

Assessment report on the Masters in Biology, Masters in Environmental Science, and Ph.D. in Regulatory Biology

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1. Goals

Program goals for the Ph.D. in Regulatory Biology, the Masters in Biology (thesis and non-thesis options), and the Masters in Environmental Science were adapted by the Department's Graduate Committee from existing program objectives and then discussed and approved by the department at a faculty meeting. Development of goals, as well as the outcome measures, took into consideration model assessment forms provided by the Assessment Office and forms obtained from other departments. The Assessment Office were consulted during the development process. An initial version was implemented and administered for most of a year. Based on this experience with the administration of the outcome measures, the forms were modified. The final versions of the goals and outcomes measures were approved by the Assessment Office; they are attached to this report.

2. Outcomes

Outcome measures matched to program goals were developed as described above. The initial assessment form and procedure were modified based on experience in the first year. In particular, the original form directly derived from the program goals was judged to be inadequate by the Assessment Office. Moreover, the procedure by which each examining committee filled out a single form did not adequately represent the full range of evaluations at some exams. Therefore, we consulted additional examples of assessment forms and developed a more complete form incorporating a rubric for the various scores. Each member of an exam committee now fills out a form, giving us a broader database. However, the change in format means that data collected in the first year are not easily compared with the more recent data.

3. Research

Evidence is acquired in two ways. First, students answer a questionnaire on their familiarity with a wide range of techniques that are taught and applied in the areas of biology represented in the department. They answer this questionnaire both upon their entry to the program and upon completing the program. Second, faculty complete an assessment form at each candidacy exam of doctoral students and at dissertation and thesis defenses. These instruments have been modified based upon the initial experience as described above. The final versions were approved by the Assessment Office.

4. Findings

To date, the primary finding is that the procedure as currently practiced appears to be workable and should produce a sufficient quantity of good data in the future, but the available data are too few for extensive analysis.

Results can only be considered preliminary. In the short span of data collection, we don't have answers from the techniques survey for any students at both matriculation and graduation. Instead, we have many surveys from the most recent cohort as they entered the program and a few surveys from different students as they finished the program. We have a large group of assessments from last year's poster session. We have exam assessments from a scattered group of students distributed unequally among the different programs.

The results are depicted in the attached figures. In all cases, assessment is on a three

point scale (essentially 3: unsatisfactory, 2: satisfactory, and 1: excellent; i.e., lower scores are better).

With respect to techniques, entering students claim to have moderate or extensive knowledge of 50 of 106 techniques and abilities surveyed (practical and theoretical knowledge is not distinguished here). Broken down by area the averages are as follows: molecular/cellular 15 of 26, statistics and analysis 8 of 16, ecology and environmental science 3 of 12, evolution and systematics 7 of 16, animal behavior and physiology 4 of 18, literature review and presentations 6 of 8, grant writing (doctoral only) 1.6 of 4, and laboratory safety and microscopy 5.4 of 6. Too few students have finished the program and completed the new forms for any analysis.

Most posters were considered satisfactory or better (Figure 1). Doctoral students tend to score better than masters students. The most interesting aspect of the poster assessments is the relationship between scores and years in the program (Figure 2). First, for doctoral students in the program less than four years, i.e., full-time students progressing normally, the poster scores show a clear improvement with the number of years in the program. Second, a few students who have been in the program for longer than the normal span do not score well. Most of these students are part-time students who are unable to devote sufficient time to their research.

The most extensive set of results is from candidacy exam assessments (Figure 3). The number of candidacy exam assessments is small; of a total of 17, there were 11 passes. In this summary, both single committee scores for the goal, the original form, and category averages from all committee members, the final form, are combined. The results for overall average score show the expected relationship between exam outcome and assessment score. Some overlap is expected due to individual differences from one committee to another in evaluation and in score assignment. Too few results are available with the new form to analyze individual components.

The evaluations at doctoral defenses are similar. The scores, satisfactory or better, are better than at the candidacy exam. The masters defenses (N=4) also show a range of values with some excellent scores.

