instance, we will need "consultants" with specialized expertise available to help with harder problems on the floor. "Focus group leader" is likely to become a non-instructional position.

3) Courseware: Like diamonds, courseware development and maintenance are forever. Real-time problems require real-time fixes: we can't wait for the next edition, we need staff who can fix it on the spot. Programming will get easier, but that will just leave us face-to-face with the bigger and longer-term problem of content development. These must fitted into the big picture as genuine operating costs, not just supported by startup grants or other soft money. We will be in big trouble if we have to curtail development when startup money runs out.

C) Credits and efficiencies.
Eventually the department will have to deliver instruction at about the same cost per student credit hour that it does now. The department will have to balance its budget because the Dean and Provost have to balance their budgets, etc. There are lots of arguments that the department should receive credit for one thing or the other, but we don't get to do the bookkeeping. Something has to translate into real money at some level, AND be credited to the department, before it can be used to offset expenses.

1) Facility: Rent and upkeep in the emporium are cheaper than University construction of new space. But this is a fragile argument: it only has force if higher powers agree it would have been necessary to build, and that renting relieves them of the need to build. Most likely the alternative to the emporium was cramming more classes into McBryde. In other words it solves a problem for us, not for them. In fact SCHEV has expectations for usage of academic space, and cramming more classes into existing spaces would improve the university ratings.

2) Staffing: we are going to need more bodies, so to balance the budget we will need to pay (on average) less per body than we do now. This will be possible because we will have a greater diversity of tasks, ranging from floor helpers to content developers. Teaching traditional classes require relatively uniform skill levels: every teacher must be qualified to teach the course. But when learning is "unbundled" so are the skills needed.
Savings will come from careful identification of the skills and duties of each position, and filling them with people at appropriate salaries. Widespread use of professorial rank faculty in these positions will not be sustainable.

3) Class meetings: A particular place efficiency will be needed is in our handling of "class meetings" for emporium-based courses. These will need to be entirely non-instructional so we can save money by either (i) using "leaders" who would not be qualified to teach the class, or (ii) assigning many more students to each leader than could be handled in an instructional situation. One possibility is to use leaders who would also be available as tutors ("office hours"), so meetings would develop a relationship with a tutor. (See section F for more on this).

4) Course conversion: There are large fixed costs in the emporium, and many other costs (e.g. programming support for courseware development) scale with the number of courses, not the number of students. In contrast, costs in traditional instruction scale directly with the number of students. This means that potential efficiencies will be realized only by moving large-enrollment courses into this mode. Most likely all large-enrollment courses will have to be converted before we can balance the budget in any sense. If this does not happen before the end of the startup period we may have to absorb the shortfall, probably through teaching overloads to handle unconverted courses. Therefore there is some urgency in having vigorous conversion programs for all large courses.

5) Time pressure: These efficiencies must be pursued vigorously enough to free some resources for experimentation, not just to cover known costs. For instance, we can't project what will be needed for student comfort and success. Large help sessions? These are relatively cheap, but early indications are that students don't find them useful enough to bother attending. More tutors? Maybe, but this is more expensive. We are unlikely to solve this before the end of the startup funding.

6) Outside sales: The "product" of all this might be marketed to other institutions, and provide income to support some activities. However this is highly problematic. Configuring it as a commercial product would have its own startup and operating expenses (e.g. for software support; think of what we want with the 1015 software), and the income would be extremely soft. Money may look plentiful now, but a serious market shakedown will take place very soon (think of how we feel about the 1015 software). As a comparison, imagine the department had directly invested in the textbooks written here over the years, with the expectation of developing a steady income from them. We might seek outside sales of the new products, but we will have to be very realistic about costs and risks, and cannot have the program dependent on marketing success.

D) Multimedia and distance learning.
These are attractive and fashionable, but dangerous. Probably the best advice is: don't.

