

Cross-College Undergraduate Biology Education

Biology at UW-Madison is spread among a number of colleges and schools, and no single unit or dean has responsibility for the success of undergraduate biology education as a central concern. The phenomenal success of the recently configured cross-college biology major underlined the need for the institution to address how it can best support and coordinate undergraduate biology education. It was this situation to which the Strategic Planning Committee of the Biological Sciences Executive Committee responded in October, 2001 by writing to Provost Peter Spear asking to begin a dialogue with him aimed at finding a solution to the problems.

Following that and other discussions, in March, 2002 the provost responded that "the Biological Sciences Deans and I would like the Biological Sciences Strategic Planning Committee to create a committee to carry out the following charge: Identify the strengths and weaknesses of cross-campus undergraduate biology education ... at UW-Madison and recommend ways to improve it." That committee, the *ad hoc* Biology Education Planning Committee (consisting of the BSSPC, plus other members of the biology community), responded to the provost and the deans in August, 2002 with its Report on Cross-Campus Undergraduate Biology Education which included a proposal for the creation of an Institute for Undergraduate Biology.

In response to the above report, in October, 2002 the provost appointed a successor faculty committee, the Committee on Cross-College Undergraduate Programs in Biology Education, and asked it to "make recommendations concerning the detailed organization and funding of a new umbrella administrative structure for cross-college biology education at UW-Madison." And then "to determine whether it is an improvement over the current structure." That committee's report is attached.

Provost Spear has discussed the report and its recommendation with the Biodeans, the Center for Biology Education, representatives from the three branches of the Biological Sciences Divisional Executive Committee, the University Academic Planning Council, and the University Committee. It is now presented for discussion to the Faculty Senate.

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Report of the Committee on Cross-College Undergraduate Programs in Biology Education

Our committee, appointed by the provost in October of 2002, was asked to study a recommendation made by an *ad hoc* Biology Education Planning Committee (BPEC) whose charge was to “evaluate cross-college undergraduate biology education at UW-Madison and to recommend ways to improve it.” The *ad hoc* committee recommended the formation of an umbrella structure to administer all of the cross-college undergraduate biology education programs out of a single office that reported directly to the provost. This umbrella structure would include the Biology Core Curriculum (Biocore), Botany/Zoology 151/152, the Biology major, the Molecular Biology major, the Biological Aspects of Conservation major, and the Center for Biology Education.

The provost asked our committee to evaluate the recommendation of BPEC, and to propose a detailed administrative structure to address problems in undergraduate biology instruction across campus. These details include:

- The administrative organization and reporting/working relationships both internally and relative to the deans and provost.
- The duties, responsibilities, and authority of the director
- Selection process for the director and the executive committee
- Funding categories, amounts, and sources
- Staffing needs
- Programs to be included
- Space needs for the umbrella structure

The provost also asked us to assess the strengths and weaknesses of the structure that we devised and to judge whether the proposed structure would resolve existing problems without creating new, even more vexing, problems.

To prepare ourselves for this assignment, we reviewed the reports of a number of committees that have in recent years addressed the problems of cross-college programs in general or biology education programs in particular. These were:

Review of the Biological Sciences, 1991 —the “Hearn Committee” report

Managing the Matrix: Sustaining Effective Cross-College Learning Communities —

prepared in 1995 for the Council of Deans by a committee chaired by David Trubek

Report of the Committee to Review Undergraduate Biology in the College of Letters and Science

— prepared in 1996 by a committee chaired by Herbert Wang

Planning for the Future of Interdisciplinary Teaching at UW-Madison — a report prepared for the

University Committee and the Provost’s Office in 1997. The authors were Maury Cotter and Karen Walsh

Center for Biology Education Internal Review — prepared in 2001 by a faculty/staff review committee chaired by Robert Goodman

Report of the Biocore Program Review Committee — prepared in 2001 by a faculty/staff committee chaired by Edgar Spalding

Report of the ad hoc Biology Education Planning Committee on cross-campus undergraduate biology education — prepared in 2002 by members of the Biological Sciences Divisional Committee

The difficulties that face cross-college programs are discussed in full in the committee reports listed above. There is no need to present them again here. Suffice it to say that UW-Madison has a tradition of strong departments and strong departmentally based programs. It is hard for cross-college programs to compete with these strong departmental programs for funds, staff time, and space. Biology research and

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education are great strengths of our university, but the population of biology researchers and teachers is widely dispersed and fragmented. The common problem faced by the cross-college programs in biology is that there is, at present, no central agency to address the needs of programs serving the entire biology community. Each of these programs reports to a dean or a department chair (or some combination) whose primary responsibility is to a school/college or to a department. When the general competes with the local, the local almost always wins.

