

MARYLAND COLLABORATIVE FOR TEACHER PREPARATION
YEAR FIVE UMBC SUBCONTRACT

UMBC MCTP PROGRAM
Faculty Involvement, Institutionalization and Faculty Development

I. PARTICIPATING FACULTY

MCTP Faculty Engaged in Campus-wide Institutionalization and Faculty Development Activities:

Dr. Susan M. Blunck, Department of Education
Dr. Phillip G. Sokolove, Department of Biological Sciences

MCTP Faculty Involved in Department-level Implementation:

Dr. Barbara Kinach, Department of Education
Dr. H. Mark Perks, Department of Chemistry & Biochemistry
Dr. Thomas I. Seidman, Department of Mathematics & Statistics

II. INSTITUTIONALIZATION

Long-term Goal:

The MCTP program at UMBC has elected to assume an "institutionalization" challenge that derives from its unique approach to teacher training. Our goal is to develop a program for preservice math and science teachers that differs from the current MCTP model, but that retains the instructional principles of the MCTP program. We aim to provide models of exemplary math and science teaching not only for preservice teachers, but indeed for all math and science students. To accomplish this we must seek systemic change in the manner in which current science, mathematics and engineering courses are taught on the UMBC campus.

Since there is no undergraduate education degree offered at UMBC, there is no math/science curriculum specifically designed for prospective K-12 teachers except for the designated course sequences in education that are required for State teacher certification. Rather than implementing new and separate MCTP courses for prospective math and science teachers, our plan for institutionalization is therefore to encourage faculty members in the math, science and engineering disciplines to consider modifying existing courses in ways that are consistent with the aims of the MCTP program. Target courses for the 1997-98 academic year will be mainly

introductory majors courses in science and math disciplines and "service" courses (i.e., required courses in biology, physics, chemistry and math that are taken by majors in another discipline). This process has already begun, but it will be neither easy, nor short term. It will involve persuading departments in the math and science disciplines that such change can substantially benefit student learning and is therefore worth the effort.

Courses within Education:

UMBC undergraduates who are planning to teach in K-12 must combine an academic major in their area of interest with a teacher training program in either early childhood, elementary or secondary education. With one exception (Mathematics for Elementary School Teachers), only those courses taught by the Education Department are designed exclusively for prospective teachers. The current undergraduate elementary and secondary science and mathematics methods courses within Education (EDUC 320, 322, 330 and 332) are, and will continue to be taught in a constructivist manner by Drs. Susan Blunck and Barbara Kinach who have been actively involved with the MCTP program during the past two years. These four courses have been accepted as MCTP courses by the program, and they will continue to serve as the institutional core for preservice teacher training in math and science methods. It should be noted that these courses are not limited to MCTP students and that, indeed, the majority of students taking them are not enrolled as MCTP students.

Courses within Biological Sciences:

At present one section (200 -250 students) of introductory biology (BIOL 100) has been designated as an MCTP course. It will continue to be taught in the Fall semester by Dr. Phillip Sokolove as part of the regular course offerings of the Department of Biological Sciences. The complimentary, but independent introductory laboratory course (BIOL 100L) is being modified by a new instructor, Dr. Lark Claassen, to promote interactive and student-centered approaches advocated by the MCTP program such as cooperative learning, inquiry-based laboratory activities and student-initiated investigation. Both introductory courses are required for biology and biochemistry majors, but 50% or more of the students are undeclared or are majoring in another area. The assessment results from these courses will be helpful in convincing faculty members in the department and in other science and math disciplines of the effectiveness of student-centered, active learning.

Other department faculty members, notably Dr. Frank Hanson and Dr. Phyllis Robinson, have also chosen to incorporate constructivist principles and cooperative learning methods in their advanced elective courses and in a 100-level course for non-majors. Discussions and workshops will be scheduled during the 1997-98 academic year for these and other interested faculty in the department to review

problems encountered and progress achieved using the new approaches.

Courses within Mathematics and Statistics:

A senior faculty member in the Department of Mathematics and Statistics, Dr. Thomas Seidman, has been a member of the UMBC MCTP team for three years and has implemented a mathematical modeling course in the department which has been designated as an MCTP course. The course (MATH 385, Introduction to Mathematical Modeling) was initially envisioned as an integrated math/science "capstone" course designed to attract preservice teachers (and others) majoring in disciplines outside of mathematics as well as students majoring in math. Results have thus far been mixed due in part to uncertainty about what the appropriate prerequisites for the course should be.

