Biology Department Assessment of Program Learning Outcomes
MS in General Biology
2015-2016

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:
MS exam questions on analysis of three research papers (direct measure)
MS written version of thesis (direct measure)

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	2015-2016
MS exam questions	100% (n=5)	100% (n=3)	100% (n=3)	100% (n=2)
MS thesis (written)	100% (n=2)	100% (n=1)	100% (n=3)	100% (n=2)

Conclusions Drawn from Data:
All graduating students, are performing very well and meeting the criterion. There is no data from the pilot study since the course is only offered every other year.

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 MS exam, Part I: Research article analysis – shaded rows
Appendix B: Rubric for MS thesis (written) – shaded row

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

Paper	Aspect of answer	Initial (fail)	Emerging (fail)	Developed (pass)	Highly Developed (pass)
#1	**Problem/ question**	Missing	Unclear	Clear, but not accurate	Clear and accurate
#1	**2 major claims**	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	**Evidence**	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	**Justification**	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	**Methods**	Methods missing	Missing some major methods	Major methods identified, but unclear	Major methods clearly identified
#1	**Topic to teach at CC level**	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 B: Rubric for MS thesis (written) – shaded row pertains to PLO #2

Component	Initial (70%)	Emerging (80%)	Developed (90%)	Highly Developed (100%)
Problem, question and/or hypothesis	• Fails to identify or summarize problem accurately • No indication of purpose of the research	• Summarizes the problem, though some aspects are incorrect or confusing • Some indication of purpose of the research	• Clearly identifies the problem • Clearly articulates the purpose of the research	• Clearly identifies the problem as well as nuanced aspects or key details • Clearly articulates the purpose of the research, beyond the narrow field
Choice of and use of relevant literature	• References not appropriately integrated into the paper	• Fewer than 35 references appropriately integrated into the paper	• 35-50 references appropriately integrated into the paper	• 50+ ref. appropriately integrated into paper
Knowledge of major biology theories	• Inadequate evidence of understanding of relevant biology concepts	• Basic evidence of understanding of relevant biology concepts	• Clear and adequate evidence of understanding of relevant biology concepts	• Clear and comprehensive evidence of understanding of relevant biology concepts
Methods (data collection/anal)	• No explanation or justification of research design • Methodology is unclear and incomplete	• Some explanation of research design, but no justification • Methodology is basic, but incomplete	• Clearly explains research design, but no justification • Explains methodology	• Clearly justifies and explains research design • Clearly explains methodology
Results	• Graphs and tables are poorly/inaccurately done • One or more pieces of data inaccurately interpreted in text with many opinion statements.	• Graphs and tables are inaccurate/missing labels with some errors • Usually accurately summarizes tables and graphs in text with obvious opinions	• Graphs and tables are adequate • Accurately summarizes the tables and graphs in text with some opinion	• Graphs and tables are professional • Accurately summarizes the tables and graphs in text w/o opinion
Conclusion(s)	• Fails to identify conclusions, or conclusion is a simplistic summary • Conclusion presented as “proof"	• Identifies conclusions and refers to some specific pieces of evidence • Does not relate conclusion to the broader field	• Clearly links evidence with the conclusion • Minimal consideration of limitations	• Clearly links evidence with the conclusion • Considers limitations of the study