Classroom to Commons: measuring how student-created media enhances learning and expands OER use and acceptance

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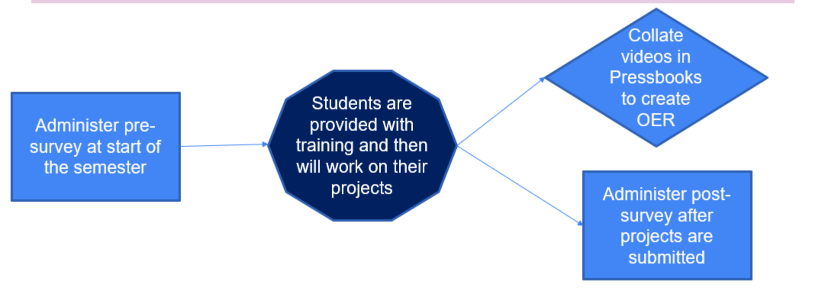
SCAN THIS TO NAVIGATE TO THE OER

Research Questions

RQ1 - Does the action of contributing to the creation of open learning materials improve students' perception and increase knowledge about open educational resources?



RQ2 - What disciplinary skills are gained by biology students who create media geared towards understanding the reactions of enzyme mechanisms?

Background

- Ongoing challenges in science education include bridging the competency gaps in foundational scientific knowledge and soft skills e.g. critical thinking, effective communication, and collaboration
- Traditional lecture-based teaching are insufficient in addressing these deficits, resulting in student disengagement and lower academic performance, particularly in complex topics like biochemistry and organic chemistry (Cain et al. 2009).
- Recognizing these challenges, the project leverages student-created OER in biochemistry to promote a shift from passive consumption to active, hands-on learning. The approach of open pedagogy shifts the perspective of students from passive content consumption to active engagement and encourages them to become co-creators of knowledge. This leads to deeper learning and fosters a sense of ownership and accountability among students (Hegarty, 2015; Hilton et al., 2019).
- Leveraging collaborative practices encourages students to engage in projects that have real-world applications and lasting impacts on the broader educational community, and not just in the classrooms (Hegarty, 2015; Ahmad, 2024).

Institutional Context

- TRU promotes the ZTC (Zero Textbook Course) initiative.
- The cost of traditional classroom resources is prohibitive for many and may result in students taking fewer courses or dropping out of courses, as well as some may simply not purchase course resources, putting them in a disadvantageous position.
- The authors of this study recognize the importance of not just adoption of OER, but also, the intimate engagement of students by such, and the necessary requirement to qualify and quantify perception and efficacy of these resources towards effective learning.

Fig 1 - Examples of ZTC materials

Participant Profiles and Selection

Inclusion Criteria

- ✓ Students enrolled in the course BIOL 3130/CHEM 3730 [Introduction to Biochemistry] during the Fall semester of 2024.
- ✓ Students who remain actively registered in the course throughout the duration of the study period
- ✓ Students who have voluntarily agreed to participate in the project and have signed the informed consent form.

Exclusion Criteria

- × Students who do not meet the minimum requirements of the activity and what is established in the course syllabus
- × Students who do not meet the inclusion criteria

Research Approach and Methods

Quantitative assessment of knowledge acquisition and exploration of students' experiences, perceptions, and skills were conducted through quizzes and surveys, respectively.

Data Analysis Methods

Surveys

Pre- and Post-Surveys were analyzed to assess shifts in student perceptions and knowledge across three thematic areas: Knowledge of Creative Commons Licenses, Perception of OERs, and Access to OERs.

The Wilcoxon Signed-Rank Test was used to compare paired responses for each question, as this test is well-suited for ordinal Likert scale data. Significant questions within the three thematic areas were identified, and thematic boxplots were used to visualize changes in response distributions. A volcano plot was also created to summarize the effect sizes and significance levels across all survey questions.

Quizzes

Quiz analysis examined student performance across Quiz 1, Quiz 2, and Quiz 3 to assess learning progress.

To explore statistical differences, two complementary methods were employed:

1. Paired t-tests were conducted for pairwise comparisons between the quizzes.
2. Repeated Measures ANOVA was used to analyze overall differences in performance across all three quizzes, accounting for the repeated nature of the measurements.