1) Multimedia, general: Much of the work in multimedia is oriented toward replication of the traditional classroom atmosphere. But this is a mistake for many reasons. First, new media offer new modes of instruction, not new ways to deliver the old mode. Getting stuck in old methodologies will prevent us from discovering new ones. Second, many "multimedia" tools, especially video, are very expensive in terms of support and time, as well as equipment. Standards are set by the entertainment industry, and products of academic-level budget efforts will look clumsy and amateurish. Finally, the entertainment industry has cultivated a "spectator mode" in which their consumers become passive and suspend critical facilities. Students can't learn while in this mode, so to be effective we must avoid triggering it.
2) Multimedia, specific: The fact that there are seductive dangers does not mean some media cannot be used. The CD-ROM tutorials prepared by Hanks seem to work, but probably because they are low-tech rather than in spite of this. It would be counterproductive to "enhance" them by adding some kind of whole-body blackboard performance, cartoons, etc.

3) Distance learning, general: The primary University mission is to provide educational opportunities to citizens of the Commonwealth. The land-grant aspect of the charter could be interpreted as indicating distributed offerings. In any case distributed education is currently a hot topic. Unfortunately, as currently conceived it is also very expensive. The citizens of the Commonwealth are not willing to pay for it, either individually as students or collectively through allocations of tax revenues. This economic problem has led the administration to classify some distributed education as "outreach" rather than part of the core mission. They have offered a lot of startup funding. The charitable view is that they hope clever faculty will develop economically sustainable models that can be incorporated into the normal activities of the University. The cynical view is that they would be delighted if the faculty would undertake it as a voluntary overload, or instead of research. Most developments to date (Cyberschool, on-line course supplements, video classrooms, most web-based courseware) support the cynical view. Developers tend to regard sustainability as crass and demeaning, not a vital objective, and the administration is not providing discipline or leadership on this.

4) Distance learning, specific: If the department gets involved in distance learning we will have to do our own careful thinking about sustainability. There is a particular risk in undertaking it as a department: if individuals burn out from volunteer overload they can quit. If a department is lured into an overextended position by startup funding, it will be stuck. Some specific concerns:

i) Distance learning is unlikely to be sustainable as a separate operation anytime soon, no matter how clever we are. It will have to be piggybacked on campus offerings.

ii) The courses targeted in distance learning are largely graduate or advanced undergraduate, with low enrollments and high support needs. Electronic on-campus versions are unlikely to be sustainable as a separate operation anytime soon. For long-term sustainability it will have to be piggybacked on off-campus offerings.

iii) Network-based does not mean human-free. If it did we wouldn't have a problem, since the marginal cost of adding an off-campus student would be near zero. But since it doesn't, we do have a problem. We are betting that the network component will reduce the need for human interaction sufficiently to make it economically sustainable. But this is far from clear: advanced course levels and the highly inhomogeneous backgrounds of off-campus students will require highly-qualified (expensive) helpers. Off-campus availability of such help is problematic. Effectiveness of remote help from campus (whiteboards, etc.) is untested. And even if the technical problems work out, a high level of need for help could doom any hope of breaking even.

5) Bottom line: If involvement with multimedia or distance learning can be integrated into our main effort, fine. But if it requires any diversion of effort from conversion of high-enrollment on-campus courses, we must avoid it. Similarly, anything that will lead to unrealistic expectations or unfunded commitments should be avoided. This includes "gift" facilities (e.g. a TV studio) or startup funding for unsustainable courses.
E) Program Assessment

In this new environment we must evaluate performance of both the program and individual contributions to it, for use both internally and by the Dean and other administrators. We must address this issue ourselves, quickly, directly and honestly. If we are too slow, or not direct enough, we will lose control of it and the results are guaranteed to be unpleasant. This section considers the program, individuals are discussed in the next.