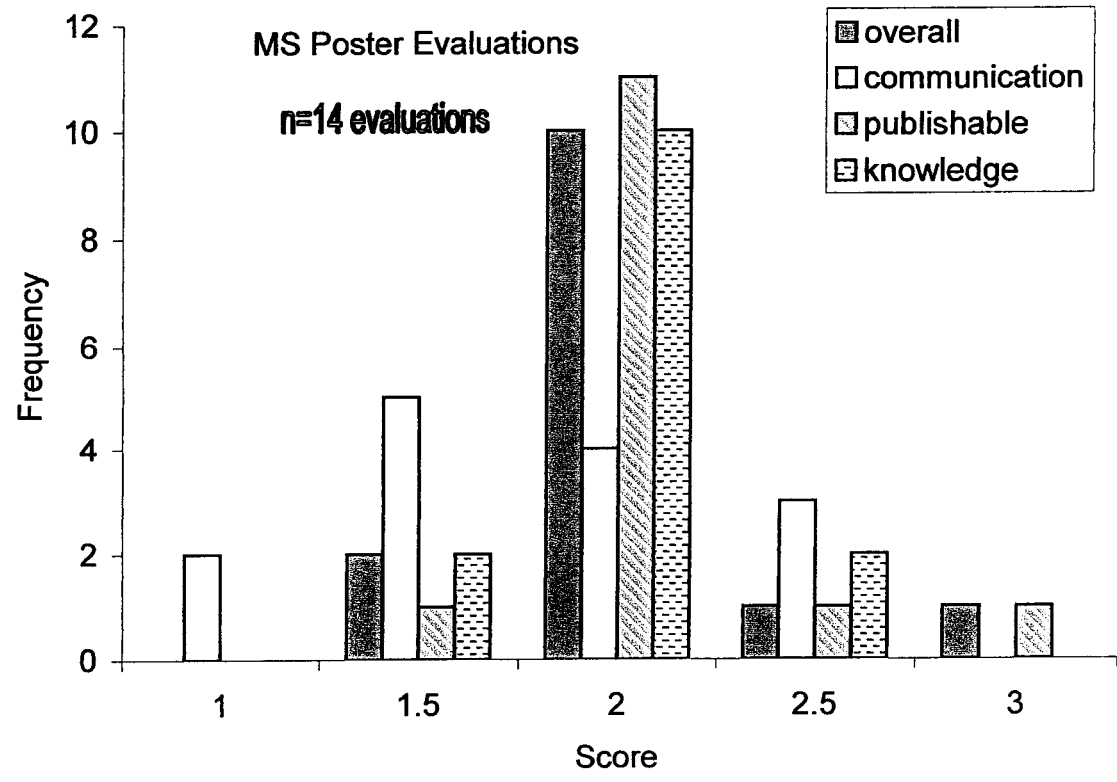
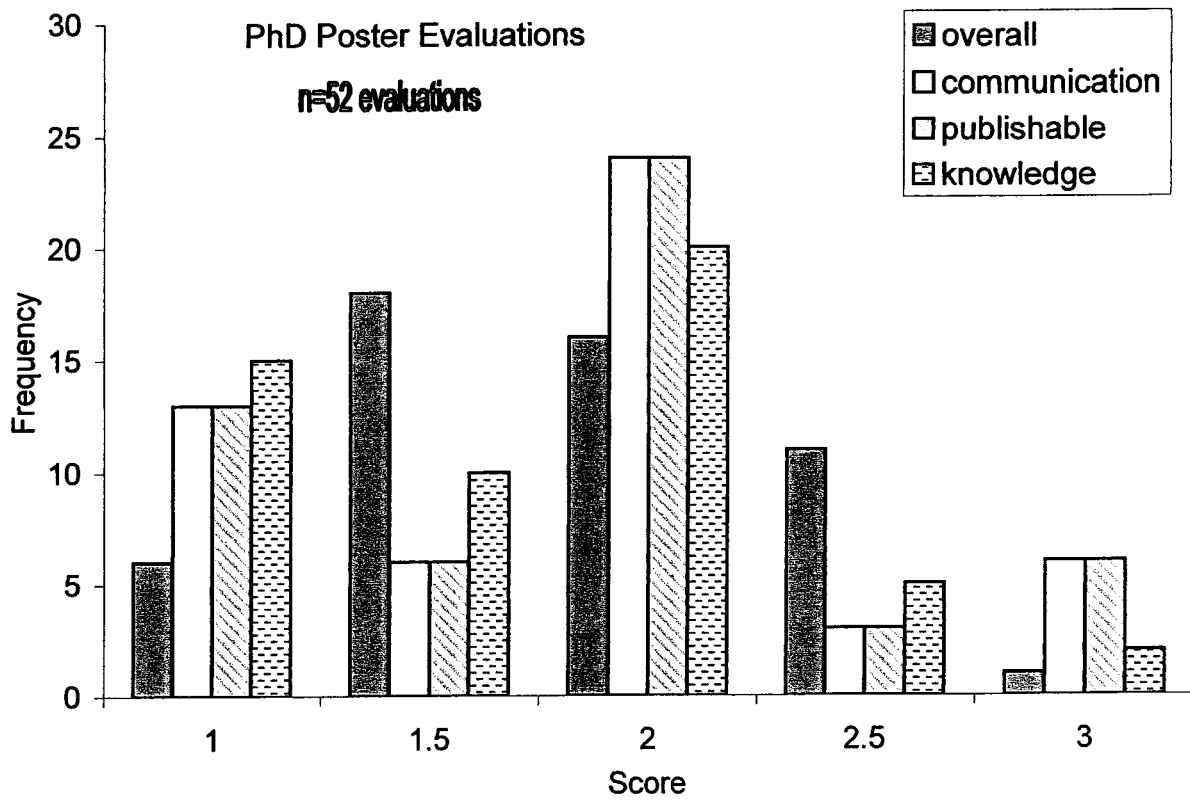
The number of non-thesis masters students is small (N=2) and results are too few for analysis.

5. Review

Summaries of the data were reviewed by the graduate committee. It was decided that no changes to curricula or programs are needed at the present time. The results and conclusions will be discussed by the department at a faculty meeting next Fall, the next opportunity.

