Master of Technology - Biology Option  
Southeastern Oklahoma State University  

Assessment Report  
2010-2011  

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Special Note: The Master of Technology program has a separate Coordinator for the Information Technology option. Dr. Ming-Shan Su is responsible for assessment of that part of the program. Please see comments below. A copy of this report was provided to Dr. Tim Smith, the Chair of the Department of Chemistry, Computer, & Physical Sciences.
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I. Mission Statement

Ia. The Master of Technology program at Southeastern Oklahoma State University provides an environment of academic excellence that enables students to be nationally competitive in their chosen fields. By having personal access to excellent teaching, challenging academic programs, and collaborative experiences, students will master a body of knowledge, and professional skills and competencies, in their chosen field that promote successful careers, responsible citizenship, and lifelong learning.

Iib. The Department of Biological Sciences is dedicated to providing the courses and programs that enable students to discover and achieve their highest potential. Students are prepared for careers by the breadth and rigor of each program; students develop the knowledge, skills, and habits necessary for responsible citizenship and continued self-improvement through lifelong learning.

II. Vision Statement

Ila. The Master of Technology program at Southeastern Oklahoma State University strives to be a leading program for graduate technical education in Oklahoma and northern Texas.

The program will continue to exemplify an innovative and responsive spirit that nurtures excellence in the education of its students. The program will respond effectively to changing technologies, economics, and demographics. Innovative partnerships with regional, constituencies will be one of the program's hallmark achievements.

Iib. Faculty in the Department of Biological Sciences provide personal attention to students in the classroom and laboratory, on field trips, and during extracurricular activities. Faculty exemplify excellence in teaching, grantsmanship, research, scholarship, and service. The Department is innovative and responsive to changing technologies and demographics and continues to pursue partnerships with regional constituencies.

III. Statement for Assessment and Student Learning.

IIIa. The program will undertake a continuous process of assessment of the outcomes from the student learning objectives, with a feedback loop for continuous improvement.

IIIb. The Department of Biological Sciences continuously strives to enrich the quality of teaching and learning through self, course, program, and departmental assessment. Through continual assessment the department will be responsive to changing technologies and needs of the marketplace.

IV. Program Goals

IVa. The goal of the Master of Technology Degree program is to prepare graduates for successful employment and advancement in science and technology fields which contribute to the economic well-being of southeastern Oklahoma. The program develops a knowledge base through three core courses and provides for an option of specialization.
IVb. To provide students with the knowledge base, technical skills, and qualifications to meet the demands of the job market in science and technology.

V. Program Learning Outcomes

Students will:

1. A) Demonstrate a broad, general knowledge about the foundations of science and technology.

   B) Demonstrate an in depth knowledge of a specialty area in science and technology. The specialty area can include many subdisciplines represented in the Biology Department including, but not limited to: Biotechnology and Conservation.

2. Demonstrate knowledge and skill in the synthesis of information by preparing and presenting written and/or oral reports.

3. Show interpersonal skills that promote the accomplishment of collaboration and communication in the areas of science and technology.

4. Develop basic research skills for the design and execution of experiments and other scientific investigations. This requires the development of skills and knowledge of the methods involved in analyzing, interpreting, and reporting data relevant to one's specialty area.

VI. Assessment of Each Learning Outcome

Every student in the Master of Technology program (option Biology and option Information Technology) is required to take three core courses. These include Information Technology (CS 5003), Statistical Analysis (STAT 5153), and Research Methods (TECH 5153).

A. Outcome 1A - Demonstrate a broad, general knowledge about the foundations of science and technology.

   1. Internal test based on topics presented in the three core courses.

   The Master of Technology Program assessment procedures have undergone major changes over the past few years. Table 1 illustrates the on-going attempt to provide an in house exam to assess the Biology option students graduating from the program. Starting in the Fall of 2008 through the Summer semester of 2010, four students have taken the exam. All of their data is included below. Two additional students graduated in Fall of 2009; however, they were students who had taken a break from the program and returned to finish before the expiration of the six-year deadline. These two students were not tested due to the fact they were not current in terms of the Instructors and content provided in the core courses.

   Please note that all tests are filed in the MT-coordinator's office and can be reviewed at any time by those with appropriate authority for the details of their grades. This test is for
assessment only and students are not typically informed of their final score other than whether it was a passing or failing grade.