Thematic analysis was conducted on quiz data by categorizing questions into Recall tasks (Q1-Q9) and Application tasks (Q10). Descriptive statistics, boxplots, and correlation analysis were used to evaluate and compare performance across these themes.

Results

The analysis revealed a steady increase in average scores: 16.88 in Quiz 1 , 19.39 in Quiz 2 and 20.11 in Quiz 3 , reflecting consistent improvement over time.

The variability of scores, measured by the standard deviation, remained relatively stable between Quiz 1 (SD = 6.77) and Quiz 2 (SD = 6.55), indicating consistent performance.

Quiz 3 showed a slightly higher standard deviation (SD = 6.83), suggesting increased variability due to the presence of outliers, which included students who either excelled significantly or struggled more than their peers.

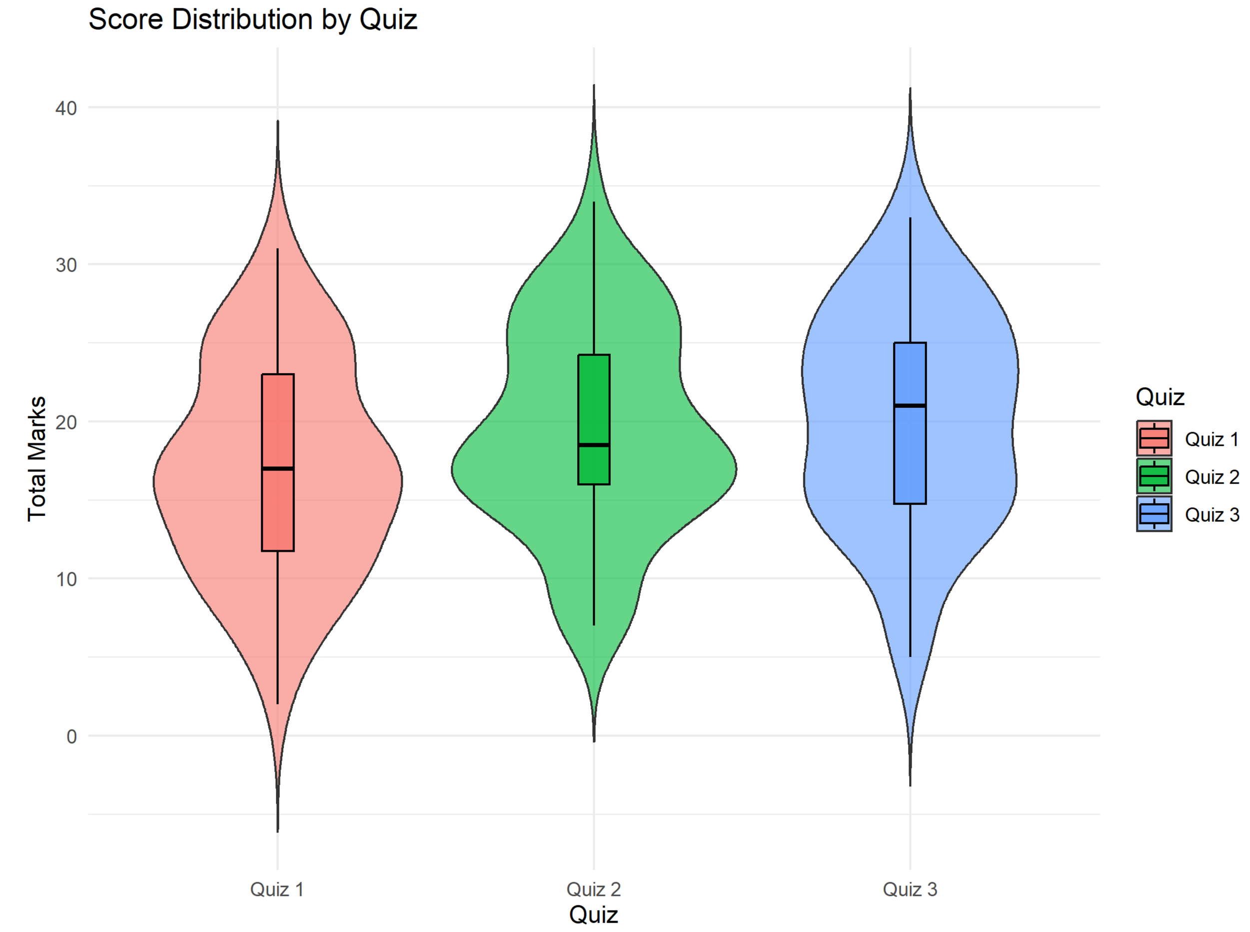


