

Introduction

Teaching complex topics like Hammett plots is difficult due to limited research on effective teaching practices in upper-level organic chemistry courses.^{1-2,6,9}

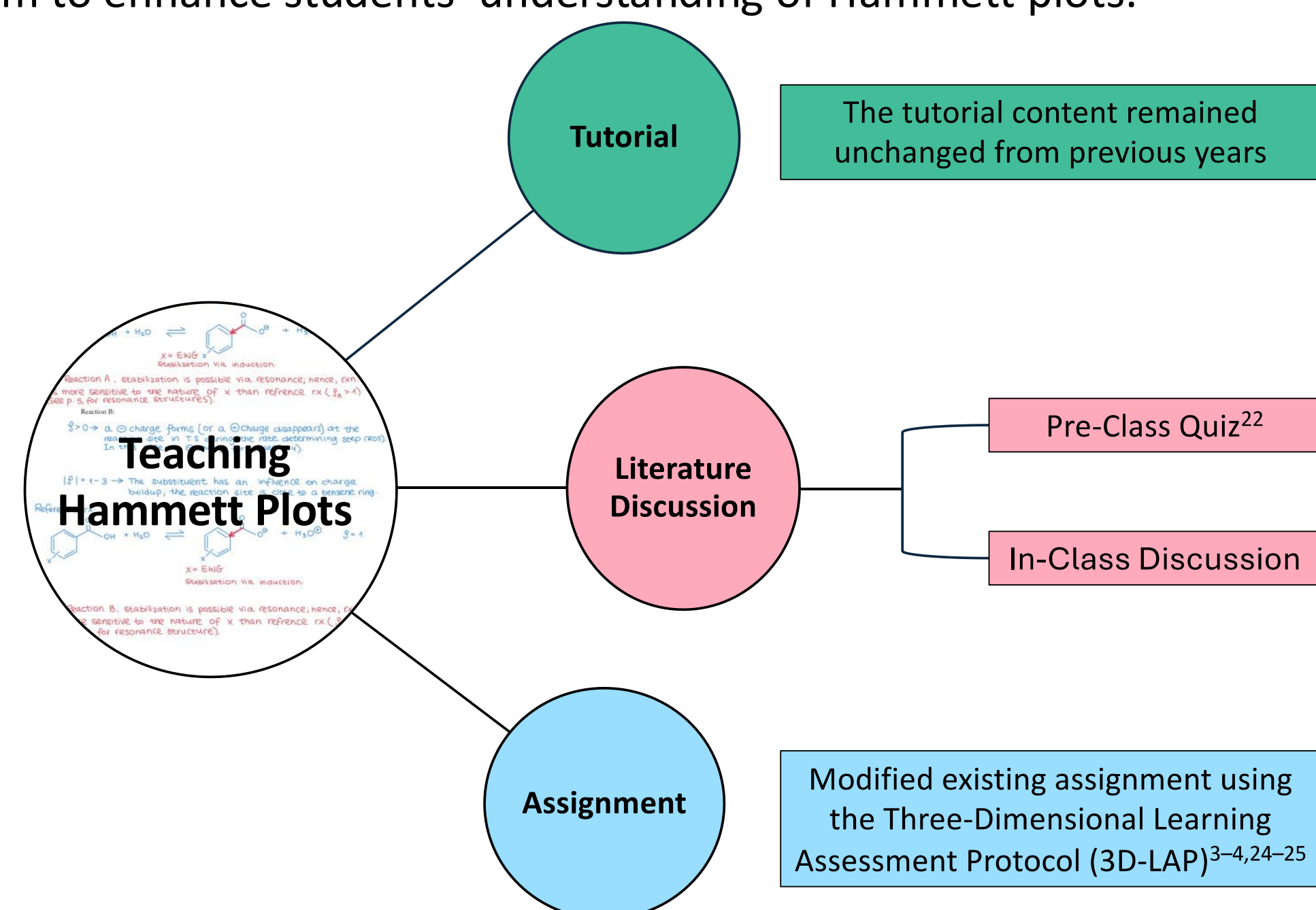
- Students often struggle with:
 - Interpreting graphical and mathematical data⁵
 - Connecting scientific models to real-world applications⁷⁻⁹
 - Engaging in scientific argumentation⁵

How Can We Better Support Student Learning?