Table 1.
Average MT Biology student scores (in %) on the new in house exam over the core courses. Note: not enough students to incorporate meaningful additional statistics (n=6).

<table>
<thead>
<tr>
<th>Course Section Tested</th>
<th>Research Methods (50% of exam questions)</th>
<th>Statistical Analysis (22% of exam questions)</th>
<th>Information Technology (28% of exam questions)</th>
<th>Total score (ave. %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student average correct (%) F'08-Sum'10; n=4</td>
<td>93</td>
<td>58</td>
<td>58</td>
<td>75</td>
</tr>
<tr>
<td>Student average correct (%) Sp'11; n=2</td>
<td>71</td>
<td>67</td>
<td>81</td>
<td>73</td>
</tr>
<tr>
<td>Student average correct (%) All; n=6</td>
<td>86</td>
<td>61</td>
<td>65</td>
<td>75</td>
</tr>
</tbody>
</table>

2. Analysis and interpretation of the internal test based on topics presented in the three core courses.

There is no nationally-normed test to assess master’s-level student knowledge in any of the subject areas of the MT program. In an attempt to address the need to assess the students in the core course areas of the program, instructors of these courses were solicited to provide relevant questions and answers based on these core courses. These questions were placed in a test bank and assembled by the Biology coordinator into a test that was used for two of the students graduating from the Biology program during the assessment period. The data also summarizes the results since the test was implemented three years ago. The last three graduates took the Information Technology course under a new Instructor. The solicited questions were very similar to those used previously so the test changed only slightly.

There are several things to consider when examining these results. The first is that the test is very new and until we have a few more years of data the statistical significance of the data is very limited. This temporarily limits our ability to also account for whether we are even providing a reasonable test (which is a problem when there is a lack of a national exam). However, the general trend of the results shows some patterns we might expect. The students did the best in the research methods section possibly because these were the skills most likely to be used throughout the Biology side of the program. The results from the statistical analysis class section were not exceptional and did trend about the same as the information technology section as might be expected from Biology students versus those students in the Information Technology
option. The total average score has remained very consistent even though in some years individual students may do better or worse in any given section. One additional point is that students face no penalty for doing poorly on the exam which may be affecting the students' motivation to do well on the exam.

3. Program Modifications.

Starting in Fall of 2008, the graduate Dean and representatives of the Biology MT option and those involved in the Information Technology MT option met and agreed to have separate coordinators for the MT program. In a functional sense this helps each program grow internally and speeds up decision making and advisement for the entire program. The core courses are still shared between the options. The test bank used for the new exam was provided to the coordinator for the Information Technologies option. While their report will outline what measures they have taken to assess the core courses, perhaps in the future, once enough data is obtained, we can cross compare student outcomes or devise a standard test for both programs.

B. Outcome 1B - Demonstrate an in depth knowledge of a specialty area in science and technology. The specialty area can include many subdisciplines represented in the Biology Department including, but not limited to: Biotechnology and Conservation.

1. Internal test based on topics presented in the student's biology courses.

In this area as well, the Masters of Technology Program Biology Option assessment procedures have undergone major changes. In the Fall of 2009, the Biological Sciences Department (graduate faculty) voted to do a test run of two potential means of assessing the specific coursework each student takes in the department. This is a daunting task in light of the lack of a true nationally-normed test and the fact that each student takes a unique arrangement of graduate classes based on topic area of interest and availability. A detailed description of both tests was presented in that year's report, but to briefly summarize one test was written and the other was an oral exam. Three students were tested this way as a trial run to see which would be the most useful format. The department graduate faculty was much in favor of the oral exam (see description below) and has continued using it.

Oral exam format. The students are given an oral exam by the three members of their committee. Any faculty who has had the student in a class is also invited to participate in addition to the three committee members. Before the exam the student also provides the committee with a CV detailing their academic achievements. During the exam they are asked a range of questions used to assess five specific criteria. These are: 1) Biology Department direct coursework knowledge, 2) general scholarship in Biology, 3) communication skills, 4) professionalism, and 5) ethical and responsible behavior. Please see a copy of this form in Appendix I. Each committee member at the completion of the exam rates the student's responses and experience (based on submitted CV) as either: exceptional (3 points), above average (2 points), adequate (1 point), or below average (zero points). In each category the student is expected to receive at least an adequate but in cases where the committee disagreed, the student could balance a 'below average' with an 'above average' or 'exceptional' from the other two committee members.
Therefore they must receive an average score of 1 to pass the exam. Faculty evaluators have the right to not score an item if they feel they do not have enough information to make an honest evaluation for a section.

