

**Biology Department Assessment of Program Learning Outcomes  
MA and MS in General biology  
2014-2015**

**Learning Outcome:**

PLO #3: Demonstrate knowledge and skills in critical thinking, such as analysis and synthesis, as applied to primary literature in the field of biology, as well as in science education.

**Outcome Measures:**

BIO 682 Pilot Study

MA exam questions on analysis of three research papers

MS written version of thesis

**Criteria for Success:**

100% of students will score at “developed” or higher on rubric

**Longitudinal Data:**

Measure	% of students achieving “developed” or “highly developed”		
	2012-2013	2013-2014	2014-2015
Written Pilot Study (BIO 692)	?	Course not offered	100% (n=12)
MA exam questions	100% (n=5)	100% (n=3)	100% (n=3)
MS thesis (written)	100% (n=2)	100% (n=1)	100% (n=3)

**Conclusions Drawn from Data:**

All graduating students, both MA and MS, are performing very well and meeting the criterion.

**Changes to be Made Based on Data:**

No changes to program. The intentional structure of the program to provide practice in building these skills coupled with close mentoring by faculty members during the thesis process results in these outcomes.

**Rubric used:**

Appendix A: Rubric for written pilot study - shaded row

Appendix B: Rubric for MA exam, Part I: Research article analysis – shaded rows

Appendix C: Rubric for MS thesis (written) – shaded row

**APPENDIX A: Rubric for written pilot study (shaded rows pertain to PLO #2)**

<b>Component</b>	<b>Initial (70%)</b>	<b>Emerging (80%)</b>	<b>Developed (90%)</b>	<b>Highly Developed (100%)</b>
<b>Problem and purpose of the study</b> ____/50 pts.	<ul style="list-style-type: none"> <li>• Fails to identify or summarize problem accurately</li> <li>• No indication of purpose of the research</li> <li>• No mention of connection to thesis*</li> </ul>	<ul style="list-style-type: none"> <li>• Summarizes the problem, though some aspects are incorrect or confusing</li> <li>• Some indication of purpose of the research</li> <li>• Unclear connection to thesis*</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly identifies the problem</li> <li>• Clearly articulates the purpose of the research</li> <li>• Briefly explains connection to thesis*</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly identifies the problem as well as nuanced aspects or key details</li> <li>• Clearly identifies the purpose of the research, beyond the narrow field</li> <li>• Clearly explains connection to thesis*</li> </ul>
<b>Review of current, Tier I, and relevant literature</b> ____/100 pts.	<ul style="list-style-type: none"> <li>• No theoretical perspective/framework</li> <li>• No synthesis, but rather listing of info from references</li> <li>• 5 or fewer references</li> <li>• Poor choice of literature</li> <li>• Research question for pilot study is unreasonable and unimportant</li> <li>• No mention of connection to thesis*</li> </ul>	<ul style="list-style-type: none"> <li>• Brief theoretical perspective/framework</li> <li>• Minimal synthesis of references</li> <li>• Use of 6 references</li> <li>• Inadequate choice of literature</li> <li>• Research question for pilot study is unreasonable or unimportant</li> <li>• Little mention of thesis*</li> </ul>	<ul style="list-style-type: none"> <li>• Clear theoretical perspective/framework</li> <li>• Adequate synthesis of references</li> <li>• Use of 7-8 references</li> <li>• Adequate choice of literature</li> <li>• Research question for pilot study is reasonable</li> <li>• Mentions connection to thesis*</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent and thorough theoretical perspective/framework</li> <li>• Excellent synthesis of references and integration into research question</li> <li>• Use of 9 or more references</li> <li>• Excellent choice of literature</li> <li>• Research question reasonable/important</li> <li>• Clearly explains connection to thesis*</li> </ul>
<b>Methods (data coll/anal)</b> ____/100pts.	<ul style="list-style-type: none"> <li>• No explanation or justification of research design</li> <li>• Methodology is unclear/ incomplete</li> <li>• Analysis missing</li> <li>• Past tense not used</li> </ul>	<ul style="list-style-type: none"> <li>• Some explanation of research design, but no justification</li> <li>• Method. is basic/missing major info</li> <li>• Simplistic/minimal analysis</li> <li>• Mix of past/future tense used</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly explains research design, but no justification</li> <li>• Method. missing some details</li> <li>• Adequate analysis</li> <li>• Generally uses past tense</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly justifies and explains research design</li> <li>• Clearly explains all methodology</li> <li>• Extensive/sophisticated analysis</li> <li>• Consistently uses past tense</li> </ul>