Table 1 summarizes the problems currently faced by the cross-college undergraduate biology education programs. The table also identifies opportunities for improvement. The committee believes that the creation of an umbrella organization to administer the cross-college programs will help to alleviate the problems and realize the opportunities listed in Table 1 by offering the following benefits:

1. **Equitable sharing**, by the individuals, departments, and programs, of responsibility for and “ownership” of the teaching of introductory biology. The new center will serve as a focal point for the community of biologists dedicated to excellence in undergraduate biology education and will help to increase the recognition that educators receive for their efforts.
2. **Better coordination across departments and colleges** of the activities of the people and programs that teach and advise biology students. The new center will provide a forum for ongoing examination and assessment of undergraduate biology education and will serve as an incubator for new ideas. This benefit would not be limited to cross-college courses, but would extend to all undergraduate majors in the life sciences.
3. **Accountability from the administration**: a single contact in the administration will have the responsibility to listen to suggestions from the biology community and the power to effect suggested changes.
4. **Authority to speak for the whole biology community**, through the director, when arguing for financial and other support from within the university and from outside. The biology community currently speaks in many voices. The new center will provide an instrument for collecting and integrating the numerous good ideas that emerge from our diverse community.
5. **Flexibility to respond to new opportunities** or changed circumstances that may arise in the teaching of biology, in a manner that takes into account the needs of all of the several constituencies concerned with biology education. This could, for example, lead to the creation of new courses or mergers of existing courses according to the needs of the broad community.
6. **A reliable mechanism for resolving conflicts** related to the teaching of biology and the allocation of resources for that purpose, above the turf wars that often result from competition for scarce resources.
7. **Continuity in the university's allocation of resources** for the teaching of introductory biology, and dependable, long-term allocations of space for classrooms, laboratories, and offices.
8. **Economies in staff and funding**, the results of the pooling of assets across departmental and college lines to achieve shared missions.
9. **Opportunities for extramural support**, attracted by a large and unified community of biology educators who speak with one voice.

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PROPOSED STRUCTURE

Our committee proposes the creation of the umbrella administrative structure shown in Figure 1. The structure is considerably more compact and coordinated than the current state of the cross-college biology education programs (see Figure 2). We recommend that the new organization be called the Center for Biology Education (CBE), a name that expresses the ambitious mission that we have in mind for the new organization. This, of course, means that the current Center for Biology Education will be dissolved and that its functions will be integrated into the new umbrella organization.

One branch of the new CBE will oversee the undergraduate education functions. We have called that branch the Team for Instruction and Student Services (TISS). Overseeing this segment of the CBE will be the TISS Steering Committee, whose members will consist of representatives of the cross-college undergraduate biology education programs plus a few “outsiders” representing departments with a stake in undergraduate biology education. The committee will serve as a communications center for instructional and advising programs within the TISS. The committee will identify needs and problems within these programs and will stimulate discussion of opportunities for cooperation among the programs.

The second branch we have called the Team for Outreach, Research, and Resources (TORR), which will contain those programs of the current Center for Biology Education that are less directly connected to undergraduate biology education. These include: professional development for faculty and pre-faculty, outreach to K-12 and the public, the Summer Research Program in Biology, the convening of discussions among members of the biology education community, and the development of resources. This branch will be supported by a TORR Advisory Committee, whose members will be drawn from the entire community of biologists. The role of this committee will be, first, to help TORR in the identification of important campus-wide educational issues affecting students and faculty and, second, to raise the visibility of CBE across campus so that more students and faculty members can benefit from its activities and services.