- Scientific Modelling:**
 - Treat Hammett plots as dynamic models for engaging in scientific practice.
 - Use interactive elements to deepen students' understanding.
- Primary Literature:**
 - Encourage analysis of research articles to bridge course knowledge and contemporary science.¹³
 - Provide opportunities to explore real-world applications and foster critical thinking.¹⁴
- Affective Learning:**
 - Enhance engagement by balancing cognitive and emotional learning experiences.¹⁵⁻²⁰

Study Design

This study focuses on (re)designing and implementing three curricular elements that aim to enhance students' understanding of Hammett plots.



Research Questions

- RQ1. Do in-class discussions influence students' perceptions of how primary literature relates to real-world applications?
- RQ2. Did the newly designed curricular elements impact students' affective experience when learning Hammett plots?
- RQ3. Do the curricular elements improve student learning as measured by student learning outcomes and perceptions?

Methods and Data Collection

- Distributed three surveys during the Hammett plot section to address RQs
- Compared Fall 2022 and 2024 assignment grades to assess performance

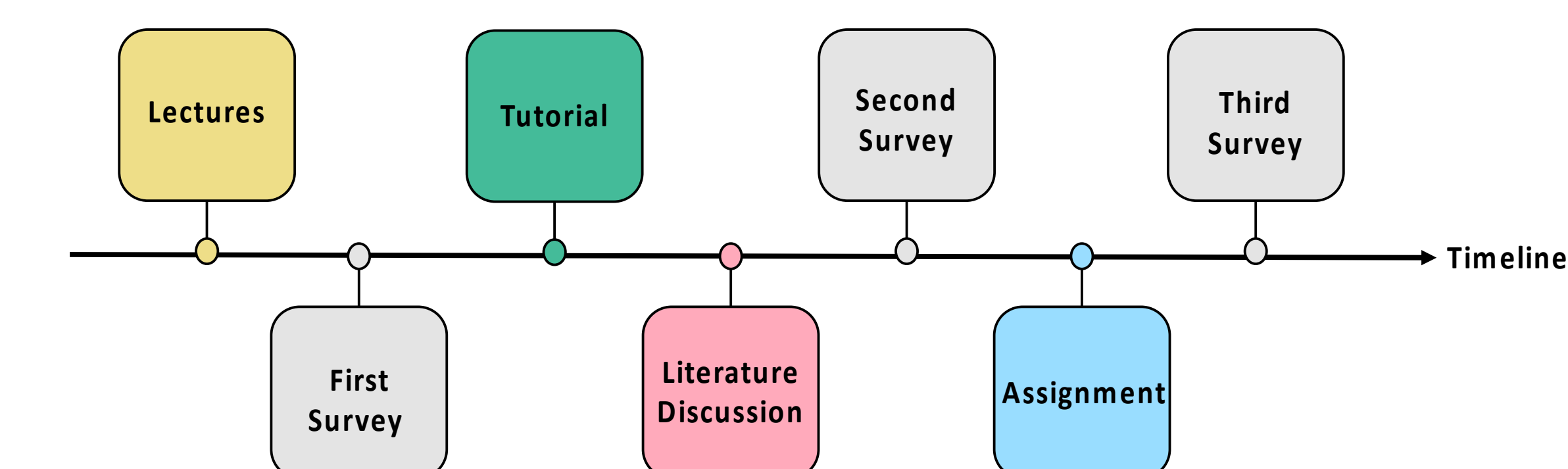


Figure 1. Study timeline.

Ethics

- HRE approval from the University of Victoria
- Voluntary participation with 0.5% bonus incentive

Selected Results and Discussion

RQ1. Do in-class discussions influence students' perceptions of how primary literature relates to real-world applications?