<b>Results</b> ____/100 pts.	<ul style="list-style-type: none"> <li>• Graphs and tables are poorly/inaccurately done</li> <li>• One or more pieces of data inaccurately interpreted in text</li> <li>• Many opinion statements</li> </ul>	<ul style="list-style-type: none"> <li>• Graphs/tables are inaccurate/missing labels with some errors</li> <li>• Minimal summary of tables and graphs in text</li> <li>• Obvious opinion statements</li> </ul>	<ul style="list-style-type: none"> <li>• Graphs and tables are adequate</li> <li>• Accurately summarizes the tables and graphs in text</li> <li>• Some opinion statements</li> </ul>	<ul style="list-style-type: none"> <li>• Graphs and tables are professional</li> <li>• Accurately and completely summarizes the tables and graphs in text</li> <li>• No opinion statements</li> </ul>
<b>Conclusion(s)</b> ____/50 pts.	<ul style="list-style-type: none"> <li>• Fails to identify conclusions, or conclusion is a simplistic summary</li> <li>• Conclusion presented as "proof"</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies conclusions and refers to some evidence but not the question</li> <li>• No mention of implications or research</li> <li>• No relation to broader field</li> </ul>	<ul style="list-style-type: none"> <li>• Some link between question, evidence and conclusion</li> <li>• Presents implications OR future research</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly links question, evidence and conclusion</li> <li>• Presents implications &amp; future research</li> <li>• Mentions broader field</li> </ul>
<b>References</b> ____/50 pts.	<ul style="list-style-type: none"> <li>• Poor formatting</li> <li>• Used 5 or fewer references</li> </ul>	<ul style="list-style-type: none"> <li>• APA format with 4 or more errors</li> <li>• Used 6-7 references</li> </ul>	<ul style="list-style-type: none"> <li>• APA format with 3 or fewer errors</li> <li>• Use of 8 references</li> </ul>	<ul style="list-style-type: none"> <li>• APA format with no errors</li> <li>• Use of 9 or more references</li> </ul>
<b>Writing quality &amp; APA format</b> ____/50 pts.	<ul style="list-style-type: none"> <li>• Simplistic and/or unclear writing</li> <li>• Many errors (typo, grammar)</li> <li>• No effort to follow APA format</li> </ul>	<ul style="list-style-type: none"> <li>• Unclear writing</li> <li>• Some errors (typo, grammar)</li> <li>• APA format but with many errors</li> </ul>	<ul style="list-style-type: none"> <li>• Clear writing</li> <li>• Few errors (typo, grammar)</li> <li>• APA format with some errors</li> </ul>	<ul style="list-style-type: none"> <li>• Clear and sophisticated writing using advanced vocabulary</li> <li>• No errors</li> <li>• APA format throughout</li> </ul>

\*If appropriate

**Appendix B: Rubric for MA exam, Part I: Research article analysis (shaded row pertains to PLO #2)**

<b>Paper</b>	<b>Aspect of answer</b>	<b>Initial (fail)</b>	<b>Emerging (fail)</b>	<b>Developed (pass)</b>	<b>Highly Developed (pass)</b>
#1	<b>Problem/question</b>	Missing	Unclear	Clear, but not accurate	Clear and accurate
#1	<b>2 major claims</b>	Identified claims that are inaccurate or not important	At least one identified claim is inaccurate	Accurately identified claims, but missed at least one main claim	Accurately identified the most important claims
#1	<b>Evidence</b>	Specific data is not identified or does not match the claim	Relevant tables, figures, etc. are mentioned but no specific areas are identified	Specific areas of relevant figures, tables, etc. are correctly identified for some claims	Specific areas of relevant figures, tables, etc. are correctly identified for each claim
#1	<b>Justification</b>	Justification missing for at least one claim	Attempt made to justify claims, but inaccurate	Justification given for why data supports the claim, but not clear	Clear justification as to why the data supports each claim
#1	<b>Methods</b>	Methods missing	Missing some major methods	Major methods identified, but unclear	Major methods clearly identified
#1	<b>Topic to teach at CC level</b>	Topic not identified, and no relationship between topic and teaching	Topic is too high or low level for CC course and unclear relationship between topic and teaching	Topic is somewhat appropriate for CC course and some relationship between topic and teaching	Topic is appropriate for CC course and clear relationship between topic and teaching