We envision close cooperation within and between the two teams. For example, innovative ideas developed within the TORR will be implemented and tested with the TISS, and pedagogical problems and opportunities identified within TISS will help to inform the work of TORR.

The director of the new CBE will become the “one voice” who speaks for cross-college undergraduate biology programs. We recommend that the position of director be a half-time (A basis) administrative position to be held by a biology faculty member who continues those professorial activities — teaching, research, publication, grant-getting — that generate respect among the faculty and administration of this university. We propose that the director be recruited from the current faculty and appointed by the provost, with the aid of a search committee drawn from members of the advisory committees of the cross-college programs and faculty/staff recognized as educational leaders on our campus. In choosing a director, the provost should, of course, confer with the Biodeans.

In order to make it possible for the director to maintain teaching and research activities, it will be necessary to provide a high-level assistant to oversee much of the daily work of the expanded CBE. This assistant director will be a new position in addition to the current associate director of CBE, who will become associate director of TORR. The assistant director will be largely responsible for administrative work generated in TISS, including the preparation of grant applications to support work both in TISS and TORR. (See the organization chart shown in Figure 1.)

The duties of the director will be act as an overseer and advocate for the cross-college biology education programs. The director will:

- Represent CBE in dealings with the provost.
- Lead efforts to coordinate, strengthen, and perfect university programs in undergraduate biology education.

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- Serve as a non-voting member of the TORR Advisory Committee and the TISS Steering Committee.
- Set the agendas for the Advisory and Steering Committee meetings in collaboration with the chairs of the committees.
- Meet with the Administrative Deans' Council.
- Act as liaison between the cross-college undergraduate biology programs and the Biodeans, the Biological Sciences Divisional Committee, and others who participate in the planning and implementation of educational programs at the university.
- Supervise the staff of the CBE, including the Cross-college Biology Adviser.
- Manage the budget and oversee the administration of CBE.

We propose the following principles to govern the operations of the new office:

1. The biology community — and especially that part concerned with the introductory courses — needs to speak with one voice when we approach the administration concerning needs and opportunities. The director of CBE will be that voice.
2. The TISS Steering Committee and the TORR Advisory Committee will represent the major constituencies in the "introductory biology" sector of the university and cross-college groups concerned with biology teaching. These committees separately and collectively will meet to discuss problems and opportunities that they share, to seek consensus on contentious issues, and to plan actions for the common good.
3. The Steering Committee and the Advisory Committee will serve in part to limit the powers of the director. If either committee perceives that the director fails to act in the common interest, assumes too much fiscal control, or is biased in distributing shared assets to the various programs under the director's supervision, the committee members may ask the provost to find a new director.
4. The two guiding committees should not merely react to solve problems as they arise in the present situations; they should search aggressively for future opportunities that require concerted action and should be proactive in going after those opportunities.
5. A central operating principle should be honored in any reorganization occasioned by the formation of this new governing unit: *Do not fix what is not broken*. If an administrative structure already in place is functioning well, it should be left in place unless there is a compelling reason to do otherwise. If the funding of courses is adequate and equitable, movement of funds between administrative units ought not to be forced just for the sake of consolidation.

BUDGET

Each of the cross-college undergraduate biology education programs currently has some funding from the university, and each of the programs currently has hidden costs that do not appear in the printed budget. Among these hidden costs are the salaries of faculty members who teach in Biocore and Botany/Zoology 151/152; the salaries of faculty/staff who advise undergraduates in the cross-college majors; and the salaries of office personnel who provide administrative support to Botany/Zoology 151/152, the Biology major, and the BAC major. The current budget contains no funds for maintenance and improvement of teaching labs or acquisition of laboratory equipment, nor are there funds for the development of new laboratory exercises or the improvement of existing lab exercises.