Since the program change in 2009, students who entered the program under the new heading MT-Biology (rather than the old, MT-Biotechnology or MT-Conservation) have graduated. The new test was implemented with this catalog change and all incoming Biology option students are informed that they must take the oral exam and pass it to graduate. The three students that have graduated since Fall 2010 therefore have been required to take the exam. The results are presented in Table 2.

Table 2.
Average MT Biology student scores on the new oral exam over the students' specialty areas. Note: not enough students to incorporate meaningful additional statistics (n=3).

<table>
<thead>
<tr>
<th>Category:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2, Pass; Above average</td>
</tr>
<tr>
<td>Student 2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1, Pass; Adequate</td>
</tr>
<tr>
<td>Student 3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2, Pass; Above Average</td>
</tr>
</tbody>
</table>

2. Analysis and Interpretation of the internal tests based on topics presented in the student's biology courses.

The graduate Biology faculty continue to like this format now that it is fully implemented. It has the benefit of addressing several of our program goals (see below). It standardizes the format in a way that will allow future comparison of results regardless of which of the many combinations of the available courses the students have taken. It is also a format that in the future could allow a standard of comparison between several different graduate programs on campus (i.e. categories like 'communication skills' could in theory be rated on the same scale in different departments which could allow for results to be compared between departments). Finally, it increases the rigor of our program bringing it closer to standards of Master's of Science (MS degree) granting programs at other Universities.

So far we have had three students take the exam and all passed on the first attempt. We hope in the future to compile more comparative data as more students graduate.

3. Program Modifications.

The Biological Sciences Department (graduate faculty) has for now decided to use and hopefully improve the oral exam format described above. As indicated above this requirement started with graduates in the Spring '10 semester. Students do have two chances to retake and pass the test in order to graduate from the program. In addition, further suggestions were implemented in that more than just the student's
committee members be allowed to sit in on the oral exam. Thus, any instructor who had the
student in class or perhaps even outside experts, could aid in this assessment exam.

C. **Outcome 2 - Demonstrate knowledge and skill in the synthesis of information by preparing
and presenting written and/or oral reports.**

**AND**

**Outcome 3 - Show interpersonal skills that promote the accomplishment of collaboration
and communication in the areas of science and technology.**

1. It is planned that the oral exam described in section B can be used as a primary tool for
assessing these outcomes. Students are required to submit a CV which would highlight professional
presentations and reports for the committee to evaluate. This would be included under the
'communication skills' and 'professionalism' headings (category 3 & 4).

2. Oral and written reports are required in many of the courses which the students take;
however, not all students take the same classes. It may be possible to assemble portfolios of the
student's work or to use the core course, Research Methods, in a manner similar to senior seminar
classes where a specific paper and presentation are required. This option has yet to be implemented.

3. In addition, students who opt to do a full research thesis are required to make a public
presentation of their data. Furthermore they then have to pass an additional oral exam in defense of
their thesis.

4. **Analysis and Interpretation.**

As to the first point regarding the exam, at this point, until more students come through the
program and take the new oral exam, there is limited data to include. So far the three students have
taken the exam and the group average has indicated a score showing above average skills in the
communication and professionalism categories (total average score for each category of 2). Over
time we will have a better statistical comparison.

Most of the graduating students (for this report, one of the two students) did present either
by poster or by oral presentation some of their own research at a meeting such as Oklahoma
Research Day. A point to note is that in general several students will take a semester of research
even if they don't intend to complete a thesis. Also, all students are required to take a Special
Studies course (BIOL/BOT/CONS 5970) before graduation which often requires assembling
research either from the primary literature or from some project of their own and presenting it in
some manner. None of the graduates in this assessment term have taken the thesis option although
as noted one did do independent research. The other student was the Graduate Assistant for the
department whose job it was to assist our undergraduates to learn these skills.
D. **Outcome 4 - Develop basic research skills for the design and execution of experiments and other scientific investigations. This requires the development of skills and knowledge of the methods involved in analyzing, interpreting, and reporting data relevant to one's specialty area.**

1. It is planned that the oral exam described in section B described above can be used as a primary tool for assessing this outcome. Students are required to submit a CV which would highlight professional presentations and publications for the committee to evaluate. This would be included in some part under all of the headings scored by the committee.