6. Actions

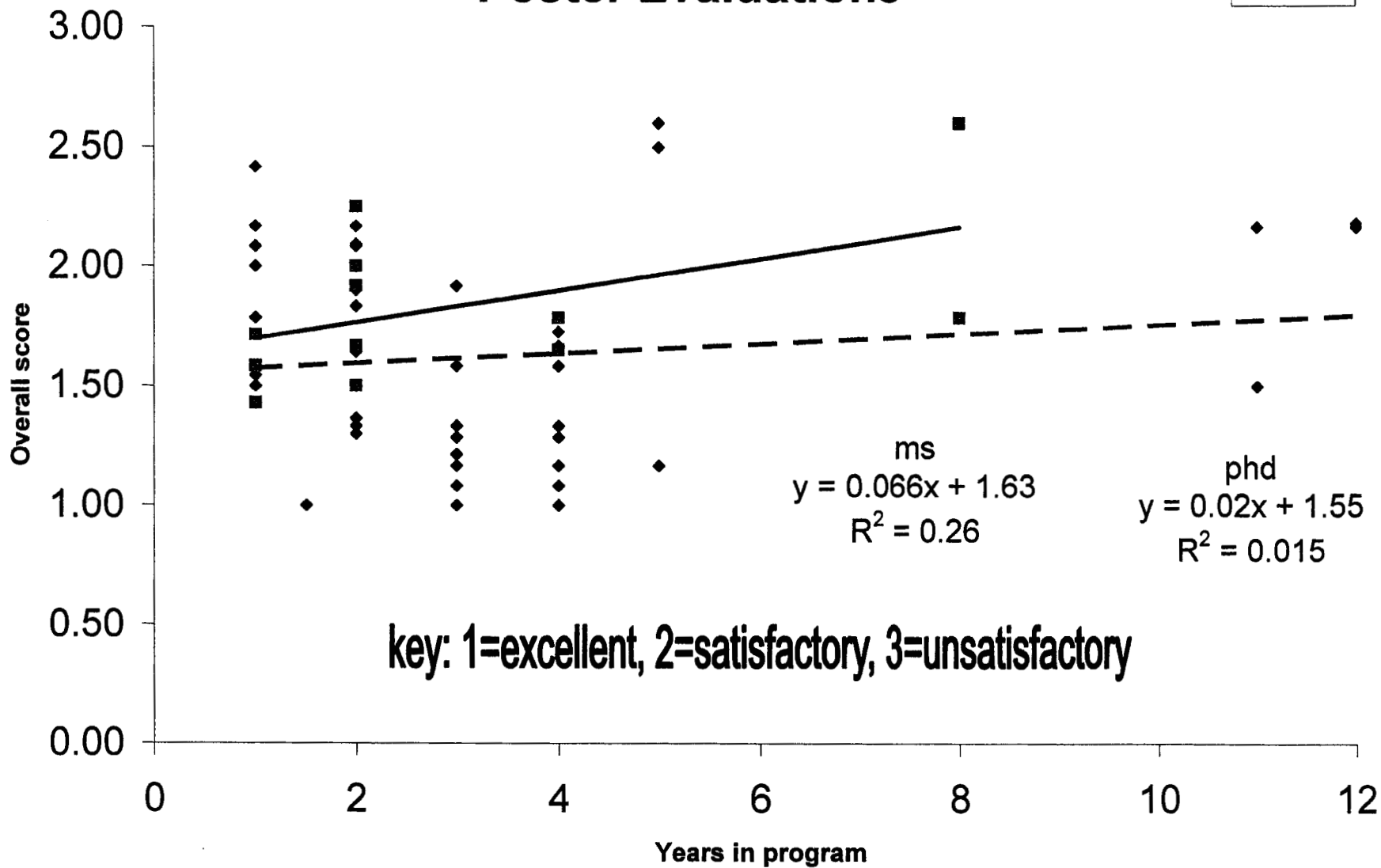
The data are still too sparse to support any changes in curricula or services. Goals are chosen not on the basis of what the data on achievement indicate but rather according to a consensus among the faculty concerning knowledge and techniques that are fundamental for masters and doctoral students in the field evaluated in the context of the employment and career goals of our students. As mentioned above, the outcome measurement instruments were adapted to simplify the procedure and allow the broad range of individual evaluations to be reflected. This change appears to be working. As sufficient data become available, we should be able to focus on individual components of student performance.