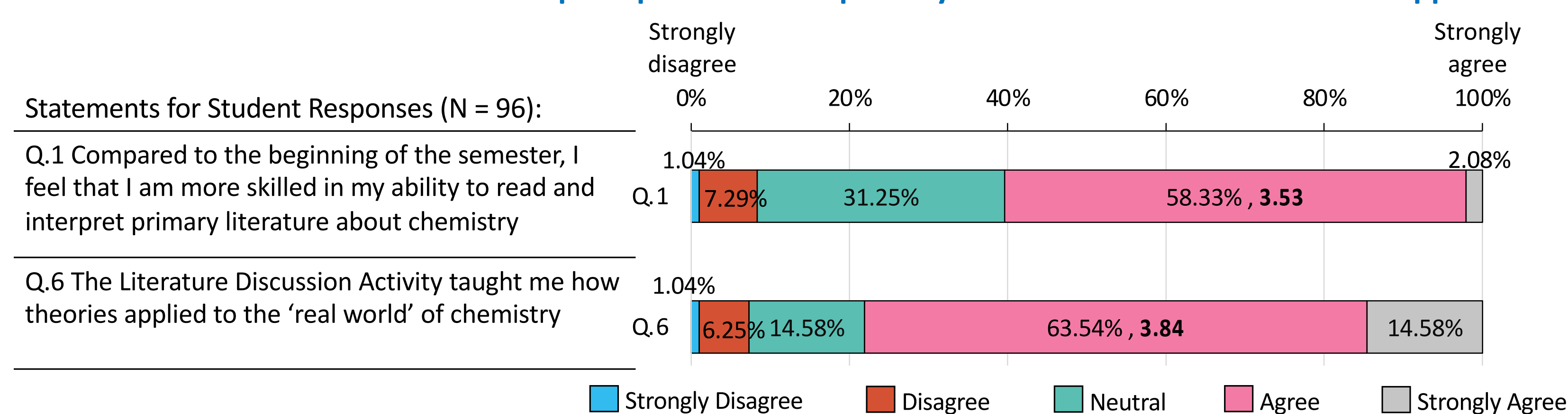


Figure 3. Students' responses to Likert-type statements regarding the literature discussion. Weighted averages in bold.

RQ2. Did the newly designed curricular elements impact students' affective experience when learning Hammett plots?

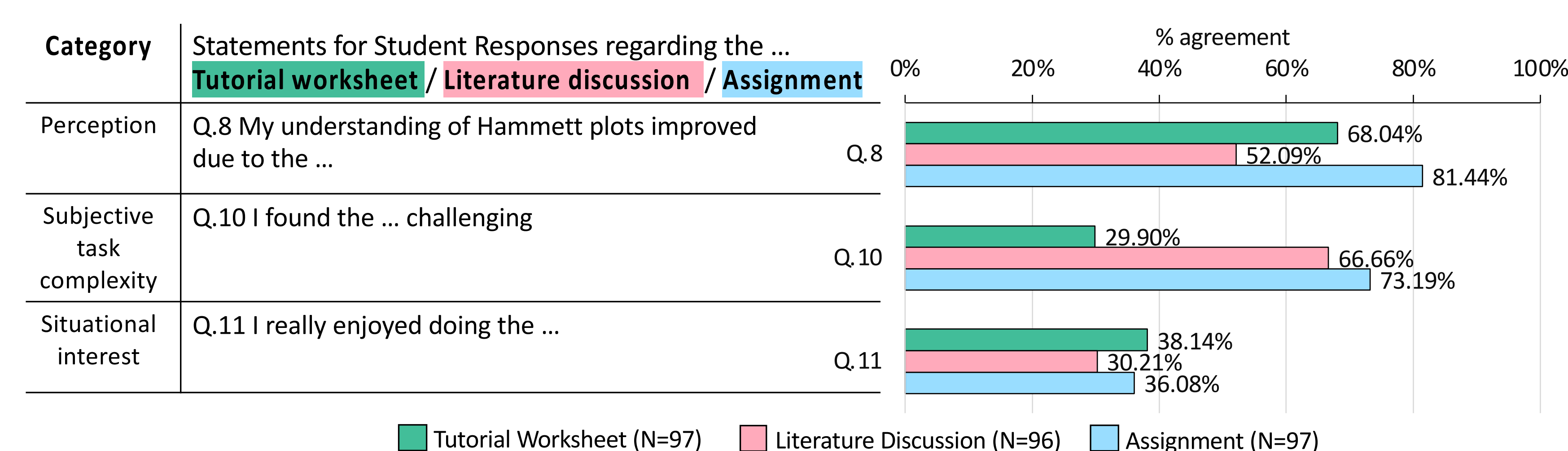


Figure 4. Percentage of students agreeing or strongly agreeing with Likert-type statements regarding their affective experience.

RQ3. Do the curricular elements improve student learning as measured by student learning outcomes and perceptions?

