Faculty of Science: Department of Chemistry

# Exam Wrappers in Second-Year Analytical Chemistry: Enhancing Student Engagement with Summative Assessment

Poisson, J.[1]; **Davy, E.C.**[1]; Huan, T.[1]

[1]Department of Chemistry, University of British Columbia, 2036 Main Mall, Vancouver, British Columbia

*Scan here for access to the exam wrapper*

## Challenges Associated with Second-Year Analytical Chemistry

There are significant challenges with taking second year analytical chemistry including:

- The **"jump"** from first- to second-year
- Analytical chemistry encompasses aspects of **mathematics/statistics** at the same time as **new chemistry concepts**
- Analytical chemistry is often a requirement for **non-chemistry science specializations**

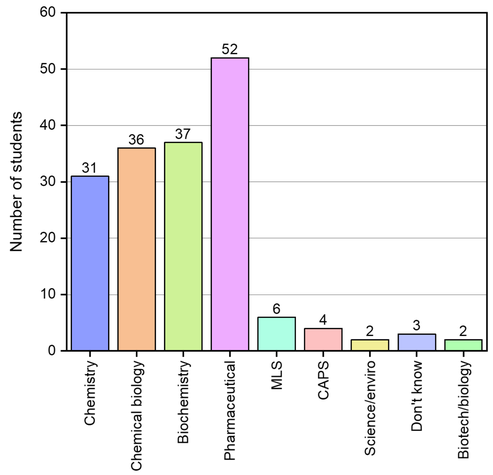


***Figure 1.*** Distribution of specializations from Winter-1 Term (September-December 2022) (N = 173)

- Analytical chemistry's **lab component** is often a **significant time commitment**
- Learnings from the lab component are rarely is capitalized upon in the lecture component[1]
- There is **rarely a tutorial component** to give students time to work through problems with an instructor[2]

## Chemistry 211: Introductory Chemical Analysis

*Chemistry 211: Introductory Chemical Analysis:*

- Offered twice per academic year
- Has a registration of ~200 students per section (**~400 students/year**)
- Has a **laboratory** component
- Is composed of **five modules**
- The lecture is assessed through homework assignments, **2 midterm examinations** and **1 final examination**
- Many students commute to 8:00 am lecture

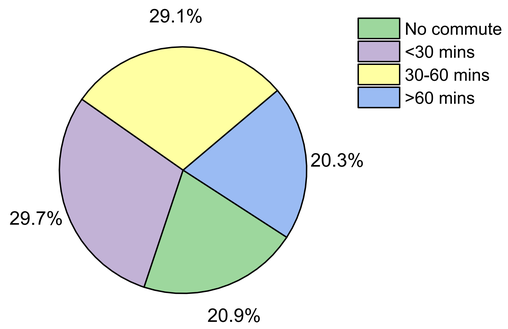


***Figure 2.*** Student commute times from Winter-1 Term (September-December 2022) (N = 172)

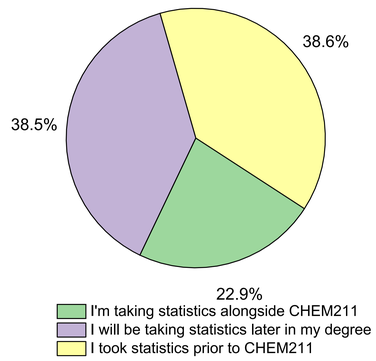


***Figure 3.*** Student responses about when they have or are taking statistics in relation to *Chemistry 211* from Winter-1 Term (September-December 2022) (N = 104)

## Exam Wrappers

Exam wrappers (post-midterm reflection surveys) are a useful tool designed to[3]:

- Encourage **useful reflection** of exams as opposed to the typical focus on grades
- Support student **metacognition**

On an exam wrapper, students are asked:

- To assess their **study habits**
- To assess their **level of confidence** with the course material
- To **identify and correct mistakes** (especially those which were made repeatedly!)
- To reflect upon how they will **prepare for future assessments**