key: 1=excellent, 2=satisfactory, 3=unsatisfactory

Poster Evaluations

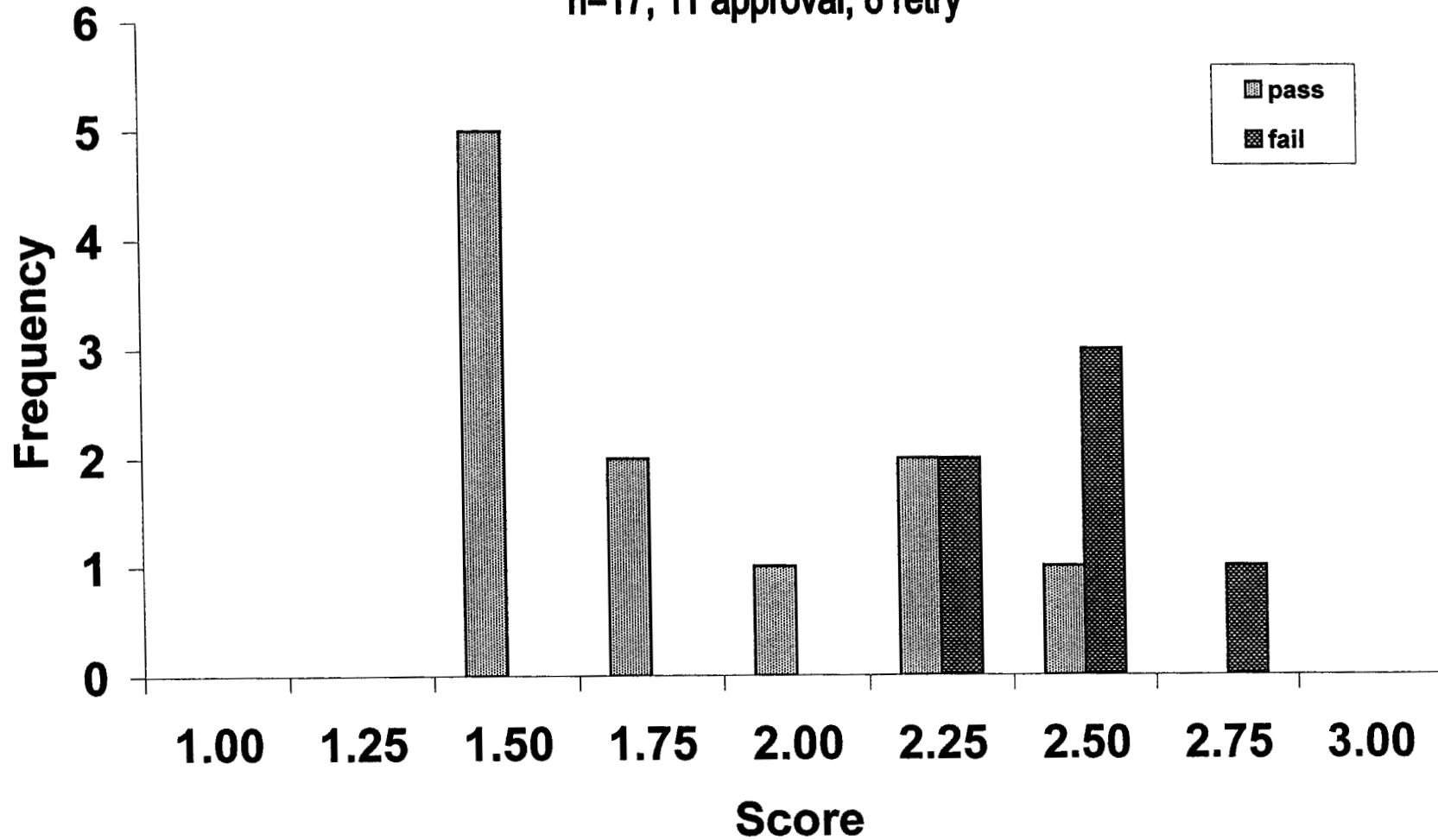
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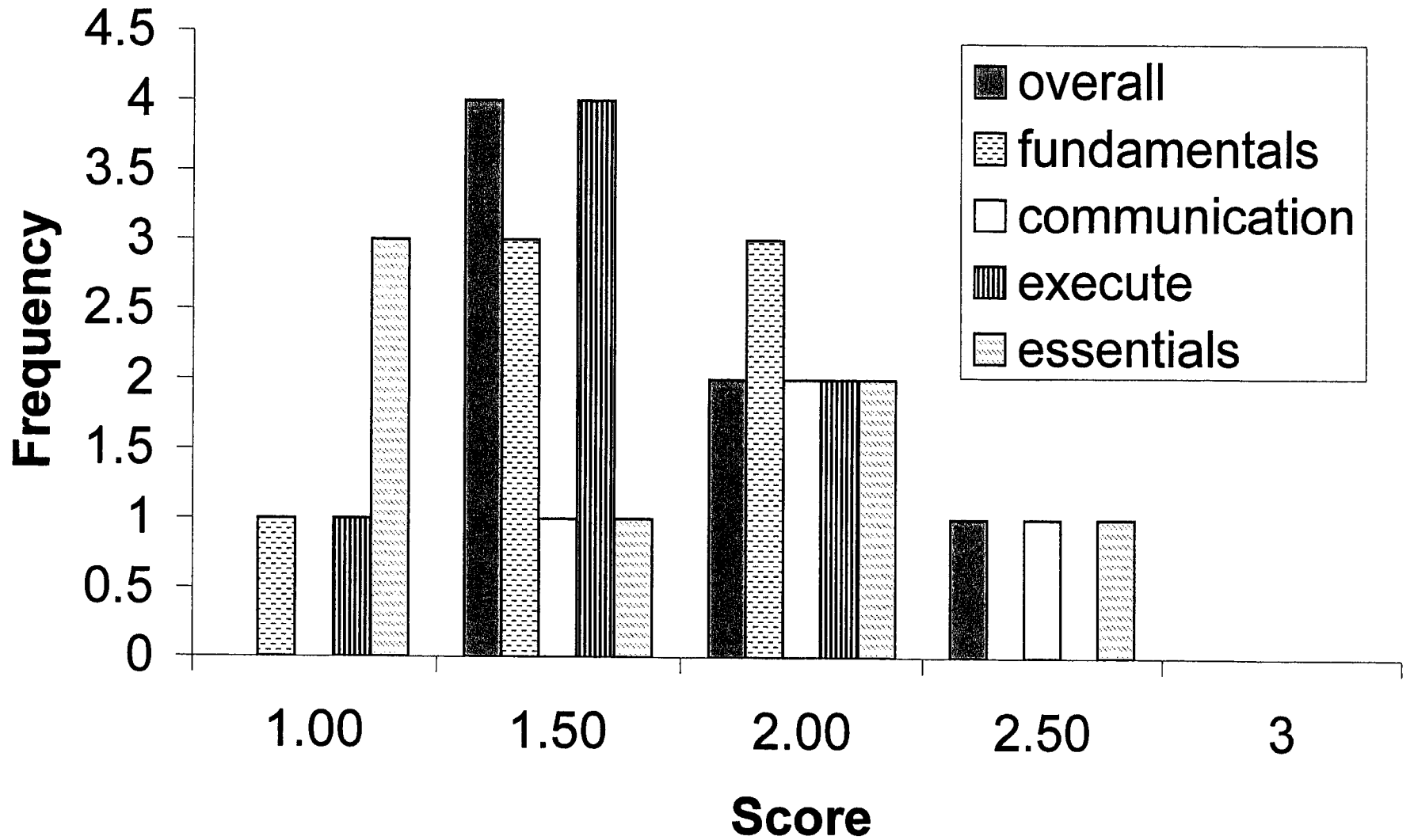
key: 1=excellent, 2=satisfactory, 3=unsatisfactory

Candidacy Exam Histogram

n=17; 11 approval, 6 retry



PhD Defense Scores



Poster Evaluation

Assessment of Student Academic Achievement Objectives/BGES Graduate Program

This evaluation is to be completed by each member person selected to evaluate Poster presentations. Return form to the department secretary. Please check the appropriate box in each row, leaving blank anything that does not apply. Evaluation is with respect to discipline norms.

Student's Name: _____ *Student's Program:* _____ *Number of years in program:* _____

Person completing evaluation: _____ *Date:* _____

Objectives/Criteria for Evaluation	Level of Achievement		
The objectives are to develop in the student:	Excellent	Satisfactory	Unsatisfactory
1. Essential knowledge and critical perspective pertaining to the major substantive area of biology that the student has selected			
a. Depth of knowledge	<input type="checkbox"/> Student shows excellent understanding of fundamental principles in the area; good working knowledge of literature: readily cites many relevant articles.	<input type="checkbox"/> Student displays good understanding of fundamentals; generally familiar with key literature.	<input type="checkbox"/> Understanding of fundamental principles directly related to the area is weak; unfamiliar with important literature.
b. Breadth of knowledge	<input type="checkbox"/> Student shows good understanding of related subjects.	<input type="checkbox"/> Knowledge of related subjects is adequate.	<input type="checkbox"/> Knowledge of related subjects is weak.
c. Knowledge of standard methods	<input type="checkbox"/> Student shows excellent understanding of experimental methods, their uses and limitations.	<input type="checkbox"/> Knowledge of methods is adequate: familiar with standard methods and their application.	<input type="checkbox"/> Knowledge of methods is weak, liable to lead to inappropriate usage and interpretations.
d. Critical perspective on literature	<input type="checkbox"/> Excellent understanding; Can critique articles and explain their place in the field as a whole	<input type="checkbox"/> Can cite key findings and some weaknesses of individual articles; can explain some relationships.	<input type="checkbox"/> Unable to critique literature and relate one finding to another.
2. Ability to execute original research of publishable quality			
a. Adequacy of the scope of the research	<input type="checkbox"/> Work has examined several facets of the problem	<input type="checkbox"/> Amount of work is adequate, perhaps limited to one aspect.	<input type="checkbox"/> Amount of work done is inadequate.
b. Adequacy of the depth of the research	<input type="checkbox"/> Work has probed deeply the chosen problem; logically compelling	<input type="checkbox"/> Work answers some basic questions of the problem.	<input type="checkbox"/> Work only touched the surface of the problem.
c. Logic of the research plan	<input type="checkbox"/> Proceeds in an orderly logical fashion, considering all alternatives and controls.	<input type="checkbox"/> Addresses major alternatives and controls.	<input type="checkbox"/> Does not address major alternative explanations

