The Freshman "Research" Experience

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Most freshman laboratory exercises are the "cookbook" types where the students are given explicit instructions, and then provided with the expected result. If and when this pre-assigned result does not occur, the students are often encouraged to identify their own error in the process. This is not how science is conducted "in real life." Actual research never has an expected answer. In fact, if the results of a well-designed experiment differ from the original hypotheses, it does not suggest experimental error, but rather a remarkable outcome. Budding scientists should be able to experience how scientific research is actually conducted. Yet, we fear allowing too much freedom at this early stage in their education, since these young scientists do not yet have the training to create and conduct their own projects. To this end, our biology department has incorporated three week modules in our introductory biology laboratory to introduce the research process. In the first two weeks the students learn some simple techniques on a topic in a manner similar to the classic biology laboratory exercises of the past. However, the final twist is that, in the last week, they design their own original "research" project that utilizes one or more of the techniques they learned. As an example of this methodology, I will discuss the module we created on the topic of plants, where students learn about, and then choose from, simple techniques involving photosynthesis, transpiration, and plant photosynthetic pigments.