Analysis of Assignment Grades:

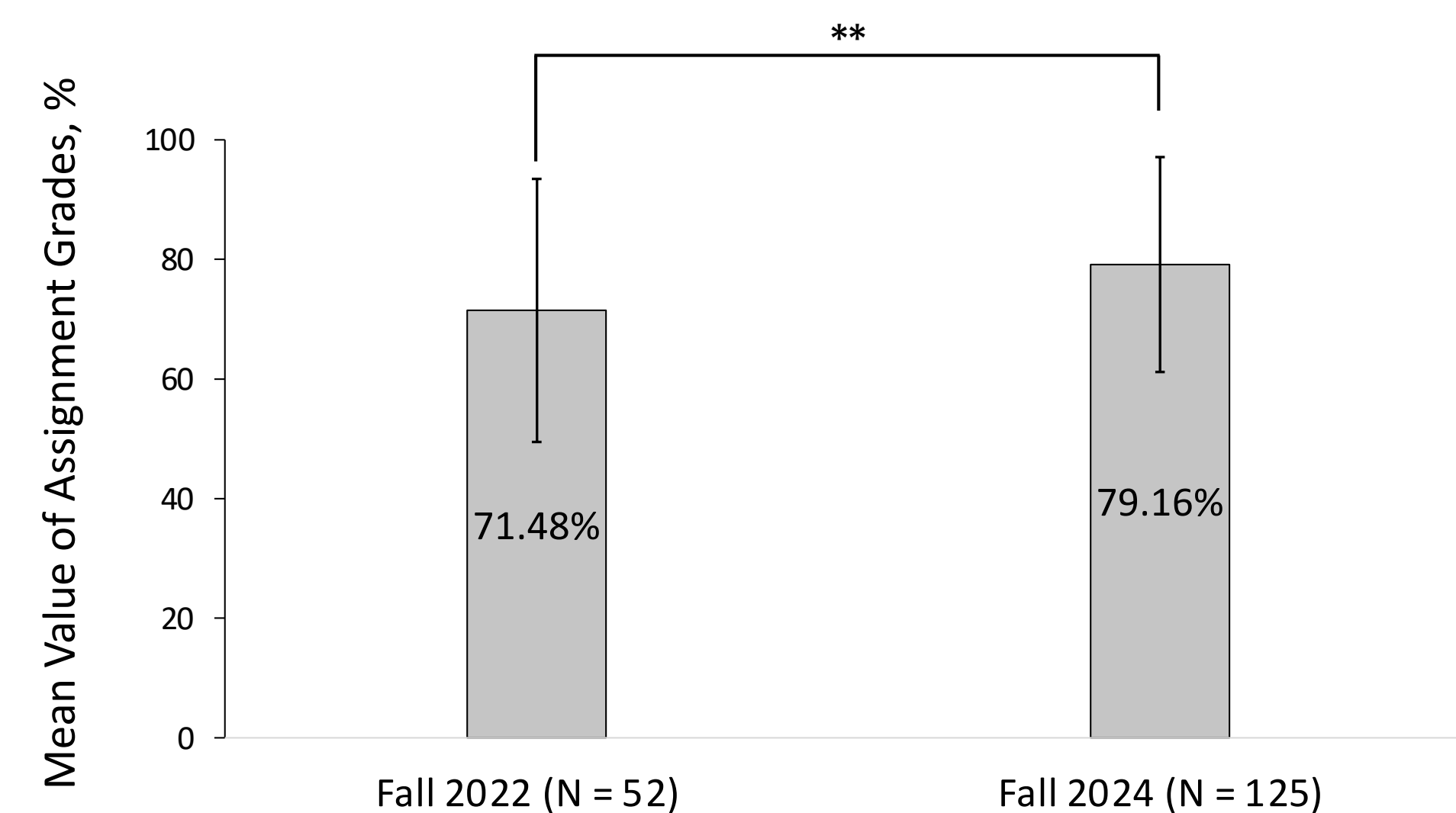


Figure 6. Comparison of the Hammett plots assignment grades of CHEM 337 students from Fall 2022 and Fall 2024. Mean grades are represented as bar graphs, with error bars indicating standard deviation. Statistical significance is denoted by ** (p < 0.05).

Pre- and Post-Intervention Ratings:

