

Integrating Quantitative Skills into Biology Courses

Kathleen Hoffman^{1,*}, Sarah Leupen², Hannah Pie³, Michelle Starz-Gaiano², Patricia

Turner³, Tory Williams⁴

¹*Department of Mathematics and Statistics, UMBC, Baltimore MD 21250*

²*Department of Biological Sciences, UMBC, Baltimore MD 21250*

³*Department of Science Engineering and Technology, Howard Community College, Columbia MD 21044*

⁴*College of Natural and Mathematical Sciences, UMBC, Baltimore MD 21250*

khoffman@umbc.edu

As a response to calls for changes in Biology education to include more quantitative reasoning skills, teams of instructors from University of Maryland, Baltimore County (UMBC), Howard Community College (HCC), Montgomery College (MC), and Community College of Baltimore County (CCBC) through the National Science Foundation Improving Undergraduate STEM Education (NSF IUSE) project designed novel group work modules for four core Biology courses that incorporate the application of mathematical skills in biological contexts. The modules focus on helping students improve quantitative competencies like demonstrating quantitative numeracy, interpreting data/graphs, demonstrating proficiency in statistical analyses, using mathematical models in biological systems, applying logic to problem solving, and using quantitative language to describe biological phenomena. Each module includes pre- and post-assessment questions to assess student learning gains in the quantitative competencies. Validity, reliability, and learning gains relative to the summative assessment will be presented across modules implemented in cell biology courses over several semesters and institutions, including over 600 students. A positive correlation between between post-assessment scores and final grade as well as gains on assessment and final course grade were found for transfer students, who were previously identified as a population whose post assessment scores and gains were significantly smaller than direct entry students.