# Master of Science in Biology for Teachers Program Review

# Committee Report 1/11/2008

#### Summary

The Master of Science in Biology for Teachers (MSBT) is an interdisciplinary program designed for biological sciences teachers who have had some experience in the classroom or informal education settings. In summary the quality of the program is very high because of its unique research requirements, the interdisciplinary nature, and the fact the students can work in some of the top research units in the country. The quality and the dedication of all faculty involved is exceptional. This committee considered this small program a jewel on the UW campus that is a success in spite of very little institutional support. This committee strongly recommends that the MSBT program be continued and that in 10 years time it is reviewed again.

#### 1. Committee Member and Activities

Elizabeth Nesbitt (Chair); Earth & Space Science and Burke Museum, UW

Matthew Weinstein, Education Program, UW Tacoma

George "Pinky" Nelson, Science, Mathematics and Technology Education, Western Washington University

### 2. Committee Activities

The internal members (Nesbitt and Weinstein) met with Thomas Gething Associate Dean of the Graduate School, Werner Stuetzle, Natural Science Divisional Dean of the College of Arts and Sciences and Augustine McCaffery Academic Program Specialist, Graduate School to discuss the charge to the review committee, unit review procedures, and the timetable. At this time we received a letter from Suzanne Ortega, Dean of the Graduate School, and Thomas Gething outlining the Graduate School's objectives for the reviewing the Master of Science in Biology for Teachers Program (MSBT). Committee members each received the MSBT self-study file, lists of faculty involved with the program, internal statistics, and lists of present and former graduates with their research projects and supervisors. Nesbitt and Weinstein met, held telephone conversations, or email exchanges, with a number of the program's steering committee, faculty who had supervised students, past and present graduate students prior to the site visit.

The site visit took place on November 15-16, 2007 with the entire committee, in Hitchcock Hall. A list of meetings and their participants is attached.

### 3. Program Overview

The MSBT Program originated 1967 as the Masters in Arts of Teaching in Biological Sciences, supported by, and physically based in, the Zoology Department. The program was changed to the Master of Science in Biology for Teachers in 1999. It has always been interdisciplinary, administered through the Graduate School with a faculty Program Director and a Graduate Program Advisor. Helen Buttemer has been the Program Advisor since 1987, chief architect of the MSBT changes, and the coordinator, manager, outreach person, key contact person for the program. Buttemer is the Director of the Biology Program for Teachers and is also instructor for biology courses for pre-service teachers. This pre-certification program has funding from the Howard Hughes Medical Institute for biology education. The MSBT program is nominally situated within the Biology Department that provides space and an academic home for the graduate students.

The MSBT program is small, and most of the students are part-time. Five to eight new students are admitted per year, of whom one or two do not take up their positions. There are usually 10-15 active at any one time, and 3-7 graduate each year. Everyone who applies is admitted if they meet the academic qualifications, and no recruiting or advertising is involved. Notably it is not a teachers' certification program. The Steering Committee currently consists of 11 faculty, chaired by Douglas Sprugel, from the College Forestry Resources. The Graduate School provides one RA position/year, and \$2,000 for incidentals. The Biology Department provides the library-workspace room (216 Hitchcock Hall), and Helen Buttemer's salary and office space. Buttemer's position is unusual as it is a permanent, dedicated faculty line within the College of Arts & Sciences.

The MSBT program is built around 30 credits of course work and a science research project. Most of the students are already accredited and teaching science within middle and high schools. Since the last unit review in 1997, the program has expanded to include student from informal learning settings. This population now accounts for 25% of the students, and they have come to the UW from a variety of institutions most notably Island Wood Environmental Learning Center (formerly the Puget Sound Environmental Learning Centre) on Bainbridge Island. Many of these students can attend the program full-time, unlike the in-service teachers.

The aspect of this program that makes it unique is the research component in which each graduate student does the equivalent of an MS research project in their chosen field. Students are accepted into research labs or field studies by a wide diversity of faculty across numerous Colleges and Departments: Biology, Forest Resources, Microbiology, Genome Sciences, Medicine, Pharmacology, Oceanography, Fisheries, and Anthropology. The only comparable programs in the U.S. with research components are the MS in General Biology designed for teachers at the University of Arizona, and at University of West Florida where the research based MS in Teaching program is confined to Biological Chemistry. Neither of these programs appears as rigorous as the one at UW.

The primary goal of the MSBT program is to upgrade the teachers' content knowledge in the light of the vast changes in biologic sciences over the last 20 years that changed from the organismal to cellular and sub-cellular levels, and to provide experiential learning in the process of science: "...although the core of scientific discovery is research, few precollege science teachers have ever had the opportunity to participate in significant research projects themselves."

(MSBT Self-study Report, page 1). The experience that teachers gain from this program will enable them to be science teachers, better informed regarding the nature of science. Students take 10-12 research credits but most of them put in far more than the required hours. The final product of the research is a written report, prepared as if for publication, and an oral presentation to a committee of three faculty, though some students also invite community members.