1) Cost. This is a big issue, and potentially a big problem. We might want to work out a detailed agreement with the Dean's office about who should be charged for what, and get a "budget", possibly based on student credit hours. This would provide a clear and common basis for assessment. It would also address questions or attacks from other units who suspect they are being short-changed to pay for the emporium. It provides us an opportunity to get control, by accepting responsibility. For instance the staff that maintains operating systems, networks, check-in programs, etc. really should report directly to someone inside the emporium, not outside (eg. in the Computer Center, as is now the case). We need more contact and responsiveness with this staff, and cannot afford exposure to priority shifts in other units. Thus it is prudent as well as honest to have this counted as part of our costs. Similarly, we will be a whole lot better off in the long run if courseware development is counted as an operating expense rather than requiring external funding. We should make this point now, and accept the responsibility to be sure it gets covered. Generally, being willing to take responsibility up-front should enable us to get clear assessment criteria, a role in formulating them, and flexibility in how we meet them.

2) Happy and successful students: The most urgent need here is a replacement for in-class evaluations. We must give students a way to express their feelings about the program. But we must also be proactive in how the outcome is to be interpreted. The alternative to the emporium was very large lecture sections, which we know to be unsuccessful and unattractive to students. We need to be sure feelings about the emporium are compared to what they would have been toward large lectures, not the comfortable situation of a few years ago. Also, some of these courses had large failure rates, and a fair evaluation would compare complaints about the emporium to this. Thus if under 10% of the students complain, we are doing better than before. But for this sort of argument to be credible it must be done quickly and up-front. It will be a whole lot less convincing if we wait until there is a problem, or wait for someone else to set benchmarks and then try to protest them. Note that the comparisons suggested here are to a traditional program constrained by declining resources. This argument looses its force if the new program requires significantly more resources. But in that case happiness wouldn't be crucial anyway, since we would have already failed at a higher-level priority.

3) Quality: The strongest demands for quality come from our own intellectual integrity, not from the University. For that matter, nowadays quality itself is seen as subjective (culturally determined!). We should track student learning, and use the results internally to improve the offerings. But the quality of quality assessment itself is low, unreliable, and vulnerable to idealistic or unrealistic goals, so is not a good primary index for assessment of the program. In fact whatever we come up with will honestly be satisfactory, and we should have no qualms about presenting it that way.

4) Research: Research assessment takes place mostly at the individual level (see the next section, and H). The main point here is that we must resist the temptation to classify courseware development as "instructional research." If we did, we could not count it as an instructional assignment. This would also create burdensome expectations about ongoing grant support.
F) Individual assessment
Assessment of individual performance will have to undergo huge changes, in directions unfamiliar and unattractive to us. But this makes it all the more important that we tackle it promptly and honestly.

1) Internal needs: Traditional education, with many autonomous classes, did not require quick or careful assessment. Problems in one class had little or no effect on other classes, or on the program as a whole. Consequently faculty traditionally have felt little need for (or even hostility toward) assessment. But the result is that the current systems were largely imposed by the administration, and designed to meet the needs of the administration. The emporium is completely different. There are many levels of activity, and they all must mesh for the program to succeed. Assessments of individuals will play a vital role in spotting problems and making assignments. Choice of criteria and methods of evaluation will make a big difference to departmental operations.

2) Evaluations should be primarily be done by the individual’s supervisor. Basic criteria should be explicit. For instance, what is expected of undergraduate floor helpers in terms of familiarity with courseware? What are the primary responsibilities of floor supervisors, and who has the responsibility for deciding who is suited for the task? Who has responsibility for seeing that courseware is effective and ready on time, and along with that, responsibility for evaluating performance of people assigned to the task? Measures like student evaluations can be part of the supervisor’s assessment, but the sort of stand-alone status they have now would be counterproductive.

3) Evaluations give credit for success, as well as identify shortcomings. If things run smoothly on the floor, floor managers should get credit even though they may have little or no direct contact with students. If the organization and conduct of the course is successful, credit should go to focus group leaders, not floor managers or courseware developers. If students learn effectively, this reflects well on the courseware developers, not the focus group leaders.

