The Implementation of Pre-Laboratory Handouts and Quizzes in an Animal Reproductive Physiology Laboratory Course: A Case Study

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ABSTRACT

Using a flipped classroom method has shown to increase student achievement, interest, and engagement, while allowing for classroom time to be used more efficiently [1]. This study examined the use of pre-laboratory handouts and quizzes on student learning in a laboratory-based course. Participants were undergraduates in an animal reproductive physiology course. All participants received the same pre-laboratory reading one week before the corresponding laboratory for a total of ten weeks. Student performance was evaluated using pre- and post-quizzes on the day of the laboratory as well as a laboratory practicum that reflected material from both handouts and laboratory exercises. Results were analyzed using Pearson's correlations. Students were surveyed at the end of the semester using 6 Likert scale questions [2] to determine their perception of the handouts and quizzes. Survey questions were evaluated as a contsruct and the reliability of questions was evaluated using Cronbach's alpha test. Results revealed a positive correlation between students' scores on pre- and post-quizzes ($r = 0.331$; $P = 0.002$), as well as pre-quizzes and laboratory practicums ($r = 0.524$; $P < 0.0001$). The survey questions were reliable (Alpha = 0.74). The handouts and quizzes were well perceived by the students with 85% recommending to keep them as part of the course, 94% of the students felt that the handouts and quizzes prepared them for the laboratory activities, 69% felt they improved their practicum grades and 90% felt the handouts and quizzes boosted their confidence in the laboratory activities. These results suggest that the pre-laboratory handouts and quizzes are a helpful tool for the students in preparing for laboratory-based course content and warrant multiple replications in a quasi-experimental design format.

OBJECTIVE/HYPOTHESIS

The objective of this study was to evaluate pre-laboratory handouts effects on laboratory quizzes and laboratory practical grades. We hypothesized that pre-laboratory handouts would improve grades, specifically by preparing the student for the laboratory activities and content.

REFERENCES

1. Herreid, C. F. and N. Schiller. 2013. Case studies and flipped classroom. J. College Sci. and Teaching 42:62-66
2. Nemoto, T. and D. Beglar. 2014. Developing Likert-scale questionnaires. JALT Conference Proceedings.

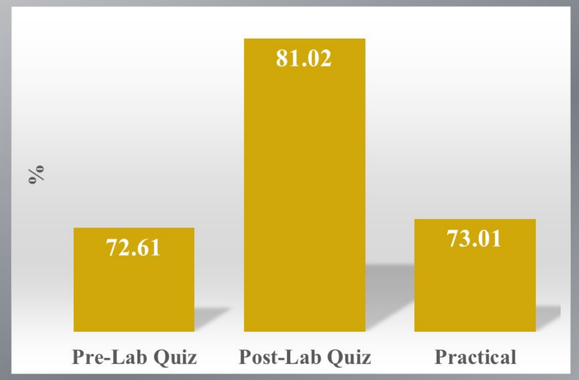

Figure 1: Grade percent for pre and post-laboratory quizzes, as well as, laboratory practical grade percent.

Qualtrics Survey Questions

1. I like having pre-laboratory handouts and quizzes.
2. I would recommend keeping the pre-laboratory handouts and quizzes.
3. The pre-laboratory handouts and quizzes prepared me for the laboratory activities.
4. The pre-laboratory handouts and quizzes boosted my confidence in the laboratory activities and content.
5. The pre-laboratory handouts and quizzes helped me understand the materials learned in the laboratory.
6. The pre-laboratory handouts and quizzes improved my lab practical grade.

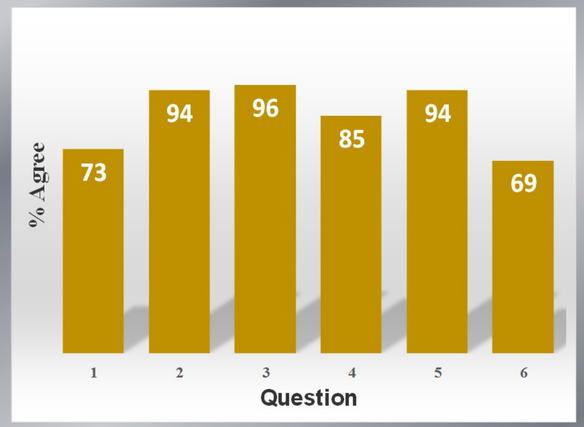

Figure 2: Percent of students that agree with questions from the Qualtrics Survey. Questions are numbered and correspond to the above questions.

MATERIALS & METHODS

- 81 Students enrolled in an animal reproductive physiology laboratory course were asked to participate in a case study that included:
  - Pre-Laboratory handouts (each student were expected to read and study their handouts prior to class)
  - Pre-Laboratory Quiz (each student was given a quiz prior to the start of the laboratory, which was graded and recorded)
  - Post-Laboratory Quiz (each student was given a quiz following laboratory activities, also which was graded and recorded)
- At the end of the semester, all students also were given a laboratory practical that was collectively made up of prior laboratory activities (the lab practical was graded and recorded).
- Pearson's correlation coefficients were performed between pre-laboratory quizzes and post-laboratory quizzes, as well as, pre-laboratory quizzes and the laboratory practical. All data was analyzed using the PROC CORR procedures of SAS.
- An end of semester survey was conducted in Qualtrics and contained 6 Likert-scale questions to determine student's perceptions of the handouts and quizzes.
- Cronbach's alpha reliability statistic was used to determine reliability of the survey questions in PROC CORR.

RESULTS

- Figure 1 reports the class average grade as a percent for pre and post-laboratory quizzes, as well as, laboratory practical grade.
- A positive correlation was found between pre and post-laboratory handouts ($r = 0.331$; $P = 0.002$) and pre-laboratory handouts and the laboratory practical grade ($r = 0.524$; $P < 0.0001$).
- The results from the Qualtrics survey are reported in Figure 2 as a percent of students that agreed with the corresponding questions. Response rate was 65%. The handouts and quizzes were positively perceived by the students.
- The reliability of these questions as a construct to assess student perceptions was strong (Alpha = 0.74).

CONCLUSIONS

- These results suggest that the pre-laboratory handouts and quizzes are a helpful tool for the students in preparing for laboratory-based course content.
- We feel multiple replications in a quasi-experimental design format is warranted.