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We do not believe that the creation of the new umbrella organization will require any change in the current arrangements for administrative support of the undergraduate majors or the cross-college courses. The umbrella structure can be created without changing the current edits (or UDDS numbers) for the component programs. We recommend, however, that the CBE be provided its own budget, including funds to compensate departments for faculty/staff participation in cross-college teaching and advising. The lack of such funds has been the largest problem facing all of the cross-college programs in biology education. Although Botany/Zoology 151/152 and Biocore are required courses in almost all of the undergraduate majors in the life sciences, the chairs of these courses find it difficult to recruit teachers because participation in these courses, save in the departments of Botany and Zoology, is considered to be “volunteer work”. Even when faculty members are eager to teach in these courses, they often find that their departmental colleagues and chairs disapprove because they place a higher value on departmental teaching than on cross-college teaching. A similar problem exists in recruiting advisers for the large numbers of students in the cross-college biology majors. We believe that the only way to resolve this problem is to provide funds to compensate departments for the time that their faculty/staff members devote to cross-college programs.

The CBE budget should also contain some funding for laboratory maintenance, for equipment purchase, and for new laboratory development. We believe it is essential to recognize that these are necessary functions of any science education program. The Laboratory Modernization program has provided a good deal of funding in recent years, and the Howard Hughes Medical Institute Grant for Undergraduate Biology Education provided some. However, these funding sources are *ad hoc* and intermittent. It is reasonable to expect the CBE programs to compete for extramural support to some extent, but at least some ongoing funds are needed to deal with maintenance and occasional emergencies.

There will be routine administrative work — bookkeeping, typing, photocopying, and such — that will require support staff. The recommended budget contains funds for clerical support and student hourly help.

In keeping with its research and development mission and its role as an educational change agent, the Center for Biology Education will be expected to pursue extramural funding. The preparation of grant applications is an important duty of the assistant director. In addition, we recommend that the Center for Biology Education be assigned an associate in the UW Foundation who can help to identify sources of private funding to advance the programs of the center.

Our budget recommendations are outlined in Appendix 1.

SPACE

Ideally, all the components of CBE should be located in contiguous space easily accessible to undergraduate biology students and to members of the biology faculty and staff. This location should be proximal to the classrooms and labs in which Botany/Zoology 151/152, Zoology 102, and Biocore are taught. There should also be access to conference facilities that can accommodate large and small meetings, seminars, and workshops. Access to photocopying equipment is essential. All of the cross-college programs need access to technical support for computers and web resources; in the best of all possible arrangements, these would be available in the neighborhood of the CBE office. There should be some “community” space that allows for the interaction among undergraduates and faculty/staff.

The current situation is far from the ideal just described. The Biology and Molecular Biology majors currently occupy office space in Birge Hall, proximal to the office of the Cross-campus Biology Adviser (Pat Henrikson). This is Botany Department space. There is, as far as we know, no present pressure on this space, but the space is barely adequate now, and there is little likelihood that more space could be

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provided if the programs expanded. The BAC major operates in virtual space. The Center for Biology Education occupies space that belongs to the Biotechnology Center. This is excellent space, with access to such valuable common facilities as the auditorium and large meeting rooms. However, the Biotechnology Center is under pressure to expand its research operations, and the space provided to CBE has recently been significantly reduced. It is likely that CBE will be squeezed out completely within a few years.

We recommend a two-stage plan for relocating the operations of CBE. We recommend that the a single location be found *now* for:

- The CBE director and support staff
- The Center for Biology Education
- The Biology Major
- The Molecular Biology Major
- The Biological Aspects of Conservation Major
- The Cross-campus Biology Adviser

This space would have to be in a place that provided convenient access to small meeting rooms, seminar rooms, and a classroom with at least 100 seats. The programs also depend on high speed Web connections and support for wireless computer operation. The programs listed above would require approximately 3000 square feet of office space, including a common space for mail, photocopying, printers, and supplies storage. If the Biology New Media Center (BNMC), currently housed in the Biotechnology Center, should lose its space in that building, we recommend that the BNMC be provided space close to or contiguous with the space for CBE. One possible location for this CBE headquarters would be the “old” Biochemistry Building.

We recommend that work on a long-term plan for completely unified space be started at once. The committee believes that the BioStar IV building is the logical ultimate location for the unified CBE, and that *all* introductory biology instruction and most biology majors advising should be housed in this building as well.