Figure 2: Score Distribution by Quiz. The violin plot shows the spread and density of scores for each quiz, highlighting improvement over time.

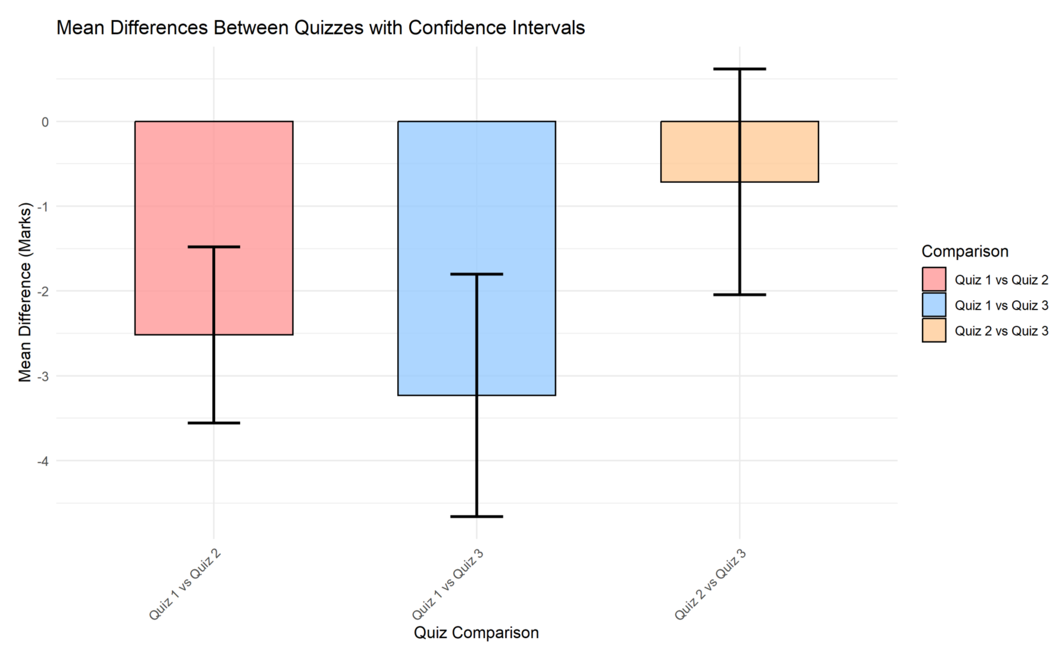


Figure 3: Mean Differences Between Quizzes.

Repeated Measures ANOVA was conducted to determine whether there were significant differences in mean scores across Quiz 1, Quiz 2, and Quiz 3.

The results revealed a significant effect of the quiz factor F (2, 110) = 14.2, p = 3.26e-06), indicating that mean scores differed significantly across the quizzes.

Pairwise comparisons using paired t-tests with Bonferroni adjustment further clarified these differences.

The comparison between Quiz 1 and Quiz 2 (p = 3.1e-05) and Quiz 1 and Quiz 3 (p = 9.5e-05) showed highly significant improvements. However, the comparison between Quiz 2 and Quiz 3 (p = 0.86) revealed no significant difference.