2. These skills as well are taught and tested in many of the courses which the students take; however, not all students take the same classes. In this case even if they do not take the same classes most will at some point take a class requiring enrollment in a laboratory section. It may be possible to assemble portfolios of the student's work or to use the core course, Research Methods, in a manner similar to senior seminar classes where a specific assignment is required. In addition those students taking research for credit include those doing a thesis and sometimes those who are not, but who want to try doing some hands-on scientific work. Students who do this produce notebooks of their data and may even publish or present it.

3. **Analysis and Interpretation.**

   This past year, all of the graduating students opted for the non-thesis option.

   At this point, the oral exam shows the students can pass in all of the categories on the first try. The requirement for submission of a CV incorporated into the exam allows us to assess this area.

**VII. Faculty Level of Involvement in Assessment Process**

In Biology, the primary person responsible for compiling data and writing the report is the MT coordinator, Teresa Golden. Due to the need to find a better way of assessing the program (essentially starting from scratch) all of the Biology graduate faculty have actively participated this past three years in making decisions about how to improve assessment results and some assisted in the trial runs of the new assessment methods. This includes several faculty members working as committee members for the students (advising and assisting) and administering the oral exam. All Biological Sciences graduate faculty were given the opportunity to review this report before its submission. Also, from Biology Dr. Stan Rice provided questions for the research methods portion of the core assessment exam. Two of the core courses are taught outside of the Biology Department and the instructors of those courses in recent years, Rhonda Richards and Dr. Brett Elliott have provided questions and answers for our in-house assessment core exam as well.

As mentioned previously, the graduate Dean and representatives of the Biology MT option and those involved in the Information Technology MT option met two years ago and agreed to have separate coordinators for the MT program. We share the blanket umbrella of the MT degree, however, the needs of students in the separate programs are evolving in different directions. Dr. Su and I can share data for the program but even the core courses should be evaluated by each department in the way that best facilitates their specific program's growth.
Relevant stakeholders outside of the University are wide and varied. In many cases these would include future employers of our graduates. Our graduates have typically been employed as teachers at either the Junior or High School level or at the Community College level. This is supported by the fact one of our graduates in the last year received a faculty Instructor position at a college outside of Oklahoma. The other student is currently working as a substitute teacher. In the past many of them have obtained or are set to obtain their alternative teaching certificate and are employed in the teaching profession. One of the other former graduates who is not a teacher are working in a research lab out of state. Yet another former graduate (from Fall 2008) continues to be a full-time Instructor/faculty at one of Oklahoma’s regional colleges. The end result is that seven of our eight most recent graduates are employed at jobs which required the completion of their Master’s degree. None have reported problems that indicated their degree being an MT and not an MS was an issue. In addition, we also have current students who are concurrently employed who are planning on promotions in their job status when they do receive the MT-Biology degree. We often receive feedback from these students; however, we have not directly contacted any employers to discuss our program with them.

VIII. Assessing IETV and/or Web-Based Instruction

The MT program does not have any IETV or web-based blended or online course offerings at this time.

IX. Strengths and Weaknesses of the Program

Strengths:

1. The program provides an opportunity for local students, usually graduates of Southeastern, to obtain a master’s degree that will allow them to find employment or advance within their jobs.

2. The graduates of this program frequently find relevant employment.

   As described in detail above seven (out of eight) of our recent graduates are employed in jobs which required their Master’s degree.

3. The program is finally beginning to grow.

While the economy can take some of the credit, the change of the program options from Biotechnology and Conservation to just Biology has helped to increase interest in the program. The seeds of this growth began in Spring 2009 with 3 seniors concurrently enrolling in graduate level courses. Also, whereas previously we had 0-2 total active students in a given year, beginning in Fall 2010 we had ten active students. While some students have finished or chosen to take a break, we have maintained this level of active enrollment in the program into 2011. A positive side-effect of having more students in the program is that more of our undergraduates notice these students and consider the MT program as a possible option for the future.