The creation of the proposed umbrella administrative structure will certainly produce some benefits for the cross-college biology education programs, but the impact of this reorganization will be limited if contiguous space cannot be found. The most important potential impacts of this restructuring are:

1. Increased cooperation among the programs, leading to an overall improvement of undergraduate biology education, and 2. Increased visibility and status for undergraduate educational programs and the faculty who participate in instruction, leading to broader participation and support among members of the diverse biology community. These benefits are much more likely to be realized if the programs are housed in a single, centrally located facility than if they continue to be scattered. In addition, of course, a centralized facility will allow some economies from the sharing of administrative staff and office equipment and possibly even more through the sharing of teaching equipment.

ASSESSMENT OF STRENGTHS AND WEAKNESSES

We have addressed the benefits of the proposed restructuring throughout this document. Briefly, these are:

- Reporting to the provost. At present, the undergraduate programs do not have a single administrative home. The proposed arrangement gives the university administration a clearer view of the scope and quality of the cross-college undergraduate biology education programs
- Coordinated planning of programs and a unified voice to convey plans and needs
- Higher visibility and broader community support
- Enhanced ability to recruit instructors for cross-college courses
- Support structure for creative restructuring of existing programs
- Competitiveness for extramural support, based on more centralized and efficient planning and program development.

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Are there clear weaknesses in the proposed umbrella organization? As we have pointed out above, the success of the new organization will require some financial resources and some geographical rearrangements. Allocation of resources to new programs always raises some objections, and, in the current fiscal climate, these objections are liable to be even stronger. However, we believe that the problems that face the undergraduate biology programs would require some allocation of resources even if a new umbrella administrative structure were not created, and the proposed structure promises to yield more benefit per dollar invested. It is possible that merger of the diverse programs in biology education will lead to heightened competition among them and give rise to new turf disputes. The recruitment of a trusted and imaginative director who enjoys strong support from the provost should forestall such problems. It is possible, of course, our prophesy of stronger community support for undergraduate biology education and increased recognition of excellence in teaching will not materialize at this university, where the "culture" values research so highly. We believe, however, that the culture has changed somewhat in recent years and that the value placed on teaching has steadily increased. It is our hope that the creation of a new organization wholly dedicated to excellence in education will promote further cultural change.

PROGRAM REVIEW

The umbrella organization that is outlined in this document is an experiment. After a suitable time, it should be analyzed and evaluated. We recommend that the new Center for Biology Education be required to perform a self-review after three years of operation and that it be reviewed by an external review team after five years. After three years, the members of CBE should be able to enumerate the problems that they have addressed and the opportunities that they have tried to develop. They should be able to recount any unexpected problems that they have faced and noteworthy successes that they have achieved. They should have some sense of their progress in resolving problems and stimulating positive change. They should be able to outline their hopes for the next 3-5 years and, more important, they should be able to define the criteria by which their success can be judged in the five-year external review. Both reviews should be occasions for reexamination and adjustment of the goals of the center.

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**APPENDIX 1
EXISTING EXPENDITURES**

Program	Activity	Budgeted costs	Unbudgeted current expenses
Biology 151/152	Staff Salaries	\$208,300	
	Student helpers/LTE	\$21,000	
	TAs	\$196,000	
	S&E	\$28,000	
	Clerical support		\$40,000 (Zoology Office staff)
	Co-chairs' salaries		~1 month, not shown in budget; approx. \$11,000
	Faculty instructors		3.75 FTE not shown in budget; approx \$285,000
Biology Core Curriculum	Staff Salaries	\$182,000	
	Student helpers	\$11,500	
	TAs	\$110,000	
	S&S	\$29,000	
	Director's salary		~1 month, not shown in budget; approx \$11,000
	Faculty Instructors		1.5 FTE not shown in budget; approx. \$114,000t
Center for Biology Education	Staff Salaries	\$301,400	
<i>These are FY04 figures, down \$20,000 from FY03</i>	Student helpers/LTE	\$2,600	
	S&E	\$27,000	
	Director's salary		Does not appear in current budget; approx. \$60,000
Biology and Molecular Biology Majors	Staff salaries	\$80,000	
	S&E	\$4,500	
	3 Directors' salaries		3 months not shown in budget; approx. \$33,000
BAC Major	S&E	\$1,000	
	Clerical support		\$8,000 (Zoology office staff)
	Director's salary		1 month not shown in budget; approx. \$11,000

