Master of Technology - Biology Option
Southeastern Oklahoma State University

Assessment Report
2009-2010

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Prepared by:

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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.
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I. Departmental Mission Statement

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. Departmental Vision Statement

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.

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

- 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

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 first attempt to provide an in house exam to assess the Biology option students graduating from the program. In the Fall of 2008 through the Spring of 2009 the two (only) biology graduating students were tested to give a base-line for the future. This year, one student graduated in Fall of 2009 and one in the Summer semester of 2010 and they took the exam as well. All of their data is included below. Two other 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 this year an error in the answer key was discovered that resulted in a change in the data reported previously. This did not alter graduation status or cause any problems for the individual students involved. The only change is in the tallied numbers from last year's report. All tests are filed in Dr. Golden's office and can be reviewed at any time for the details of the re-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 on the new in house exam over the core courses.

Note: not enough students to incorporate meaningful additional statistics (n=4).

<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</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student average correct (%) F'08-Sp'09; n=2</td>
<td>86</td>
<td>58</td>
<td>31</td>
<td>64</td>
</tr>
<tr>
<td>Student average correct (%) F'09-Sum'10; n=2</td>
<td>100</td>
<td>58</td>
<td>84</td>
<td>86</td>
</tr>
<tr>
<td>Student average correct (%) All; n=4</td>
<td>93</td>
<td>58</td>
<td>58</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 two years ago. The last graduate mentioned 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 statistical methods results 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. Overall the average has improved but that is most likely due to students being more aware that this testing will take place resulting in some awareness of the test format. 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.

During the previous assessment period, 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 previous year 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 last 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 1. Each committee member at the completion of the exam rates the student’s responses and experience (based on submitted CV) as either: exceptional, above average, adequate, or below average. 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.

This year is the first year that 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 single student that graduated in the Summer 2010 semester was required to take the exam and received an adequate or better ranking in all categories from all three committee members.

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

Those involved with the trial run of this type of format felt it worked very well. 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.

This year we had the first student to take this exam as a requirement for graduation. It seems a bit unfair to single out this person’s rankings in all categories but as noted above the exam was passed. 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 in last years report 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' heading. For this outcome it seems unfair to single out the one student who took the test for this report but she did receive a ranking higher than adequate from all three members. As previously stated by next reporting period we should have data on more than one student to report.

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.

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.

At this point, until more students come through the program and take the new oral exam, there is no other particular data to include. It is hoped that future use of the oral exam and the requirement for submission of a CV will allow for true assessment in this area. For this outcome it seems unfair to single out the one student who took the test for this report but as previously stated by next reporting period we should have data on more than one student to report.

Most of the graduating 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 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.

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 under several 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 there is no particular data to include. It is hoped that future use of the oral exam for multiple students and the requirement for submission of a CV will allow for true assessment in this area.

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

In Biology, the primary person responsible for compiling data and writing the report is 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 two 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.

As mentioned previously, the graduate Dean and representatives of the Biology MT option and those involved in the Information Technology MT option met last year 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 three of our graduates in the last year maintaining or receiving a position teaching at a local Junior or Senior High School. In addition one former student (graduated in Spring of 2009) also recently received such a teaching position. All of them have obtained or are set to obtain their alternative teaching certificate. Our other recent graduate received a research internship in a 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 all six of our 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. 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 all six 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 students in a given year, beginning in Fall 2010 we have ten active students; two of which are new this fall. We also have about four students on hiatus mostly due to financial or family reasons. 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.

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.

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 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 into 2010-2011 and later, 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, Diane Dixon

Dean, Lucretia Scoufos

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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:

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

   Below Average  Adequate  Above Average  Exceptional  
   (fail)  (pass)

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

   Below Average  Adequate  Above Average  Exceptional  
   (fail)  (pass)

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

   Below Average  Adequate  Above Average  Exceptional  
   (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  Adequate  Above Average  Exceptional  
   (fail)  (pass)

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

   Below Average  Adequate  Above Average  Exceptional  
   (fail)  (pass)