

UNIVERSITY OF WASHINGTON
Biology Teaching, Box 355320

September 15, 1997

Elizabeth L. Feetham,
Associate Dean for Academic Programs,
The Graduate School, Box 351240

Dear Dean Feetham,

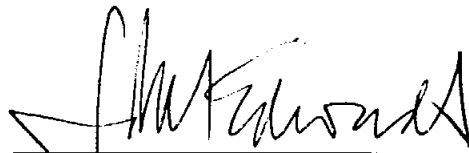
Herewith the revised self study for the M.A.T. in the Field of
Biological Sciences.

In submitting the revised version, together with evaluations by several
advisers of the research experience and letters of support from students in
the program, I want to emphasize the special aspects of the M.A.T. program:

1. This program is designed specifically to increase the biological literacy
and to provide a genuine research experience for the high school teacher or
community college teacher.
2. The program is unique at the University of Washington in providing a
masters degree for teachers with a research component in science.
3. It has a had a steady clientele for thirty years, with students coming from
as far afield as Maine.
4. If size alone is a criterion for continuation of a graduate program, it is
surely a reflection on the evaluation of higher education programs. This
program is small because relatively few teachers have the opportunity to
enter it, but for those who do have the opportunity we know that the quality
of their teaching is improved.

We trust that the review can proceed in a timely fashion as proposed.

Yours sincerely,



John S. Edwards, Chair
Biology Teaching Group

**M.A.T. IN BIOLOGICAL SCIENCE
SELF REVIEW 1997**

CONTENTS

M.A.T. SELF REVIEW pages 1-7

APPENDICES:

APPENDIX A: BASIC PROGRAM DATA

APPENDIX B: LIST OF FACULTY/ SUPERVISORY COMMITTEES
CHAired - LAST 5 YEARS

APPENDIX C: CURRENT STUDENT LIST/ADDRESSES

APPENDIX D: PLACEMENT OF GRADUATES

APPENDIX E: GRADUATES 1986-97

RESEARCH PROJECTS pages 1-2

CURRENT EMPLOYMENT, pages 3-4

APPENDIX F: COMMENTS FROM M.A.T. RESEARCH COMMITTEE
CHAIRS & M.A.T. STUDENTS

**UNIVERSITY OF WASHINGTON
M.A.T. IN BIOLOGICAL SCIENCE
SELF REVIEW 1997**

I. ORGANIZATION

1.1 Unit authorized to offer degree program:
Interdisciplinary Group: Graduate School Biology Teaching Group

1.2 College or School: (same as 1.1)

1.3 Exact Title of Degree Granted:
Master of Arts for Teachers in the Field of Biological Sciences

1.4 Administration:
The Biology Teaching Group comprises a chair and an advisory committee of 15 faculty drawn from relevant departments. The program has no direct financial support. The graduate program advisor and administrative assistant, currently Helen Buttemer, is supported indirectly through the Biology Program for other teaching responsibilities and as coordinator for the Biology Teacher Preparation Program.

1.5 Visiting Committee(s):
The Biology Teaching Group does not have a Visiting Committee.

II. DESCRIPTION

2.1 History:

The program was proposed to The Graduate School May 29, 1967 under the sponsorship of the departments of Botany, Genetics, Microbiology and Zoology. The proposal was developed by an advisory committee comprising H.W. Blaser (Botany), H.L. Roman (Genetics), H.C. Douglas (Microbiology), A.J. Kohn (Zoology), and I. Deyrup-Olsen, the advisory committee chair who was first chair of the approved program and remained in that position until 1983 when she was succeeded by J.S. Edwards (Zoology). The program was conceived, and continues with the objective of training secondary school and community college teachers to achieve a higher level of competence in biological literacy and in the adaptation of biological methods and experimental approaches for classroom teaching through direct contact with a professional research experience.

In 1972 the Washington State Council on Higher Education requested a review of the program aimed at determining need, and possible redundancy. The report submitted Dec. 7, 1972 justified the program and continuation was approved.