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RECOMMENDED ADDITIONS TO BUDGET SHOWN ABOVE:

We recommend that the restructured Center for Biology Education be provided with the following funds. Most of these are not new funds; they represent actual current costs of the programs that are hidden because they are not itemized on the University budget (see table). The new costs in the following budget are boldfaced.

CBE Director: Half-time salary for faculty member. Approximately \$60,000.

Assistant Director: Approximately \$65,000

Classified/Student helpers/LTE support for the umbrella office: \$35,000

Funds to compensate departments for faculty participation in Biology 151/152 teaching: Approximately 3.75 FTE = \$285,000

Funds to compensate faculty Co-chairs of Biology 151/152: One month's salary. Approximately \$11,000.

Funds to compensate departments for faculty participation in Biocore teaching: Approximately 1.5 FTE = \$114,000

Funds to compensate faculty Director of Biocore. One month's salary. Approximately \$11,000.

Funds to compensate the faculty Directors of the undergraduate majors (Biology, Molecular Biology, and BAC). About \$44,000.

Funds to reward faculty members for service as advisers in the undergraduate majors. Approximately \$2,000.

Equipment and remodeling funds for all operations. The approximate annual cost would be \$60,000.

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TABLE 1: PROBLEMS AND OPPORTUNITIES

PROGRAMS	STAFF ISSUES	RESOURCE ISSUES	PEDAGOGICAL ISSUES
COURSES 151/152 and Biocore	Administrative support Recruitment of faculty Staffing of labs with TAs	Space; Maintenance of labs and equipment; Expensive materials; Acquisition of supplies and equipment for new labs; Information technology and computer based learning; Animals	Coordination across courses; Faculty and TA expertise; Assessment; Adequacy of facilities and equipment
MAJORS Biology Molecular Biology BAC	Administrative support Faculty advisers Professional advisers	Space Manuals and guidebooks Web sites Student organizations	Need for new courses; Assuring adequate space in high-demand courses; Assistance for students in trouble; Building community; Career advising; Arbitrary rules that affect flexibility (see L&S rules)
CENTER FOR BIOLOGY EDUCATION	Administrative support Faculty for courses (Ways of Knowing Biology; BIGs) Mentors for undergrad research	Space Administrative support Staff job security	Faculty/staff development; Stimulating innovation; Stimulating interdisciplinary cooperation in education; Assessing innovation; Building community; Contributing to change in “culture;” Stimulating diversity