**Appendix C:** Rubric for MS thesis (written) – shaded row pertains to PLO #2

<b>Component</b>	<b>Initial (70%)</b>	<b>Emerging (80%)</b>	<b>Developed (90%)</b>	<b>Highly Developed (100%)</b>
<b>Problem, question and/or hypothesis</b>	<ul style="list-style-type: none"> <li>• Fails to identify or summarize problem accurately</li> <li>• No indication of purpose of the research</li> </ul>	<ul style="list-style-type: none"> <li>• Summarizes the problem, though some aspects are incorrect or confusing</li> <li>• Some indication of purpose of the research</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly identifies the problem</li> <li>• Clearly articulates the purpose of the research</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly identifies the problem as well as nuanced aspects or key details</li> <li>• Clearly articulates the purpose of the research, beyond the narrow field</li> </ul>
<b>Choice of and use of relevant literature</b>	<ul style="list-style-type: none"> <li>• References not appropriately integrated into the paper</li> </ul>	<ul style="list-style-type: none"> <li>• Fewer than 35 references appropriately integrated into the paper</li> </ul>	<ul style="list-style-type: none"> <li>• 35-50 references appropriately integrated into the paper</li> </ul>	<ul style="list-style-type: none"> <li>• 50+ ref. appropriately integrated into paper</li> </ul>
<b>Knowledge of major biology theories</b>	<ul style="list-style-type: none"> <li>• Inadequate evidence of understanding of relevant biology concepts</li> </ul>	<ul style="list-style-type: none"> <li>• Basic evidence of understanding of relevant biology concepts</li> </ul>	<ul style="list-style-type: none"> <li>• Clear and adequate evidence of understanding of relevant biology concepts</li> </ul>	<ul style="list-style-type: none"> <li>• Clear and comprehensive evidence of understanding of relevant biology concepts</li> </ul>
<b>Methods (data collection/anal)</b>	<ul style="list-style-type: none"> <li>• No explanation or justification of research design</li> <li>• Methodology is unclear and incomplete</li> </ul>	<ul style="list-style-type: none"> <li>• Some explanation of research design, but no justification</li> <li>• Methodology is basic, but incomplete</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly explains research design, but no justification</li> <li>• Explains methodology</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly justifies and explains research design</li> <li>• Clearly explains methodology</li> </ul>
<b>Results</b>	<ul style="list-style-type: none"> <li>• Graphs and tables are poorly/inaccurately done</li> <li>• One or more pieces of data inaccurately interpreted in text with many opinion statements.</li> </ul>	<ul style="list-style-type: none"> <li>• Graphs and tables are inaccurate/missing labels with some errors</li> <li>• Usually accurately summarizes tables and graphs in text with obvious opinions</li> </ul>	<ul style="list-style-type: none"> <li>• Graphs and tables are adequate</li> <li>• Accurately summarizes the tables and graphs in text with some opinion</li> </ul>	<ul style="list-style-type: none"> <li>• Graphs and tables are professional</li> <li>• Accurately summarizes the tables and graphs in text w/o opinion</li> </ul>
<b>Conclusion(s)</b>	<ul style="list-style-type: none"> <li>• Fails to identify conclusions, or conclusion is a simplistic summary</li> <li>• Conclusion presented as "proof"</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies conclusions and refers to some specific pieces of evidence</li> <li>• Does not relate conclusion to the broader field</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly links evidence with the conclusion</li> <li>• Minimal consideration of limitations</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly links evidence with the conclusion</li> <li>• Considers limitations of the study</li> </ul>