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Utilizing the Software Package "R" to Integrate Graphical and Statistical Analysis in Undergraduate Laboratory Courses

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Broad student learning goals in undergraduate courses include graphical and statistical analysis of data. Students engaged in field and laboratory courses frequently generate large data sets that are graphically and statistically analyzed. The majority of graphical and statistical software packages are proprietary, which limits student access. Additionally, most software is "point and click", which is very functional, but results in a "black-box" perspective that limits conceptual understanding of the processes being explored. The open source software package "R" is a very versatile program that can generate publication quality graphics and perform various statistical analyses. By understanding how the software works, students gain a broader understanding of elements involved in graphing and underlying statistical procedures. The software "R" was incorporated into field based labs that were part of a marine ecology course and used by students to generate graphs, such as bar plots or X-Y-Z plots, and perform statistical analyses, such as a t-test or an ANOVA. Students were introduced to "R" and provided with step-by-step tutorials that guided them through the process of generating graphs and performing statistical analyses. "R Commander", which is a graphical user interface for "R" that displays underlying "R" programing, was initially used to help students learn appropriate commands and gain a broader understanding of graph construction and statistical analysis. Future work will integrate "R" into large introductory biology labs as a mechanism to increase competency in graphical and statistical analysis.

Keywords: Software Package R, graphics, statistics

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