The first time the course was offered students were required to have taken differential equations which effectively eliminated virtually all preservice students who were not math or physics majors. In a second trial, the differential equations prerequisite was not strictly imposed, but this time it was found that too few of the students who enrolled had sufficient computer experience to be comfortable with computer simulations. The department will continue to offer MATH 385 for both majors and non-majors, but the instructional objects and prerequisites will be reviewed in light of our experience before it is taught in 1997-98, and a decision will need to be made about whether it should be again offered as an MCTP course.

Of particular importance for institutionalization of the MCTP program will be to initiate discussions with the department about the possibility of incorporating constructivist and integrated math/science approaches in the only course sequence at UMBC (outside of Education) designed expressly for preservice teachers (MATH 131 and 132, Mathematics for Elementary School Teachers). At this time it is not evident that much, if any, major change in instructional approach is even warranted. Thus, our objective during 1997-98 will be to negotiate department approval to work with the course instructor to review current course goals, instructional approaches and assessment methods, and if appropriate, to recommend how consistency with MCTP objectives might be achieved.

If this cooperative effort yields demonstrable improvements in teaching effectiveness, future cooperative efforts might be aimed at adding MCTP "flavor" to service courses in math and statistics taken by large numbers of students in other science disciplines: e.g., MATH 150, Precalculus Mathematics, MATH 151 and 152, Calculus and Analytic Geometry (also taken by math majors), and STAT 350, Statistics with Applications in the Biological Sciences. Last year Drs. Blunck, Kinach and Sokolove were invited to present an overview of the MCTP program and its objectives at a regular meeting of the department faculty. Although some general skepticism was evident, a few faculty members were enthusiastically positive, and Dr. Kinach has continued to maintain a dialog with the department Chair.

Courses within Physics:

At this time no member of the Physics Department has been involved in the MCTP program, although one member of the department, Dr. Robert Reno, has shown a personal interest in the methods and approaches being employed in the MCTP section of BIOL 100. On the other hand, the department as a whole has been concerned about declining enrollments in its undergraduate courses and is undertaking a comprehensive review of both the curriculum and the instructional approaches being employed by the faculty in the department.

During the 1997-98 program year, with the support of Dr. Reno we plan to approach the department Chair with an offer to provide information about the MCTP program and to invite the faculty to examine the student-centered constructivist approach -- particularly in the area of physics -- through which the MCTP program has achieved significant improvements in student attitudes and understanding. If the initial reception from the faculty is positive, workshops will be scheduled for physics faculty who wish to explore physics education reforms at greater length. A general physics course sequence for non-majors that the department may be willing to consider modifying in the near future is PHYS 111 and 112, Basic Physics. Later, depending on faculty experience and student reaction, the department may be prepared to consider extending instructional reforms to its PHYS 121 -122, Introductory Physics sequence for students majoring in physics, chemistry and engineering.

Courses within Chemistry and Biochemistry:

Dr. Mark Perks is a member of the department who has been involved with the MCTP program for the past three years. As the lead instructor responsible for the core laboratories in introductory and organic chemistry (CHEM 102L, 351L and 352L), he has implemented modifications in these courses to make them more student-centered and inquiry-based. Due to realignment of teaching responsibilities within the department, Dr. Perks will also soon be teaching a non-majors course (CHEM 100, The Chemical World) which is designed to engage student interest through topical discussions of chemistry and its relationship to human affairs. It is anticipated that this course will have a strong MCTP flavor, and it may be appropriate to request that it be listed by the program as an MCTP course.

The approach we plan to follow in 1997-98 will resemble that described for physics. Both the Chair and the faculty of the department will be provided with information about the nature and aims of the MCTP program. We will invite them to consider how the science education approaches advocated by the MCTP program might be used to further any ongoing departmental efforts aimed at instructional reform.

Responding in part to professional recognition by the American Chemical Society of the need for teachers to re-examine chemistry instruction at all levels K-16, and particularly the Society's attention to reforms in post-secondary chemistry education, the department has begun the process of assessing its own role with respect to curriculum modification and improvement of teaching. By proposing that chemistry faculty consider the MCTP program as a local resource for experience and information, we hope to kindle cooperative partnerships that can aid department-initiated changes in courses taken by large numbers of students majoring in chemistry, biology and chemical and biochemical engineering (CHEM 101-102, Principles of Chemistry, and CHEM 351-352, Organic Chemistry).