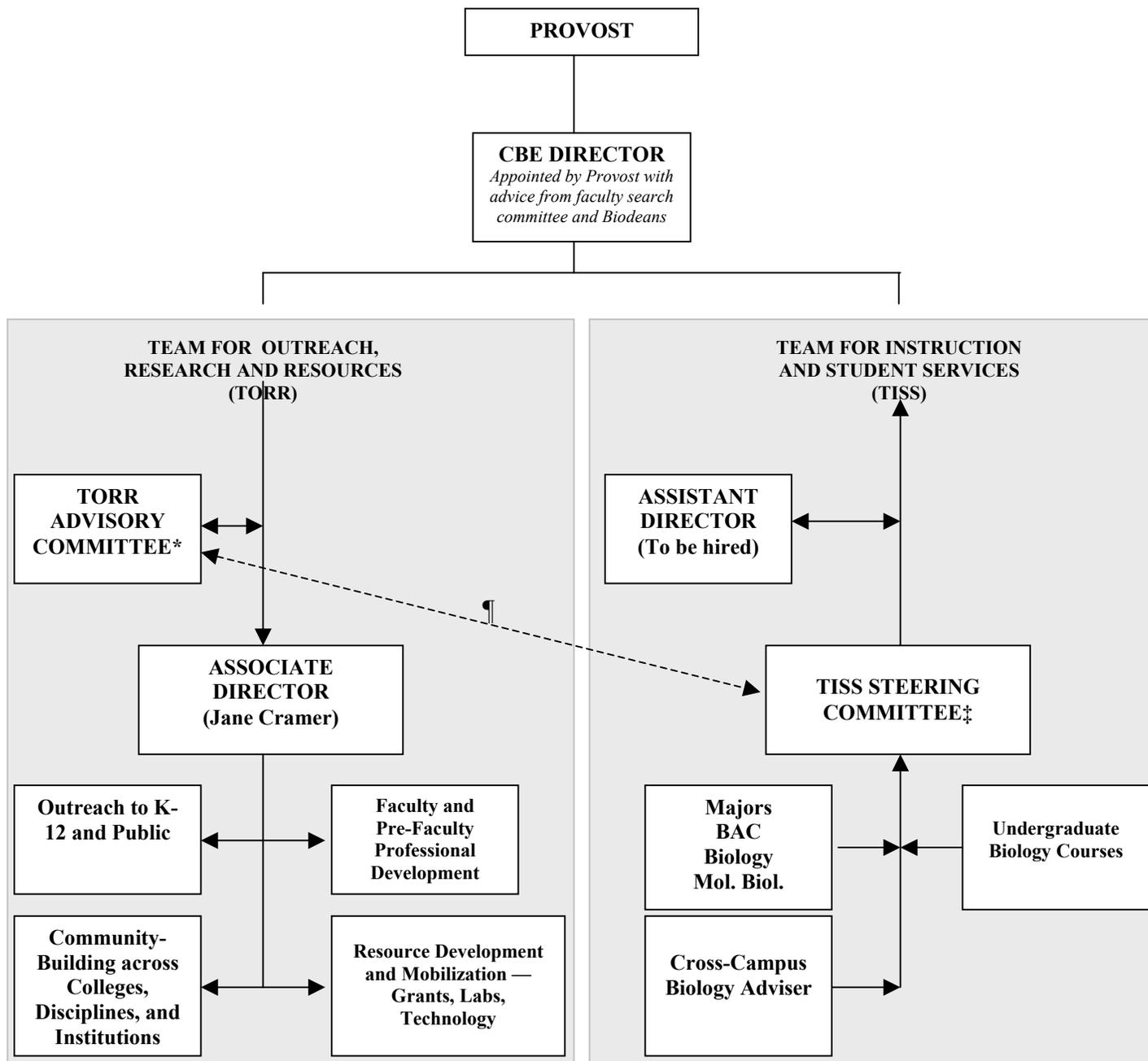
Overall needs:

1. Support of central administration and backing from deans. Clear signals that teaching is a high priority for the university and that good teaching is rewarded. (Corresponding support from Divisional Committee.)
2. Funds or other inducements to reward faculty for participation and leadership in teaching, advising, curricular reform, “community” activities, and educational planning.
3. Role in faculty recruitment.
4. Help in securing funds for needed program enhancements — either new courses or improvements in existing ones.
5. Space allocations sufficient to meet program needs.
6. Role in strategic planning for curricular reform — requires coordination with Curriculum Planning Committee, Strategic Planning Committee, and, perhaps, other decision-making bodies yet to be created.
7. Listing of the Biology and BAC majors in the *Timetable* to enable students in those majors to enroll in program-based independent study and research courses.

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FIGURE 1: PROPOSED CENTER FOR BIOLOGY EDUCATION



* Members of the TORR Advisory Committee are broadly representative of the campus biology community, appointed by the Provost in consultation with the CBE Director. The members of the Committee elect their own Chair.

‡ Members of the TISS Steering Committee consist of six members representing 151/152, Biocore, the Biology Major, the Molecular Biology Major, the BAC Major, and OOTE. These are appointed by the Provost in consultation with the programs. In addition, there are three members representing programs in L&S, CALS, and the Health and Veterinary Sciences that have a stake in undergraduate biology education. These three will be appointed by the Biodeans. The Committee will elect its own chair from among its members.

¶ Each committee will choose a liaison to attend the other committee's meetings.

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