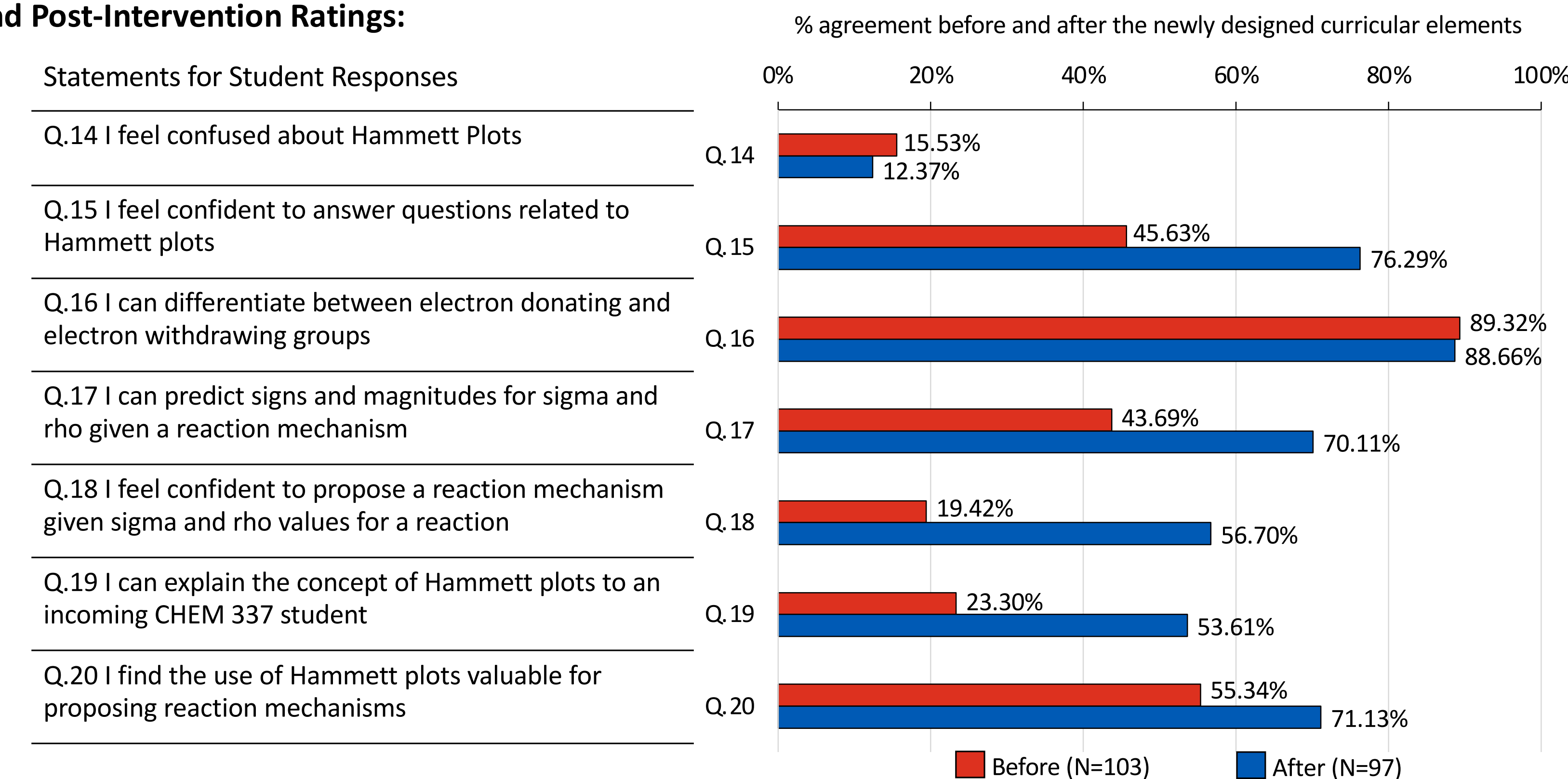


Figure 7. Student responses to Likert-type statements administered before and after the newly designed curricular elements.

Student Feedback

In the final question of the third survey, we invited students to share their thoughts on how the curriculum could be improved, and here is some of the feedback we received:

"The room, very bad room to have a discussion with 4-5 people as the desk space does not allow for a good discussion."

"Release the discussion questions ahead of time to help guide students when reading through the paper..."

"It was hard for me to figure out the graph in Excel. I think that having a little tutorial on how to create the graphs would have been helpful."

Limitations and Future Work

Limitations

- Small sample size
- Cohort-Specific Results
- Lack of a true control group
- Reliance on self-reported survey responses

Future Work

- Conduct thematic analysis and code open-ended student responses
- Expand curricular design to other chemistry topics

Conclusions

Key Findings

The combination of a tutorial, literature discussion, and assignment enhanced students' comprehension of Hammett plots.

Research Questions Addressed

- RQ1. In-class literature discussions positively influenced students' views on real-world applications.
- RQ2. The curricular elements improved students' affective experiences when learning Hammett plots.
- RQ3. Statistical comparison of assignment grades and pre- and post-implementation survey responses showed significant improvement in cognitive understanding.

Acknowledgments

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- My family, for their support and encouragement throughout my academic journey

Further Information

Scan the QR code to explore my references, read my thesis, watch my video, and connect with me for further insights!



Please note that the order of figures and references in this poster follows the structure of my thesis and may differ from typical sequencing.