A critical aspect of the program is its flexible nature that allows in-service teachers to take classes and continue to work. This results in the students taking ~4 years to complete the program. The success of the program over the last 10 years is illustrated by the fact that of 38 graduates in the last 10 years, 84% are currently employed in science education: middle and high schools, community colleges, science centers, and other environmental and informal education units. After graduation, 10% of these students enrolled or completed PhD programs, in science or education.

## 4. Students

Current and recently graduated MSBT students unanimously expressed enthusiasm for the program, for Helen Buttemer's role as advisor and mentor, and for their research supervisor. Those enrolled part-time appreciated the flexibility in time, choice of courses taken, and selection of research field and/or supervisor. They could fill in content knowledge where they perceived gaps, and conduct research in areas of particular interest. There is a very wide range of labs/programs available to them: Buttemer and members of the Steering Committee help the students make contact with potential supervisors and their research. Once in those units, the students felt as if they had become an integral part of the supervisors research program, and they all stated that their peers (or post-docs) in these labs treated them as equals. Many students were funded by their supervisor while doing their research project (usually over summers). Supervising faculty who answered the self-study questionnaire mostly expressed complete satisfaction with the program and the student placed within their research group. Some of this research is, or has been, included into scientific papers for publication.

The students most emphatically supported the research component of the program. For example, recent graduate, John Moffat said "The research requirement is a MUST: the hands on experience of the joys and pitfalls of working in a lab, planning your experimental design, collecting the data, organization and analyzing the data – then asking what the data is telling us. This allows the teachers to personalize their teaching when we discuss doing research (in the classroom)". Another recent graduate, Oliver Jones said that the program "changed my way of teaching. It is essential that the program stays with the same emphasis on the research component. Other people want a quick Masters in teaching degrees, but they cannot duplicate this experience of actually being a researcher." Many students said that once they became engaged in the research project they spent more time than anticipated and took their own lines of research further than was necessary. Carol Sibley, a Steering Committee member, noted that once graduated the students' maintained contact with their research supervisor who could continue to provide support.

Problems that the students encountered were largely the result of them having to attend the program part-time. The biggest issue is that the program has only one RA position, which is distributed equably amongst the students, but typically each one only received one quarter of support. This resulted in the students taking longer to complete the degree than expected, and incurring financial hardships as they are older students who generally have added family expenses. The other issue is that most of the classes that the students need to increase the breadth of their content knowledge are only offered in the day time. Over the last 10 years fewer and fewer upper division courses are scheduled in the late afternoon/evening. Providing more RA support would solve both these problems by allowing in-service teachers to take an entire quarter off from their classroom commitment to be full time students.

There were two issues raised by all the students interviewed that are worthy of note: 1) that they needed office and desk space, and 2) they regretted not being part of a cohort, or even knowing any other MSBT students. The lack of dedicated office space for students in this program is an impediment to their progress. Having to work in the libraries, they had to pack up all their materials every time they went away from that space as nothing there is safe. Even going out for a snack, or to make a phone call, necessitated packing everything up. From this frustration, students felt they were treated as second-class citizens of the Biology Program. The nature of the program, its flexibility and the fact that most of the students are part-time does not allow for student cohorts. Program managers and the Biology Department include the students in departmental events, but very few MSBT students attend.

This remains a negative but permanent aspect of the program and the committee recommends that:

- 1. the students should be specifically told when they joined the program that they will not be part of a cohort *per se*
- 2. a single office space be provided for the students, with perhaps shared desks. This would greatly alleviate the problem, and provide a place where students would inevitably meet their program peers.
- 3. a program orientation and campus tour would also help the new students feel more comfortable within the university and the department.

### 5. Faculty

Helen Buttemer, the Program Advisor, is the center of this program. Every single one of the faculty and the students interviewed said that she is the most important aspect of the program's success. She is an excellent advisor providing immense help in designing the individual programs for each student, in finding the appropriate *and* supportive supervisor, as well as an academic and personal mentor. In addition, she maintains contact with the students after graduation, and tracks their professional progress. The largest concern expressed by all other faculty associated with the program is the continuity of the program quality after Helen Buttemer retires.

The Steering Committee is effective in maintaining the highest academic standards for the program, and the current Chair, Douglas Sprugel is dedicated, engaged, and very supportive of Buttemer in administrative task. It is indeed interdisciplinary, composed of senior research

scientists from a number of departments who meet as a body once a year. These are all stellar academics with national and international reputations in their fields. However the Steering Committee does not have a clear role: it does whatever Buttemer requires, which is largely connecting students with faculty across the campus for the research component of the program. It has served well in that role and responds to requests.

The committee recommends that:

- 1. the Graduate School provide an assistant for Buttemer, to enable her to write a program manual;
- 2. the Steering Committee formalize their roles and provide a written document of expectations for the supervising faculty and students;
- 3. the Graduate School implements a regular professional assessment for the entire program to support ongoing quality and needs assessment as well as track the impact of the program on their student's professional lives.