Courses within Engineering:

Drs. Blunck and Sokolove were recently invited to meet with the Undergraduate Advising Committee for the College of Engineering to describe their MCTP-supported effort to promote active learning in introductory biology. The committee was appointed by the Dean of Engineering in Fall 1996. Included in the charges to the committee are to develop a strategic plan for undergraduate engineering education at UMBC and an innovative engineering curriculum. The discussion with the committee lasted for almost four hours and elicited many positive responses from committee members. It was suggested that the Dean schedule regular "brown bag" lunches for engineering faculty to participate in discussions on effective teaching methodologies. We anticipate a future request from the committee for Dr. Blunck and/or Dr. Sokolove to act as facilitators for these or similar discussions during 1997-98.

Although the committee may not be prepared in the short term to suggest consideration of changes in instructional approach in any current engineering courses, it is also evident that there is considerable interest in considering systemic change within the College of Engineering with regard to both teaching and curriculum reform.

Promoting Administrative Support for Systemic Change:

Although there is currently no campus policy statement or program initiative supporting systemic change specifically in math and science instruction at UMBC, on numerous occasions the Provost, Dr. Jo Ann Argersinger, has indicated awareness and appreciation of the general need to facilitate teaching reforms in science and mathematics that promote student-centered active learning and inquiry-based instruction.

Throughout the 1997-98 program year, but especially during Summer 1997, we will connect regularly and repeatedly with the Provost and other campus administrators to encourage their endorsement of and support for the department-based systemic

reform effort detailed above. Drs. Blunck and Sokolove have already met once with the Dean of Arts and Sciences to provide information about their MCTP-supported BIOL 100 reform program. Additional meetings will be scheduled during the Summer and Fall of 1997 in order to obtain his reaction and advice about how to proceed.

In addition, key faculty advisory committees and task forces that have interests or charges that involve undergraduate instruction will be consulted for advice about how best to integrate our MCTP institutionalization efforts with the various committee agendas, reports, recommendations and initiatives that have been proposed or will soon be forthcoming.

Both the Provost and the President, Dr. Freeman Hrabowski, have been very effective in providing resources and institutional support for high-ability minority and other students majoring in math, science and engineering at UMBC. The Meyerhoff Scholarship Program in particular has received much national acclaim as a model program to attract and train minority students for future careers in science, math and engineering. In addition, the campus administration has been instrumental in initiating and augmenting programs to encourage and support faculty development in research. More recently, the Provost has sponsored scholarships and promoted the development of programs to support research experiences for undergraduates.

At present, there appears to be additional administrative interest in improving undergraduate instruction through increased support of faculty development and faculty mentoring programs. Although such programs will not be limited to math, science and engineering faculty, faculty in these areas must comprise a significant proportion of those participating in order to maintain consistency with the campus' academic mission and its commitment to excellence in these areas. Thus, it should be possible to link the department-based institutionalization plans described above to these general campus faculty development initiatives.

III. FACULTY PROFESSIONAL DEVELOPMENT

At UMBC professional development activities during 1997-98 will be initiated in Fall 1997 and will depend upon the receptiveness of departments and their faculty members to "recruitment" presentations to be scheduled in individual departments. "Short format" workshops (see MCTP Faculty Professional Development Program) will be organized for science and math departments that indicate an interest in implementing new teaching approaches in their discipline, and that have at least one faculty member who is committed to try improving student learning in the courses he or she teaches.

What we must take care to foster is the sense that continuous improvement in math and science instruction is both possible and achievable at the post-secondary level, and can benefit department faculty as well as students by providing in addition to research another avenue for creative success. What we must avoid is the impression that science and math teaching is badly in need of fixing and that we own the best tools to do the job. If the faculty cannot be persuaded to take ownership of their own professional development, any change is likely to be temporary.

During the preceding summer (1997), we will meet individually with math/science department chairs to brief them on our intentions and to assess the potential interest in their departments for learning about MCTP instructional concepts and strategies. We will also meet with representatives from the Office of the Dean of Arts & Sciences and the Provost's Office who are scheduled to be appointed on July 1, 1997 and whose charge will be in part to encourage and promote faculty development activities across the campus. These appointees will be key individuals whom we will ask to help us coordinate our development efforts with those of others on the campus and to consider strategic deployment of limited campus resources for professional development in ways that can support our activities. We will also ask to be included as participants in orientation programs for new faculty which are typically held at the end of the summer or in some years soon after the start of the Fall semester.