Authentic Research Environments for Information Technology Skills Development

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Abstract: A model technology professional development program for high school biology teachers is presented. Based on a cognitive apprenticeship model, teachers conduct authentic marine biology research and analyze the data they develop using bioinformatics. The authors model lesson plans that teach both technology skills and biological content. Teachers draft lesson plans appropriate to their classrooms based on the research experience. Upon completion of the program teachers exhibit significant increases in content knowledge.

K-12 science teachers throughout the United States most commonly report facing two issues, lack of support for new teachers and little or no professional development for established teachers (Froschauer 2007). Professional development is especially important for high school biology teachers since keeping current with information technology skills and content knowledge are arguably the most daunting tasks of any K-12 discipline. Since professional development opportunities are limited in the United States, it is essential the core program design includes best practices and efficient learning. The authors designed and implemented a program based on the cognitive apprenticeship model that embeds technology learning in the social and physical context of authentic marine biology research (Brown et al., 1989). Marine Biotechnology and Bioinformatics for Teachers (MBBT) is a three-week summer institute followed by six Saturday workshops throughout the school year. The authors model appropriate pedagogy for the associated content and technology skills. The teacher participants generate DNA sequence data from locally collected mussels to identify an invading cryptic species. They then perform comparative analyses using bioinformatic databases and thereby track the progress of the invasion along the California coast (Bartl et al., 2006). Using their authentic research experience, the teachers develop standards-aligned lesson plans in related biology content areas. The last part of the institute allows teachers to pilot their lesson with students in a summer bridge program at California State University Monterey Bay. The authors have found that when teachers acquire technology skills in an authentic context their content knowledge is significantly enhanced. Additional data collection on technology skills enhancement and student career choice is ongoing.

Acknowledgements

The authors wish to thank Dr. Helen Cagampang for ongoing suggestions for program improvement. The authors were supported by National Science Foundation grant #0525224 (Marine Biotechnology and Bioinformatics).

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