3. Effective communication in written and oral form.			
a. Quality of the writing style	<input type="checkbox"/> Written sentences are complete and grammatical, stylistically pleasing. Words are chosen for their precise meaning.	<input type="checkbox"/> Writing is grammatically correct. Paragraphs and sentences may not flow together perfectly.	<input type="checkbox"/> Writing contains many grammatical errors.
b. Organization of the presentation	<input type="checkbox"/> Presentation is clear, logical and organized. Viewer can follow line of reasoning.	<input type="checkbox"/> Viewer can follow and understand the presentation.	<input type="checkbox"/> Poster is poorly organized, jumps from topic to topic.
c. Clarity of language usage	<input type="checkbox"/> Comfortable delivery, easily audible and understandable by all.	<input type="checkbox"/> Generally understandable. May have some grammatical errors, incomplete sentences, or imprecise formulations.	<input type="checkbox"/> Pronunciation, grammatical errors, or delivery make speaker difficult to understand or hear.
d. Ability to answer questions	<input type="checkbox"/> Answered questions directly, clearly and to the point.	<input type="checkbox"/> Student can answer questions, but with some difficulty. May need some prompting.	<input type="checkbox"/> Difficulty understanding questions and/or unable to answer important questions, even with prompting.
e. Quality of visual presentation	<input type="checkbox"/> Graphics and visual aids enhance the presentation; prepared in a professional manner.	<input type="checkbox"/> Visual aids are adequate for the presentation.	<input type="checkbox"/> Visual aids are inadequate (writing too small, poorly labeled; too much or too little information).
4. EVS only: Familiarity with related areas of environmental science, including law, policy, and technology issues.			
a. Familiarity with law and policy issues related to the work	<input type="checkbox"/> Student shows excellent understanding and ability to discuss implications.	<input type="checkbox"/> Student displays some understanding and ability to discuss implications.	<input type="checkbox"/> Student is unfamiliar with related areas; unable to speak to related aspects
b. Familiarity with technology issues related to the work	<input type="checkbox"/> Student shows excellent understanding and ability to discuss implications.	<input type="checkbox"/> Student displays some understanding and ability to discuss implications.	<input type="checkbox"/> Student is unfamiliar with related areas; unable to speak to related aspects

Have any papers resulting from the work been accepted for publication in peer-reviewed journals? ____ Yes ____ No
 If yes, how many? _____

Masters in Biology/Environmental Science
Assessment of Student Academic Achievement Objectives/BGES Graduate Program

This evaluation is to be completed by each member of the student's Advisory Committee, upon completion of the defense. Return form to the department secretary. Please check the appropriate box in each row, leaving blank anything that does not apply. Evaluation is with respect to discipline norms for the Masters level.

Student's Name: _____ *Occasion (Defense) Date:* _____ *Person completing evaluation:* _____

Objectives/Criteria for Evaluation	Level of Achievement		
	Excellent	Satisfactory	Unsatisfactory
The objectives are to develop in the student:			
1. Essential knowledge and critical perspective pertaining to the major substantive area of biology that the student has selected			
a. Depth of knowledge	<input type="checkbox"/> Student shows excellent understanding of fundamental principles in the area; good working knowledge of literature: readily cites many relevant articles.	<input type="checkbox"/> Student displays good understanding of fundamentals; generally familiar with key literature.	<input type="checkbox"/> Understanding of fundamental principles directly related to the area is weak; unfamiliar with important literature.
b. Breadth of knowledge	<input type="checkbox"/> Student shows good understanding of related subjects.	<input type="checkbox"/> Knowledge of related subjects is adequate.	<input type="checkbox"/> Knowledge of related subjects is weak.
c. Knowledge of standard methods	<input type="checkbox"/> Student shows excellent understanding of experimental methods, their uses and limitations.	<input type="checkbox"/> Knowledge of methods is adequate: familiar with standard methods and their application.	<input type="checkbox"/> Knowledge of methods is weak, liable to lead to inappropriate usage and interpretations.
d. Critical perspective on literature	<input type="checkbox"/> Excellent understanding; Can critique articles and explain their place in the field as a whole	<input type="checkbox"/> Can cite key findings and some weaknesses of individual articles; can explain some relationships.	<input type="checkbox"/> Unable to critique literature and relate one finding to another.
2. Ability to execute original research of publishable quality			
a. Adequacy of the scope of the research	<input type="checkbox"/> Work has examined several facets of the problem	<input type="checkbox"/> Amount of work is adequate, perhaps limited to one aspect.	<input type="checkbox"/> Amount of work done is inadequate.
b. Adequacy of the depth of the research	<input type="checkbox"/> Work has probed deeply the chosen problem; logically compelling	<input type="checkbox"/> Work answers some basic questions of the problem.	<input type="checkbox"/> Work only touched the surface of the problem.
c. Logic of the research plan	<input type="checkbox"/> Proceeds in an orderly logical fashion, considering all alternatives and controls.	<input type="checkbox"/> Addresses major alternatives and controls.	<input type="checkbox"/> Does not address major alternative explanations
d. Novelty of the research	<input type="checkbox"/> Research is an innovative idea from the student; student shows creativity in designing experiments and solving problems.	<input type="checkbox"/> Student contributed originality to designing experiments and solving problems.	<input type="checkbox"/> The student followed directions from his/her advisor.

