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Undergraduate Molecular Biology: An Inquiry-based Curriculum and Learning Assessment

Poster Presentation

An inquiry-based molecular biology techniques curriculum was developed and implemented over a six year period, with formal learning assessment occurring during the last three years. The curriculum was developed to serve the needs of a traditional biology department at a primarily undergraduate institution. Within the department, undergraduate students play a critical role in faculty research programs. As a result there is a need for developing strong, fundamental molecular biology training. The development and implementation phases of this project were lengthy and involved curricular material development, space renovation, grant appropriation, technology/equipment purchases, and efforts to secure institutional resources to sustain the curriculum. The curriculum consists of an introductory segment that reviews basic laboratory techniques; a long-term subcloning inquiry-based project that introduces students to many basic molecular biology and bioinformatics concepts; and a final capstone mini-grant project. Learning was assessed over four semesters using pre-/ post-test content questions, student self-evaluations, focus groups, class observations and numerous writing assignments (e.g. one-minute papers, research notebooks, mini-grant proposal). Students indicated a high satisfaction level with this type of learning environment, as they felt empowered to learn and significantly increased confidence in their abilities by the end of the course. Analysis of student learning indicated substantial mastery of content and retention of the material throughout the semester and identified particular concepts that the students found challenging. Overall, the results indicated that inquiry-based learning was an effective method for enhancing student learning and application of molecular biology concepts.