Ingrith Deyrup-Olsen was ahead of the times as founder of this program thirty years ago in recognizing the value of direct contact with research in the training of science teachers at a time when few university scientists were concerned. But the recognition of this need has grown in recent years (in *National Science Education Standards-*, Standards for Professional Development of Teachers, p.58, NRC) as more attention is being focused on the quality of pre-college science education.

2.2 Program Mission and Goals:

The objective of the single degree offered, the M.A.T. in the Field of Biological Sciences, is to provide a pathway to a master's degree which combines additional advanced coursework in the biological sciences together with a research

experience in a specific area of biology. While the emphasis is on direct experience with subject matter in the biological sciences, the program also allows a small number of credits to advanced courses in science education. In this way the program is designed to improve the student's effectiveness as a biology teacher in several important ways: through the broadening of the student's understanding of various fields of biological science, through direct interaction with scientists in the form of a research experience in an established laboratory, and through reflection and research on the practice of science teaching and learning.

There are easier paths to a master's degree for teachers. The M.A.T. in Biological Sciences is distinct from other masters degrees for teachers (M.Ed. degrees) which are essentially coursework programs directed primarily to pedagogy. It is also distinct from non degree programs for teachers which may involve short lab visits or summer institutes. While such programs are valuable opportunities for teachers, they are typically limited in scope and duration and subject to the whims of funding agencies. The MAT program is a respected masters program which has existed for thirty years and which offers the highly motivated candidate the opportunity of serious study in the biological sciences combined with the direct experience of carrying a research project through from conception through to completion.

It has always been recognized that the demand for the program will be relatively small simply because only a small portion of teachers, given the current modes of funding the professional development of teachers, will have the opportunity and the motivation to pursue this option. It is also evident from conversations with graduates over the thirty years the program has been in existence that this degree gives the teacher a stronger professional sense from having actively participated in research, and while it is not readily open to quantification, we sense that the research experience primes the inquiry mode of teaching. The accent on inquiry in recent reports on science education (*National Science Education Standards*, NRC, *Benchmarks*, AAAS) points to the need for teachers equipped to handle inquiry on the basis of experience rather than on the basis of pedagogic theory.

A second but significant outcome of this degree program is the establishment of ongoing interaction between the graduates and their advisors.

2.3 Basic Program and Unit data:

The M.A.T. program is administered on a day to day basis by the Director, currently John Edwards, and the administrative assistant and advisor, Helen Buttemer. The Biology Teaching Group acts as an advisory group representing a broad spectrum of disciplines within biology. This group provides many of the research project advisors and meets intermittently as the need arises.

2.4 Demand:

The program responds to a widely recognized need to upgrade the subject-matter content of teacher training. The recognition of this need has grown in recent years and the program forms one means to respond to an increasingly acute need for informed biologists as teachers. The program spans the basic biological sciences, and a first-hand experience with research in the laboratory of a research biologist are the means of increasing competence. As the impact of the current trend to involve teachers and students in research has been manifested in new programs, for example Science Education Partnerships (SEP), the M.A.T. program has continued to receive a steady stream of applicants. Many M.A.T. students are able to take advantage of these opportunities as part of the M.A.T. program.

With a change in organization from a voluntary program to one with financing which would allow the teacher the opportunity to devote full time to the

program, together with funds available for research expenses, it seems likely that the demand for this program would increase. It must be borne in mind in evaluating this program that not all faculty are willing or able to accept students in their labs. The reasons are many, but the salient ones are space, access to instrumentation, availability of day-to-day mentors, and the feasibility of doing a significant piece of research in the available time. There are nonetheless enough opportunities to take care of current enrollment, and the students have shown considerable drive and enterprise in finding suitable advisors and outside sources of funding (American Physiological Society High School Science Teacher Fellowship, Sheryal Balding 1992; Partners in Science Fellowship, Tim Krell, 1995/6).