e. Skill in execution (Defense only)	<input type="checkbox"/> Routine and difficult techniques carried out well with skill.	<input type="checkbox"/> Routine techniques applied well, providing clear results.	<input type="checkbox"/> Shoddy experimental technique; data unconvincing.
f. Impact on advancement of the field (Defense only)	<input type="checkbox"/> Work has strong impact on the field.	<input type="checkbox"/> Work has incremental impact on field.	<input type="checkbox"/> Work has no impact on the field.
3. Effective communication in written and oral form.			
a. Quality of the writing style	<input type="checkbox"/> Written sentences are complete and grammatical, stylistically pleasing. Words are chosen for their precise meaning.	<input type="checkbox"/> Writing is grammatically correct. Paragraphs and sentences may not flow together perfectly.	<input type="checkbox"/> Writing contains many grammatical errors.
b. Organization of the written thesis	<input type="checkbox"/> Dissertation is logically organized and easy to follow.	<input type="checkbox"/> Dissertation organization is clear.	<input type="checkbox"/> Dissertation is poorly organized.
c. Organization of the presentation	<input type="checkbox"/> Presentation is clear, logical and organized. Listener can follow line of reasoning. Pacing is correct for the audience.	<input type="checkbox"/> Listener can follow and understand the presentation.	<input type="checkbox"/> Talk is poorly organized. Speaker jumps from topic to topic.
d. Clarity of language usage	<input type="checkbox"/> Comfortable delivery, easily audible and understandable by all.	<input type="checkbox"/> Generally understandable. May have some grammatical errors, incomplete sentences, or imprecise formulations.	<input type="checkbox"/> Pronunciation, grammatical errors, or delivery make speaker difficult to understand or hear.
e. Ability to answer questions	<input type="checkbox"/> Answered questions directly, clearly and to the point.	<input type="checkbox"/> Student can answer questions, but with some difficulty. May need some prompting.	<input type="checkbox"/> Difficulty understanding questions and/or unable to answer important questions, even with prompting.
f. Quality of visual presentation	<input type="checkbox"/> Visual aids enhance the presentation and are prepared in a professional manner.	<input type="checkbox"/> Visual aids are adequate for the presentation.	<input type="checkbox"/> Visual aids are inadequate (writing too small, too much or too little information per slide).
4. Complete this section for MASTERS – ENVIRONMENTAL SCIENCE Degree Program ONLY: Familiarity with related areas of environmental science, including law, policy, and technology issues.			
a. Familiarity with law and policy issues related to the work	<input type="checkbox"/> Student shows excellent understanding and ability to discuss implications.	<input type="checkbox"/> Student displays some understanding and ability to discuss implications.	<input type="checkbox"/> Student is unfamiliar with related areas; unable to speak to related aspects
b. Familiarity with technology issues related to the work	<input type="checkbox"/> Student shows excellent understanding and ability to discuss implications.	<input type="checkbox"/> Student displays some understanding and ability to discuss implications.	<input type="checkbox"/> Student is unfamiliar with related areas; unable to speak to related aspects

To be answered by the research advisor only:

Have any papers resulting from the dissertation work been accepted for publication in peer-reviewed journals? ____ Yes ____ No

If yes, how many? _____ (Please submit or have student submit a complete list.)

Doctor of Regulatory Biology

Assessment of Student Academic Achievement Objectives/BGES Graduate Program

This evaluation is to be completed by each member of the student's doctoral dissertation committee, upon completion of the exam or defense. Return form to the department secretary. Please check the appropriate box in each row, leaving blank anything that does not apply. Evaluation is with respect to discipline norms for the doctoral level.

Student's Name: _____

Occasion (Circle one: Exam/ Defense)

Date: _____

Outcome (circle one: Pass/Retry/Fail)

Person completing evaluation: _____

Objectives/Criteria for Evaluation	Level of Achievement		
	Excellent	Satisfactory	Unsatisfactory
The objectives are to develop in the student:			
1. Essential knowledge and critical perspective pertaining to the major substantive area of biology that the student has selected			
a. Depth of knowledge	<input type="checkbox"/> Student shows excellent understanding of fundamental principles in the area; good working knowledge of literature: readily cites many relevant articles.	<input type="checkbox"/> Student displays good understanding of fundamentals; generally familiar with key literature.	<input type="checkbox"/> Understanding of fundamental principles directly related to the area is weak; unfamiliar with important literature.
b. Breadth of knowledge	<input type="checkbox"/> Student shows good understanding of related subjects.	<input type="checkbox"/> Knowledge of related subjects is adequate.	<input type="checkbox"/> Knowledge of related subjects is weak.
c. Knowledge of methods, both standard and advanced	<input type="checkbox"/> Student shows excellent understanding of experimental methods, their uses and limitations.	<input type="checkbox"/> Knowledge of methods is adequate: familiar with standard methods and their application.	<input type="checkbox"/> Knowledge of methods is weak, liable to lead to inappropriate usage and interpretations.
d. Critical perspective on literature	<input type="checkbox"/> Excellent understanding; Can critique articles and explain their place in the field as a whole	<input type="checkbox"/> Can cite key findings and some weaknesses of individual articles; can explain some relationships.	<input type="checkbox"/> Unable to critique literature and relate one finding to another.
2. Ability to initiate, plan and execute original research of publishable quality			
a. Adequacy of the scope of the research	<input type="checkbox"/> Work has examined many facets of the problem	<input type="checkbox"/> Amount of work is adequate, perhaps neglecting some aspects.	<input type="checkbox"/> Amount of work done is inadequate.
b. Adequacy of the depth of the research	<input type="checkbox"/> Work has probed deeply the chosen problem; logically compelling	<input type="checkbox"/> Work answers the basic questions of the problem.	<input type="checkbox"/> Work only touched the surface of the problem.
c. Logic of the research plan	<input type="checkbox"/> Proceeds in an orderly logical fashion, considering all alternatives and controls.	<input type="checkbox"/> Addresses major alternatives and controls.	<input type="checkbox"/> Does not address major alternative explanations