# 5. Growth

The MSBT program has always been small and this has allowed it to become an exceptional program providing life-science teachers with the unique opportunity of the experiential research component. Because of the very high level of advising and mentoring each student has an individualized program of study and research. Graduates from this program have gone on to leadership roles within their schools or educational units, for example Judy D'Amore is Education Director of the Port Townsend Marine Science Center, Timothy Krill is Principal of Bellevue Christian Junior High, Martha Strachan is Chair of the Science Department at Meadowdale High School, Edmonds, and Cynthia Updegrave is Instructor for the Community Environmental and Planning Program, UW. Almost all the students have established positions in schools, community colleges and informal education programs.

In this format with few active students/year there is little room for growth. Buttemer and Sprugel agreed that they could manage a few more students, but not many. To grow the program would mean a complete structural change, and a great deal more resources. Students find the program by word-of-mouth, or on the UW website. Accepting non-certified, environmental and informal educators into the program has increased the numbers, especially those attending full-time. These students can be TA's within the Biology Department and that helps with both the feeling of isolation and the financial burden.

The committee suggests that:

- 1. the Program actively solicit minority students, and for these seek funds from the GO-MAP and similar minority funding programs. This would be particularly helpful for providing support for the in-service teachers. Such a system would require some negotiations with the funding unit that normally provides support for an entire academic year. However, we believe that the Graduate School is in a position to do this for the program.
- 2. To attain the next level of growth would require a much greater administrative structure, and may put too much of a burden on those faculty who volunteer their time for these

students. The committee suggested that instead of increasing the number of students in the MSBT program, UW could reproduce similar programs within other science fields, for example in the earth sciences. The MSBT program is a superb model for similar degree programs across campus.

3. An alternative path for growth would be to place the MSBT program within the planned College of the Environment, while still maintaining it as an interdisciplinary degree within the Graduate School. This could provide more funding and a more compatible home for the students.

#### **Comments on our finding:**

- Logistical needs of the students were not well supported. In spite of perceptions by the faculty, the students did not feel that they belonged: there was no orientation, no attempt to have the currently enrolled students meet each other, and they felt like second-class citizens in the biology grad world. Almost all students, present and past, mentioned this issue. Providing a single office space with desk (that could be shared) would go a long way to diminish this problem.
- Because this is such a unique program, it should have a careful and professional evaluation of the program: measuring its outcomes compared with its goals.
- The most urgent requirement is more funding for students so that they can take time off teaching to take day-time classes and accomplish their research project in one continuous time-period (1 or 2 quarters) in instead of doing it part time.
- A small addition to the program would be to find a way for a bigger audience on campus to their research results. Sometimes their final presentations were given to just three people. We suggest that a request be made to be part of the Undergraduate Research symposium as a section only for teachers. Perhaps as part of the Undergrad Research symposium only for teachers who do research. In addition students asked for a website to present their research to other students in the program.
- The Graduate School needs to formulate a plan on replacing Helen Buttemer in the future. The program is entirely dependent on her: almost every faculty member interviewed reiterated this. We suggest the following plan: to hire an assistant to learn on-the-the job. One of the first pieces to put in place is to have a written manual on all aspects of this diverse program.

## 1. Site visit meetings with the Review Committee

### Thursday Nov.15

- 1. Thomas Daniel, Chair of Biology Department
- 2. Douglas Sprugel, (Forestry) MSBT Program Director
- 3. Helen Buttemer, (Biology) MSBT Program Advisor and Director Biology Program for Teachers
- MSBT Steering Committee members Dee Boersma (Biology), Douglas Sprugel, Forestry), John Marzluff (Ecosystems Sciences), Thomas Hinkley (Ecosystems Sciences), Eugene Nester (Microbiology), Carole Sibley (Microbiology), Barbara Wakimoto (Biology)
- 5. Current MSBT Graduate Students Emily Elasky and Kate Henso, with a representative of the Graduate and Professional Student Senate.
- 6. Past MSBT graduates Sara Frame (2007), Cara Ianni (2003), Timothy Krell (1998), Thomas McDonald (2005), Nancy Canino (1997) \*

### Friday Nov. 16

- 1. Exit interview with Douglas Sprugel, Helen Buttemer, Thomas Gething and Augustine McCaffrey (Graduate School), Ana Mari Cauce, Executive Vice Provost, Werner Stuetzle, Bruce Bare, Dean College of Forestry, Thomas Stritikus, Associate Dean College of Education.
- 2. Exit interview with the above but without Sprugel and Buttemer.

\*In addition, Nesbitt had personal, phone or email interviews with the following recent MSBT graduates: Alicia Blood (2004), Jeanne Chowning (2004), Kathy Hall (2005), Oliver Jones (2007), John Moffett (2006), William Monahan (2002), Heather Nell (2006) Nathan Oxnard (2006) and Cynthia Updegrave (2007). Total of 16 students.

Information was also obtained from the program website http://protist.biology.washington.edu/teachers/Masters/Masters.html