4. In our expansion we have picked up a new class of graduate student. These new students are ones who are waiting for acceptance into other professional programs who wish to improve their resume by entering our program while they work towards their goals. We have seen an increase
of two or three additional students in the past year who fit in this category. The advantage here is that we are serving the needs of our constituents and will likely keep some of these students who cannot or decide not to leave before graduating from our program. If success here is based on students achieving their goals and being accepted into their programs of choice then we are doing well, with two out of two actively enrolled students moving on to other programs of their choice (one to dental school and one to graduate school).

Weaknesses:

1. The primary weakness is that the Master of Technology program lacks the depth of a Master of Science degree at larger universities.

Many of our courses are 5000-level versions of an undergraduate course already offered. This means many of our students have to take classes outside of their biology interest since they already took the 4000-level version of a course as an undergraduate. This was actually a driving force for the change in the program to MT-Biology. This will continue as a problem until such time as the program can grow to include more specific graduate-level biology coursework. For now this weakness is acceptable in the sense that our students are being employed. Long term, if growth is expected to continue and if we hope to attract students from other programs this weakness will need to be addressed.

2. Our program is small and difficult to assess.

Many of the assessment issues were brought up in earlier parts of this report. We are striving for means to assess students who, with the exception of the core courses, often take very different classes to receive their degree. In addition, some choose to do a thesis, some choose to do some research but don't do a thesis and some just take straight coursework. The Biological Sciences Department faculty is working to improve this situation as evidenced by the two different tests that were used on a trial basis and now are standard for future graduates.

3. Listed as an advantage above, we are attracting students who are in a waiting period for acceptance to other programs. While this does increase our numbers and we are serving our constituents, it creates a challenging environment to judge our success. While we may not graduate these students from our program we are giving them a better chance to enter other programs which they are aiming for. We do however, lose them so they are not assessed and do not graduate from our program. Until we address weakness number 1 above this will continue to occur.

X. Effectiveness of Previous Modifications

As noted several times in the report, the program has made modifications during the previous assessment periods. The one with the most effect on the program has been the change from the options of Biotechnology and Conservation to just the option in Biology. This has resulted in more student interest in the program. The broader title seems to make the students more comfortable that this degree plan is possible for them and graduation requirements are less confusing. It is worth noting that Computer Sciences as well went from two options to just one in Spring of 2009.
XI. Modifications to be Made to the Program or the Assessment Plan

There is still much work to be done to improve our assessment of the program. We have essentially re-started from the beginning to look at different testing methods that will allow us to appropriately assess our program. This change has been incorporated in the assessment plan for Biology. This will continue into the next assessment periods. In this current report we have assessed the core courses with two of the graduates who graduated during the assessment year. As we move forward, the increased enrollment in our program should allow us to get some more statistically relevant data to use as a method to assess and improve our program. Now that the oral exam is required and deemed useful we will continue to improve this as an assessment tool. In addition we have made passing the test mandatory. This should result in the students taking the test more seriously. If taken seriously the assessment exam can provide us real data with which to improve our program.

MT- Biology Coordinator, Teresa Golden

Chair Biological Sciences, Teresa Golden

Dean, Arts and Sciences, Lucretia Scoufos
Appendix I

Biology MT Oral Exam-

Student Name:________________________

Date:________________________

Advisor/Committee Member Name:________________________

Circle the rating you would give the student in each of the categories below; point values are given to obtain averages since there is more than one committee member:

1- Biology Department Direct Coursework Knowledge (oral exam only):

Below Average (0) Adequate (1) Above Average (2) Exceptional (3)
(fail) (pass)

2- General Scholarship in Biology (can consider GPA and oral exam):

Below Average (0) Adequate (1) Above Average (2) Exceptional (3)
(fail) (pass)

3- Communication Skills (can consider meeting presentations, papers, oral exam, or other):

Below Average (0) Adequate (1) Above Average (2) Exceptional (3)
(fail) (pass)

4- Professionalism (can consider conference attendance, thesis presentation, memberships to outside relevant scientific organizations, day-to-day experience with the student, and the oral exam):

Below Average (0) Adequate (1) Above Average (2) Exceptional (3)
(fail) (pass)

5- Ethical and Responsible Behavior (can consider coursework like Bioethics, oral exam, or other):

Below Average (0) Adequate (1) Above Average (2) Exceptional (3)
(fail) (pass)