d. Novelty of the research	<input type="checkbox"/> Research is an innovative idea from the student; student shows creativity in designing experiments and solving problems.	<input type="checkbox"/> Student contributed originality to designing experiments and solving problems.	<input type="checkbox"/> The student followed directions from his/her advisor.
e. Skill in execution (Defense only)	<input type="checkbox"/> Routine and difficult techniques carried out well with skill.	<input type="checkbox"/> Routine techniques applied well, providing clear results.	<input type="checkbox"/> Shoddy experimental technique; data unconvincing.
f. Impact on advancement of the field (Defense only)	<input type="checkbox"/> Work has strong impact on the field.	<input type="checkbox"/> Work has incremental impact on field.	<input type="checkbox"/> Work has no impact on the field.
3. Effective communication in written and oral form.			
a. Quality of the writing style	<input type="checkbox"/> Written sentences are complete and grammatical, stylistically pleasing. Words are chosen for their precise meaning.	<input type="checkbox"/> Writing is grammatically correct. Paragraphs and sentences may not flow together perfectly.	<input type="checkbox"/> Writing contains many grammatical errors.
b. Organization of the written dissertation	<input type="checkbox"/> Dissertation is logically organized and easy to follow.	<input type="checkbox"/> Dissertation organization is clear.	<input type="checkbox"/> Dissertation is poorly organized.
c. Organization of the presentation	<input type="checkbox"/> Presentation is clear, logical and organized. Listener can follow line of reasoning. Pacing is correct for the audience.	<input type="checkbox"/> Listener can follow and understand the presentation.	<input type="checkbox"/> Talk is poorly organized. Speaker jumps from topic to topic.
d. Clarity of language usage	<input type="checkbox"/> Comfortable delivery, easily audible and understandable by all.	<input type="checkbox"/> Generally understandable. May have some grammatical errors, incomplete sentences, or imprecise formulations.	<input type="checkbox"/> Pronunciation, grammatical errors, or delivery make speaker difficult to understand or hear.
e. Ability to answer questions	<input type="checkbox"/> Answered questions directly, clearly and to the point.	<input type="checkbox"/> Student can answer questions, but with some difficulty. May need some prompting.	<input type="checkbox"/> Difficulty understanding questions and/or unable to answer important questions, even with prompting.
f. Quality of visual presentation	<input type="checkbox"/> Visual aids enhance the presentation and are prepared in a professional manner.	<input type="checkbox"/> Visual aids are adequate for the presentation.	<input type="checkbox"/> Visual aids are inadequate (writing too small, too much or too little information per slide).
4. Familiarity with fundamental biological principles and issues outside the student's chosen field that is appropriate to the doctoral level or a beginning assistant professor, e.g., evolution, systematics, ecology, physiology, genetics, biochemistry, statistics, etc.			
a. Depth of knowledge	<input type="checkbox"/> Student shows excellent understanding of fundamental principles.	<input type="checkbox"/> Student displays good understanding of fundamentals.	<input type="checkbox"/> Student is unfamiliar with fundamental principles.

To be answered by the research advisor only:

Have any papers resulting from the dissertation work been accepted for publication in peer-reviewed journals? ____ Yes ____ No
 If yes, how many? _____ (Please submit or have student submit a complete list.)

Survey of Graduate Student Knowledge of Essential Methods and Techniques

Assessment of Student Academic Achievement/BGES Graduate Program

This evaluation is to be completed by each BGES graduate student once at entering and once upon completing the program. This survey is for our program assessment only; your answers will be used solely for statistical purposes and will not be seen by your Major Advisor, Committee or course instructors.

For each row, please check the appropriate boxes for **both theoretical and practical knowledge**; leaving blank anything that does not apply. Return this form to the departmental secretary.

Your Name: _____

Occasion (Program Entry/Completion): _____

Date: _____

Your Current Program: _____

Primary Area of Interest (e.g., cell, molecular, ecology, etc.): _____

Area / Specific Techniques	Theoretical Knowledge			Practical Experience		
<i>Level Descriptions</i>	Excellent <i>Know uses and limitations, how to interpret results, discussed at length, e.g., in seminars or workshops</i>	Moderate <i>Know basic use, encountered in courses or reading</i>	Cursory/None <i>Unknown or have seen the name</i>	Excellent <i>Used routinely in research</i>	Moderate <i>Used a few times in lab courses</i>	Cursory/None <i>Unknown or never actually used</i>
Techniques						
1. Molecular/Cellular Biology <i>Area's importance to you</i> <input type="checkbox"/> major <input type="checkbox"/> minor <input type="checkbox"/> none						
a. Plasmid DNA purification and manipulation	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. RNA purification	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. Polymerase chain reaction (PCR)	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
d. DNA ligation and bacterial transformation	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
e. Northern and Southern Blotting	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
f. Western Blotting	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
g. Cell culture	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
h. Recombinant protein expression in bacteria/yeast	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
i. Mammalian cell transfection	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
j. Basics of general enzyme assay	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory

k. Agarose and polyacrylamide gel electrophoresis	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
l. Immunostain	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
m. Pull downs/IP's	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
2. Statistics/Modeling <i>Area's importance to you</i> <input type="checkbox"/> major <input type="checkbox"/> minor <input type="checkbox"/> none						
a. Means, variance, STD, confidence intervals	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. T-tests and other two sample tests	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. ANOVA and multiple two-sample comparisons	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
d. Linear regression	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
e. Chi square	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
f. Non-parametric tests: e.g., Mann-Whitney U, Wilcoxon	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
g. Experimental Design	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
h. Null hypothesis, α and β (or Type 1 and 2) errors	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
3. Ecology/Environmental Science <i>Area's importance to you</i> <input type="checkbox"/> major <input type="checkbox"/> minor <input type="checkbox"/> none						
a. GPS systems	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. Population census techniques, e.g., marking/recapture	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. Transect design, density estimates	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
d. Water chemistry analysis	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
e. Defining biological indicator species	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
f. Mathematical modeling	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
4. Evolution/systematics <i>Area's importance to you</i> <input type="checkbox"/> major <input type="checkbox"/> minor <input type="checkbox"/> none						
a. DNA and protein sequence analysis	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. Genetic analysis of populations	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. Genetic markers–allozymes	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
d. Genetic markers–RFLPs	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
e. Genetic markers–RAPDs	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory