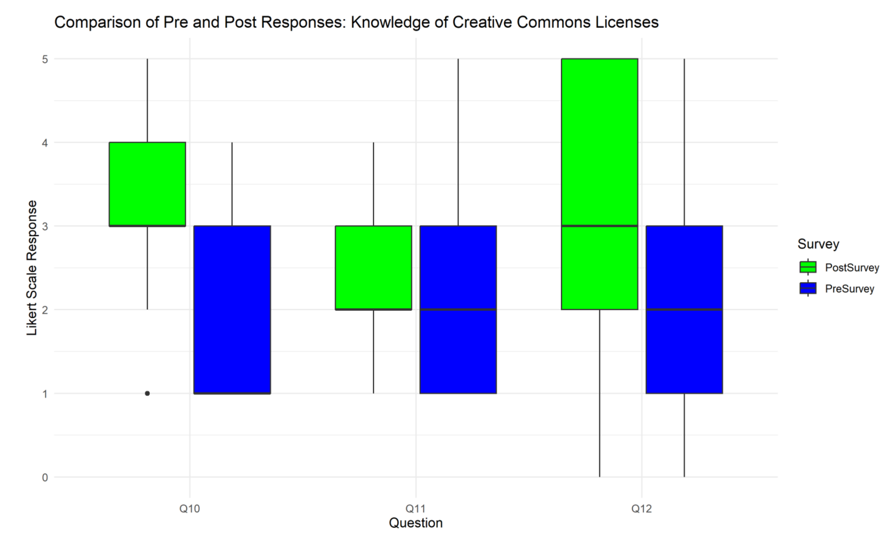


Figure 4: Comparison of Pre and Post Survey Responses for the theme Knowledge of Creative Commons Licenses.

The theme "Knowledge of Creative Commons Licenses" was assessed using responses from Q10, Q11, and Q12 in the Pre – and Postsurvey. These findings demonstrate that participants showed a significant improvement in their understanding of Creative Commons Licenses, particularly in Q10 and Q12, while Q11 displayed more modest gains.

The results indicate that the intervention successfully improved participants' perception of OERs, particularly in areas where initial perceptions were lower (e.g., Q6). The consistent agreement in Q15 CCS and Q15 FUR highlights sustained positive attitudes toward OERs.

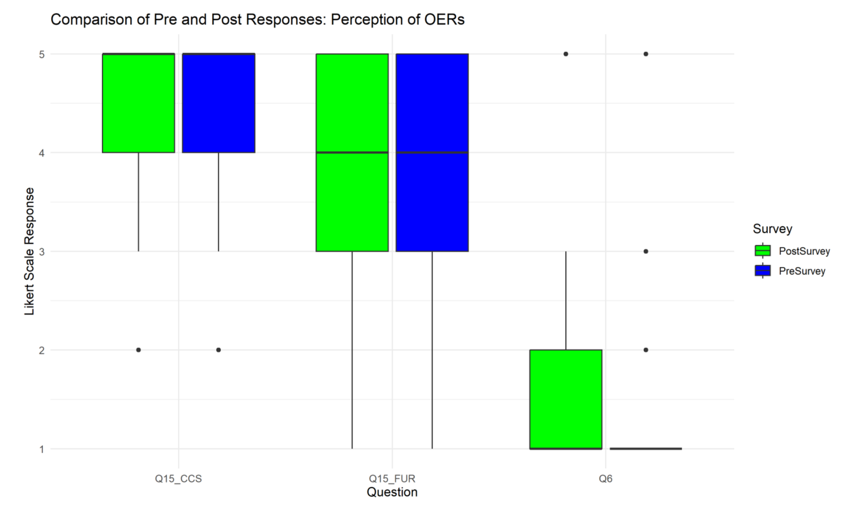


Figure 5: Comparison of Pre and Post Survey Responses for the theme Perception of OERs

Conclusions

- ✓ Dual importance of leveraging activity-based methods to promote deeper engagement and critical thinking while addressing the gaps in their implementation.
- ✓ Traditional methods form the foundation of the students' learning experience; introducing activities must be carefully calibrated to complement existing knowledge and bridge the gap between theory and application effectively.
- ✓ Traditional methods provide stability and consistency, activity-based learning offers a pathway to foster advanced skills such as application and problem-solving.
- ✓ Refining activity-based methods, perhaps through iterative development and targeted support, could enhance the impact on diverse student groups.
- ✓ Further studies should be explored to tailored strategies to maximize the benefits of activity-based approaches while addressing individual learning needs

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