## Our Exam Wrappers

On our exam wrappers:

- **>90 % of students completed** the exam wrapper for both the first and second midterm (even when the incentive was dropped from a 5% bonus to a 2% bonus)
- The **response from students was positive** with ~65% of students "agreeing" or "strongly agreeing" that the exam wrappers helped them
- **Students made adjustments** from the first to the second midterm examinations[4]
- Now that the exam wrappers are developed**, they continue to run in *Chemistry 211*** along with a welcome and exit survey

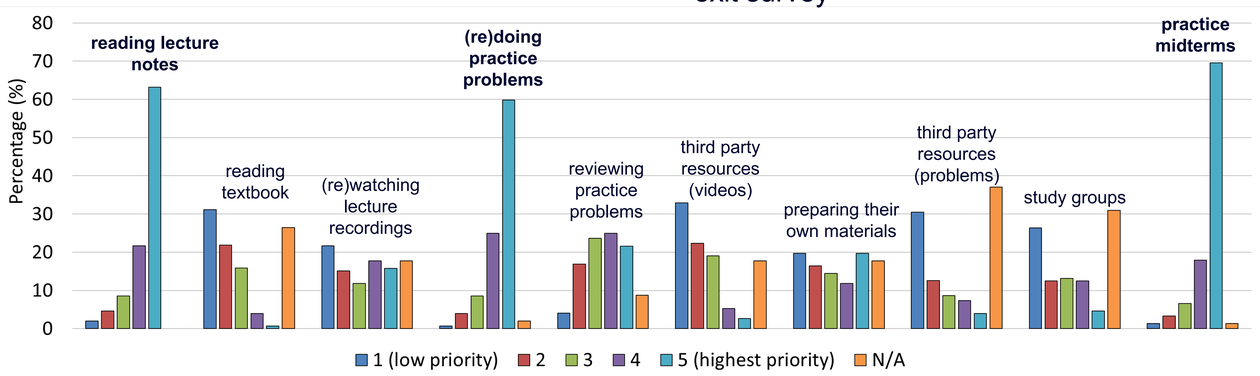


***Figure 4.*** Students' study priorities for the first midterm examination for *Chemistry 211* from Winter-1 Term (September-December 2022)

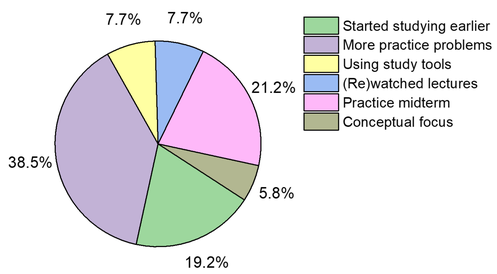


***Figure 5.*** Changes students' made from the first midterm examination to the second examination who saw improved grades from Winter-1 Term (September-December 2022) (N = 52)

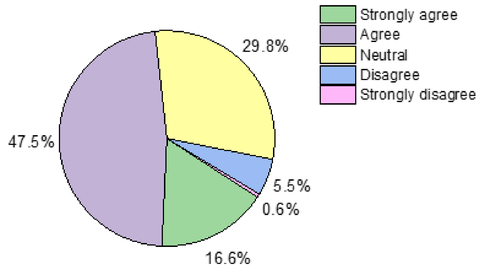


***Figure 6.*** Student responses to **"**The exam wrappers helped me recognize my learning challenges and better prepare for exams**"** from Winter -1 Term (September-December 2022) (N = 181)

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**References**

[1]Wenzel, T. J. *Microchim. Acta*. **2003**, 142, 161-166.
[2]Masania, J., et al. *J. Chem. Educ*. **2018**, 95, 47-54.
[3]Ambrose, S., et al. "How Learning Works", **2010**, Wiley
[4]Hodges, L.C., et al. *Research and Teaching*. **2020**, 50(1), 69-79.

**Acknowledgements**

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