f. Genetic markers–microsatellites	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
g. Fundamentals of nomenclature–botany or zoology	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
h. Cladistics/tree construction	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
5. Animal behavior/Physiology <i>Area's importance to you</i> <input type="checkbox"/> major <input type="checkbox"/> minor <input type="checkbox"/> none						
a. Extracellular recording (e.g., EMG, neurons, EEG)	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. Intracellular recording	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. Psychophysical measurement	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
d. Metabolic rate, e.g., O2 consumption	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
e. Models of decision making–Foraging theory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
f. Models of decision making–ESS (evolutionarily stable strategy)	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
g. Kin selection–coefficients of relatedness	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
h. Neural network modeling	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
i. Signal analysis--Frequency domain (FFT)	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
6. Literature research & presentations						
a. Secondary databases (BIOMED, MEDLINE, etc.)	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. Science Citation Index	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. PowerPoint or equivalent	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. Poster presentation (e.g., for scientific meetings)	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
7. Grant writing (Doctoral students)						
a. Identifying funding sources	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. Writing and criticizing grant applications	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
8. General laboratory techniques						
a. Radiation Safety	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
b. Chemical Safety	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory
c. Light microscopy	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory	<input type="checkbox"/> Excellent	<input type="checkbox"/> Moderate	<input type="checkbox"/> Cursory

Non-Thesis Masters in Biology

Assessment of Student Academic Achievement Objectives/BGES Graduate Program

This evaluation is to be completed by each member of the student's Advisory Committee, upon completion of the exam or defense. Return form to the department secretary. Please check the appropriate box in each row, leaving blank anything that does not apply. Evaluation is with respect to discipline norms for the Masters level.

Student's Name: _____

Occasion (Exam)

Date: _____

Outcome (circle one: Pass/Retry/Fail)

Person completing evaluation: _____

Objectives/Criteria for Evaluation	Level of Achievement		
	Excellent	Satisfactory	Unsatisfactory
The objectives are to develop in the student:			
1. Essential knowledge and critical perspective pertaining to the major substantive area of biology that the student has selected			
a. Depth of knowledge	<input type="checkbox"/> Student shows excellent understanding of fundamental principles in the area; good working knowledge of literature: readily cites many relevant articles.	<input type="checkbox"/> Student displays good understanding of fundamentals; generally familiar with key literature.	<input type="checkbox"/> Understanding of fundamental principles directly related to the area is weak; unfamiliar with important literature.
b. Breadth of knowledge	<input type="checkbox"/> Student shows good understanding of related subjects.	<input type="checkbox"/> Knowledge of related subjects is adequate.	<input type="checkbox"/> Knowledge of related subjects is weak.
c. Knowledge of standard methods	<input type="checkbox"/> Student shows excellent understanding of experimental methods, their uses and limitations.	<input type="checkbox"/> Knowledge of methods is adequate: familiar with standard methods and their application.	<input type="checkbox"/> Knowledge of methods is weak, liable to lead to inappropriate usage and interpretations.
d. Critical perspective on literature	<input type="checkbox"/> Excellent understanding; Can critique articles and explain their place in the field as a whole	<input type="checkbox"/> Can cite key findings and some weaknesses of individual articles; can explain some relationships.	<input type="checkbox"/> Unable to critique literature and relate one finding to another.
2. Ability to critically read and evaluate the original scientific literature, as evidenced by the library research paper			
a. Adequacy of the scope of the literature research paper	<input type="checkbox"/> Work has examined several facets of the problem	<input type="checkbox"/> Amount of work is adequate, perhaps limited to one aspect.	<input type="checkbox"/> Amount of work done is inadequate.
b. Adequacy of the depth of the literature research paper	<input type="checkbox"/> Work has probed deeply the chosen problem; logically compelling; raises novel questions.	<input type="checkbox"/> Work addressed some basic questions of the problem.	<input type="checkbox"/> Work only touched the surface of the problem.

c. Critical perspective on literature	<input type="checkbox"/> Excellent understanding; Can critique articles and explain their place in the field as a whole	<input type="checkbox"/> Can cite key findings and some weaknesses of individual articles; can explain some relationships.	<input type="checkbox"/> Unable to critique literature and relate one finding to another.
d. Novelty of the treatment	<input type="checkbox"/> Student independently raises novel questions and relationships.	<input type="checkbox"/> Student contributed some original material and interpretations.	<input type="checkbox"/> The student essentially followed directions from his/her advisor.
3. Effective communication in written and oral form.			
a. Quality of the writing style	<input type="checkbox"/> Written sentences are complete and grammatical, stylistically pleasing. Words are chosen for their precise meaning.	<input type="checkbox"/> Writing is grammatically correct. Paragraphs and sentences may not flow together perfectly.	<input type="checkbox"/> Writing contains many grammatical errors.
b. Organization of the research paper	<input type="checkbox"/> Paper is logically organized and easy to follow.	<input type="checkbox"/> Paper organization is clear.	<input type="checkbox"/> Paper is poorly organized.
c. Organization of the presentation	<input type="checkbox"/> Presentation is clear, logical and organized. Listener can follow line of reasoning. Pacing is correct for the audience.	<input type="checkbox"/> Listener can follow and understand the presentation.	<input type="checkbox"/> Talk is poorly organized. Speaker jumps from topic to topic.
d. Clarity of language usage	<input type="checkbox"/> Comfortable delivery, easily audible and understandable by all.	<input type="checkbox"/> Generally understandable. May have some grammatical errors, incomplete sentences, or imprecise formulations.	<input type="checkbox"/> Pronunciation, grammatical errors, or delivery make speaker difficult to understand or hear.
e. Ability to answer questions	<input type="checkbox"/> Answered questions directly, clearly and to the point.	<input type="checkbox"/> Student can answer questions, but with some difficulty. May need some prompting.	<input type="checkbox"/> Difficulty understanding questions and/or unable to answer important questions, even with prompting.
f. Quality of visual presentation	<input type="checkbox"/> Visual aids enhance the presentation and are prepared in a professional manner.	<input type="checkbox"/> Visual aids are adequate for the presentation.	<input type="checkbox"/> Visual aids are inadequate (writing too small, too much or too little information per slide).