

Does Students' Critical Thinking Improve in Microbiology?

Bara Sarraj

Department of Biology

Harold Washington College

This study was to assess the validity of the [scientific] data and interpret it correctly (Microbiology SLO 15). We looked at in-class analysis/interpretation of data presented in short videos, in-class analysis/interpretation of data via Jamboard, off-class analysis/interpretation of lab data, and off-class analysis/interpretation of scientific data in online exams. The goal was to examine if learning is taking place via the above tools and to help improve the modes of instruction that support critical thinking and problem solving.

To do so, we conducted daily activities of short multiple-choice and/or true-false quizzes on instantly introduced concepts. Some of these quizzes were based on videos that students watched in class. Other quizzes were related to data interpretation in and off class. Assessing students' critical thinking was also assessed through weekly quizzes on the material discussed in the previous week. In addition, biweekly exams were conducted off class covering two weeks' material before the exam. The scores of 37 students were averaged for every activity, quiz or exam then were normalized out of 100. Data of Jamboard answers were reflective of the activities and therefore will not be shown.

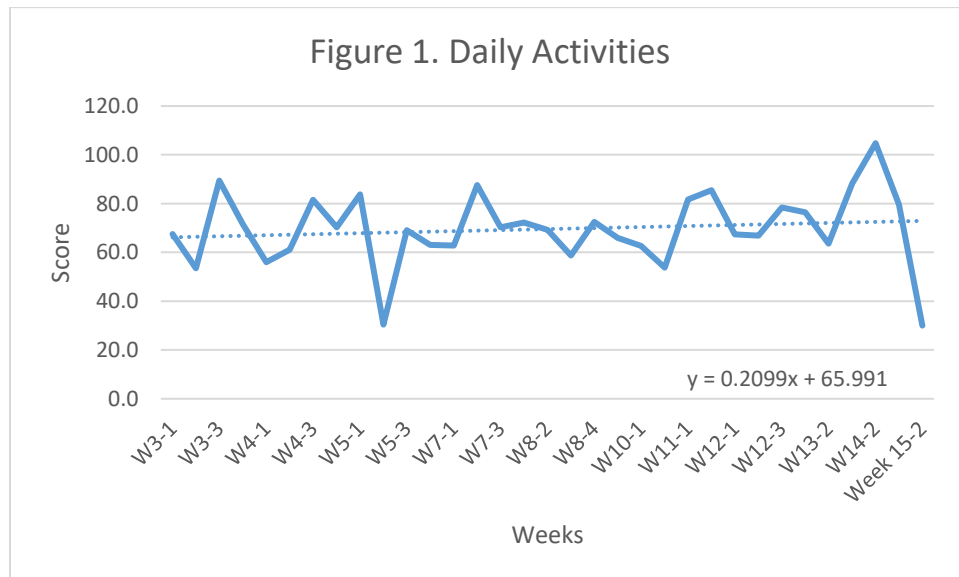
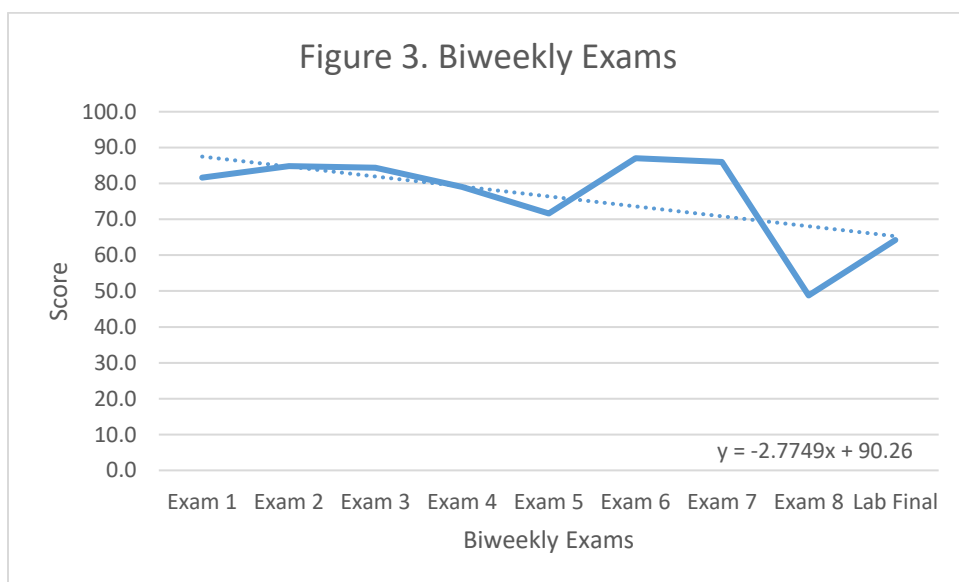
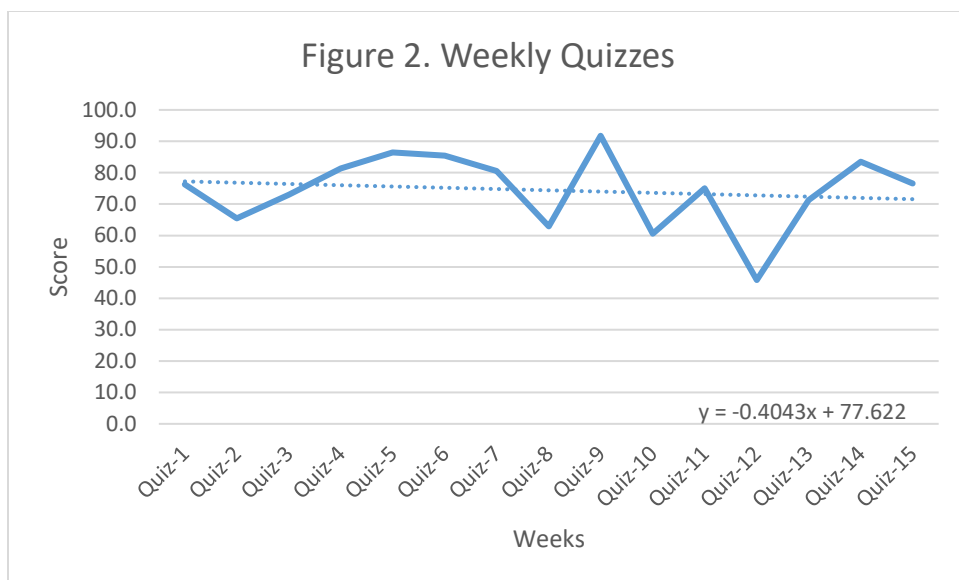


Figure 1 shows a slight improvement in the students' performance in daily activities that involved Bloom 3 and 4 applications and analyses, despite the apparent fluctuation.



Figures 2 and 3 showed a deteriorating performance in weekly quizzes and more so in biweekly exams. The questions of these exams and quizzes were only 20% of Bloom 3 or 4 levels. The data indicated that formative, not summative, assessment shows promise in improving students' performance in critical-thinking (Bloom 3 and above) activities. It is essential to accurately demarcate the Bloom levels of activities and questions to get reproducible results in future assessments. Despite the good sample size ($n = 37$) of this study, but it will be interesting to see if the results are consistent in a larger sample size and other courses as well.