III. FACULTY

3.1 Faculty List and Curricula Vitae:

See Appendix B

3.2 Visiting, Part-time and Other faculty:

All faculty volunteer their time and lab space in the case of students electing to do their research in the laboratory of the faculty member.

3.3 Faculty Distribution:

We feel that the faculty advisory committee represents a broad and adequate spectrum of the biological sciences, encompassing ecological, organismic, molecular and genetic aspects, together with applied science expertise.

3.4 Underrepresented Groups:

The faculty composition mirrors that of the departments involved. Since we do not make appointments we do not have an explicit program in place to ensure appropriate representation. However, informal input would be given where applicable.

IV. STUDENTS

In general, the M.A.T. student is a mature professional teacher who has earned an undergraduate degree in biology as well as a teaching certificate in secondary education and who holds a respected position as a professional biology teacher at the high school or community college level. While most are residents of the Puget Sound area, we have had one graduate who came from as far away as Maine (she was able to arrange a sabbatical from her school) and current students who live in Vermont and Mississippi (on-leave for the academic year). The typical student attends the UW part time, earning a degree while remaining employed full time in the teaching profession. Even so, the quality of the coursework and research projects performed by these students is excellent. (See Appendix E and Appendix F.)

4.1 Baseline Information: See Appendix A.

4.2 Enrollment Patterns:

Enrollment has remained small but more or less constant throughout the history of the program. It is expected that this will continue unless a reorganization based on the availability of funding gives more teachers access to the program. It should be stressed that the clientele is limited to certified teachers and that most of them make a significant financial sacrifice in pursuing this degree. The number of

student averages between 10 - 15, most of whom are on leave during the academic year. Currently there are 14 students in the program. See Appendix C.

4.3 Graduation Patterns:

There has been a steady pattern of degrees granted, averaging 1-2 per year. Since most students are employed as full time teachers and generally work part-time toward the degree, the mean time to completion varies widely and the mean has little significance. See Appendix E.

4.4 Placements of Graduates:

Most graduates are already employed as teachers while they complete the degree and continue in the same position after graduation. We do not have a program plan for formal evaluation of our graduates in the workplace but we are aware from informal contacts that all of the graduates are highly respected at their various schools. See Appendix D.

4.5 Underrepresented Groups:

Given the small size of the program, the sample is not statistically significant in evaluating the representation of underrepresented groups. Any such applicant would be encouraged to apply to the program. Currently, the student body is comprised of 8 women and 6 men, one of whom is an underrepresented minority (Hispanic).

4.6 Nontraditional Students:

Our enrollment is almost entirely nontraditional. The primary need for these employed students is to provide summer courses but since the enrollment is small this is not practicable. A possible solution would be to award Biology Teaching assistantships if the teacher was able to take leave for a quarter.

V. CURRICULUM/INSTRUCTION

A Undergraduate N.A.

B Graduate

5.B.1 Master's Degree:

The elements of the M.A.T. in Biological Sciences are as follows:

1. 36 (minimum) credits in the biological fields. The M.A.T. is a very flexible program for biology teachers who wish to expand their understanding of biology. Students plan individual programs to meet their own educational objectives selecting at least one course (400-level or above) from each of the following departments: Microbiology, Genetics, Zoology, Botany, and Science Education. Biochemistry is also required unless completed in prior academic work. Additional courses in Biomedical History, Fisheries, Forest Resources, Environmental Health, etc. may be appropriate for the student's interest. Both the Graduate Program Adviser and the Director assist the student in this planning.

2. No foreign language requirement.

3. 6-9 credits (600-level) in a special research assignment in biology. Students select areas of investigation of particular interest to them and under the guidance of a sponsoring professor (generally a member of the Biology Teaching Group) carries out an intensive field or laboratory study. The study results in a written

report, prepared as if for publication, which serves as the background for assessment at the final oral examination by the student's advisory committee.

5.B.2 Doctoral Degree: N.A.

5.B.3 Instructional Relationship to Other Programs:

We provide no instruction. Students take departmental offerings as appropriate.