4) If we present a well-thought-out and realistic plan for individual assessment it may be accepted. If we wait for something to come down from above it will certainly be unrelated to our needs. For instance administrators may want to think of focus group leaders as "faculty" and assign them "student contact hours" and primary credit for the whole thing. They would want student evaluations of focus group leaders and floor helpers. They would want to classify courseware development as "non-instructional" because it does not involve contact with students. Etc. We really need to be proactive on this.

5) A corollary of all this is a significant reduction in weight placed on classroom proficiency. But this also makes sense when considered directly. Teaching is going to change more in the next ten years than it has changed in the last thousand (exhibit A: the Emporium). We need to prepare for this by looking for and encouraging diversity and flexibility. But the current reward system tends to discourage change, and locks people into old tried-and-true methods.

6) For assessment of research, see (H).

G) Departmental structure
Big changes are coming. The immense inertia of academic organization will be a problem even if we start preparing immediately.
1) We will need a lot of staff not qualified to be considered "faculty" but nonetheless with vital responsibilities. This is going to cause problems with academic rank structure and state staffing regulations. One way out may be to encapsulate some of this as a non-profit corporation.

2) The number of traditional faculty positions is going to decrease. There is no way to avoid this: it is made necessary by new expenses for staff etc., and is made possible (therefore inevitable) by eliminating need for teachers in huge numbers of low-level courses. In the end, conversion of faculty positions to staff is the key efficiency that makes the whole thing possible.

3) The most obvious way to reduce faculty size is to phase out the instructorships. This is what will happen if we do business as usual until a reduction is forced on us. However this is probably not the best approach, for the following reasons:

i) We will need a lot of excellent tutors and "consultants". When helping students "on demand", as in the emporium, the task is not just to be able to work the problem that stumps the student, but to diagnose the reason the student can't work it. Treatment of the underlying difficulty is clearly more helpful than a simple demonstration. But this can be nontrivial: the students themselves are often wrong about why they are stuck. At the moment the undergraduate helpers are doing ok with 1015 and mostly ok with 1114. But the calculus&Mathematica questions often stump them. Before long we will need experienced consultants available for the undergraduate helpers to call in. The instructors would be very good for this. Also, if we want to use "focus group meetings" as a way to introduce students to potential tutors, they could be run by instructors. They would conduct a lot of short organizational "focus" meetings, then spend time on call in the emporium. This would involve a substantial change in duties, involving hours per day rather than numbers of students. But they would no longer have to grade anything.

ii) The other reason instructors may not be the best target for reduction is that their salaries are not high enough. Recall that the need is to save money, not just reduce the number of bodies.

4) Retirements or buyouts of older professorial rank faculty will probably be a key component of faculty reduction. It might be a good idea to discuss this with the Dean, particularly if (as seems likely) we will not be able to balance the books until such retirements take place. It might also be wise to suspend new hiring until this situation is clarified.

H) Research.
Research is on the bottom of the list of university priorities, except as it contributes to the top priority through outside funding. Administrators are proud of it when it happens, but cannot accept it as an excuse for shortfalls in other areas. In the math department we have seen instructional needs make significant inroads into research activity. The emporium may leverage our instructional efforts enough to permit some restoration of research. Or it may accelerate the transition to a teaching department.

1) In a sense we have made a wager that we can get the emporium to work, and the stakes are the remains of the research program. In the long run financial overruns are not an option: we might be forced to lay off instructors and use professorial faculty in their place but eventually the books will balance. Increased time demands will come out of research. To avoid this we should work quickly to realize the potential efficiencies of the new situation.
2) Research may have new significance as a marker for future contributions to instruction. On the national level most of the leaders in the various reform movements came from outstanding research careers, not focuses on instruction. Locally, much of the courseware development and innovation is being undertaken by established researchers, not our outstanding teachers. There are good reasons for this, and they will become more important as we go through this transition. Therefore we should not relax our research expectations of new faculty.