5.B.4 Teaching Participation:

Since our participants are already teaching, usually in high schools, this is not applicable. However, the potential for opportunities for M.A.T. students to receive appointments as Teaching Assistants in the Biology Program has been discussed with the Director of the Biology Program. This would have the effect of bringing professional teachers into the university teaching labs and it would give the M.A.T. candidates an opportunity to broaden their teaching experience. While this does occur already on an individual basis, a more permanent role for M.A.T. students as TAs in the Biology Program should be raised for further evaluation.

5.B.5 Preparation and Participation in Research and Creative Activities:

The research exercise is not intended as training for a career in professional research but as a direct experience of the methods and significant questions in research. This firsthand experience of professional research has its impact in the approach to the teaching of the biological sciences and is consonant with the increasing emphasis on hands-on experience in teaching school and community college courses.

5.B.6 Funding:

No specific funding is currently available, but as noted above, students may be potentially eligible for teaching assistantships. The provision of teaching assistantships would enable potential candidates to take leave from their school employment while taking courses not available to them during summers.

C Undergraduate and Graduate

5.C.1 Curricula Change:

Courses taken by M.A.T. students reflect changes in departmental course offerings. As noted above, it would be helpful to students to have relevant courses especially genetics and biochemistry, available during the summer.

VI. RESEARCH AND CREATIVE ACTIVITY

Not applicable, except to the extent that students participate in the research activities of their respective advisors.

VII. SERVICE

It should be emphasized that all faculty and staff participation in the M.A.T. program is voluntary and is thus a service to the teaching community as a whole. It operates at no cost to The Graduate School.

VIII. EVALUATION

Criteria for success in the M.A.T. program are:

1. Satisfactory coursework performance.
2. Satisfactory research work as evaluated by the research adviser and by oral presentation of the study to members of the Biology Teaching Group.
3. On a broader scale, success is reflected in the degree to which the experience improves the quality of teaching at the high school and community college level. These changes can be subtle and not readily amenable to measurement by survey instruments, but our collective experience is that this program impacts the quality of teaching through improvement of the teacher's biological literacy including a better understanding of how we know, and what we have to do to find out.

IX. RESOURCES

9.1 Funding Sources:

The allocation of Teaching Assistantships to the M.A.T. program would enable the support of students and contribute professional development for them. Allocation of Teaching Assistantships from the Biology program to provide support for a given population of M.A.T. students is under discussion. Alternatively, direct funding of Teaching Assistantships from The Graduate School specifically for M.A.T. students would enable teachers to take leave from their school for one or more quarters.

X. SUMMARY

10.1 Present Condition and Future Plans:

The M.A.T. program provides a pathway for highly motivated biology teachers to enhance their credentials and to take to the classroom their experience of the research lab. This is not to say that fundamental changes in teaching will ensue, but that more approaches through inquiry are likely to be used, and an awareness of research as a way of knowing will be communicated in the classroom. Future changes in coursework requirements and curriculum content will mirror changes in the broad field of biological sciences.

Without a change in the basis of financial support for the program we do not expect to see a significant change in enrollment. Under current conditions we hope to continue to do a good job with a limited clientele.

XI. FUTURE GOALS AND PLANS

11.1 Two future scenarios for the M.A.T. in Biology program are:

1. To remain a small program as in the past, with a steady rate of graduation of able biology teachers or
2. To re-evaluate the funding basis of the degree program to provide both for the support of students, most of whom would be taking leave from their teaching positions, and to provide for the costs of their research activities.

If the program remains on its present basis we envisage the prospect of a modest increase in the number of applicants, reflecting population growth in the area. If it proves possible to support the program as envisaged in scenario two above, then it is probable that a significant increase in the number of applicants would occur.

As a response to an earlier state mandate requiring masters degrees for all certificated teachers, preliminary discussions were initiated to broaden the M.A.T.

program to all the Natural Sciences. That possibility has not been pursued further, but should be borne in mind in formulating future goals.