

Oral Laboratory Reports: A Supplementary Teaching Tool in the Third Year Integrated Laboratories

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Objective

Laboratory reports are the most common tool for assessing students in a laboratory setting. A significant proportion of students taking 3rd year chemistry labs find the reports to be:

- Time consuming
- “Busy work”
- Not conducive to learning

As a result of these comments, oral laboratory reports were introduced as a teaching and assessment tool in the 2014-T1. Oral laboratory reports allow us to more effectively evaluate student learning, provide immediate feedback, and teach transferable skills.

Intended Outcome

1. Effective use of student time (~18 experiments/term)
2. Provide immediate feedback
3. Provide an avenue for peer-to-peer tutoring within the bounds of academic honesty
4. Opportunity to improve oral communication skills:
 - 1 on 1 oral scientific discussions
 - Exposure to in-depth follow-up questions – Thinking on the spot
 - Learning how to structure an oral presentation.

Method

We adopted an oral report format for the CHEM 325/346 X-05 and X-08 materials chemistry experiments. The oral reports were set up in a questions-answer format.

Students were provided with questions the day of the lab. One week later, students met with the teaching team to report their answers orally.

This method allows us to probe the students' "real" level of understanding with in-depth follow-up questions. Students were graded on their answers as well as their ability to provide a comprehensive picture of the purpose of the experiment.

Sample Question for X-05 (Polymerization of pyrrole to form superhydrophobic materials) provided to the students :

Include a mechanism for the electrochemical polymerization of pyrrole. Include a mechanism for the oxidative polymerization of pyrrole using FeCl_3 . (3 marks)

Sample follow-up question:

Draw the resonance structures for the intermediate radical species.

Grade Distributions

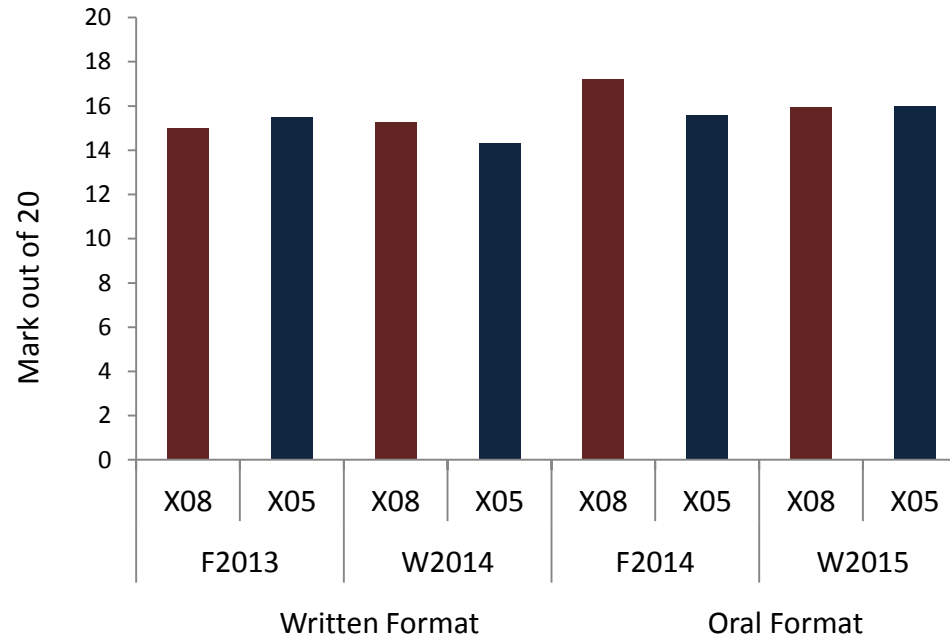


Figure 1. Average grade distribution for X-05 and X-08 reports for the written format (F2013/W2014) and oral format (F2014/W2015). Standard deviation for all data sets are 2-3 marks.

No significant difference was seen in the average grades when switching from written to oral reports. Written reports are summative assessment while oral reports are largely summative with small formative component. In the oral reports, we give partial marks to students for correcting themselves while in a written report errors in a question would result in a zero.

Time Spent and Overall Impression

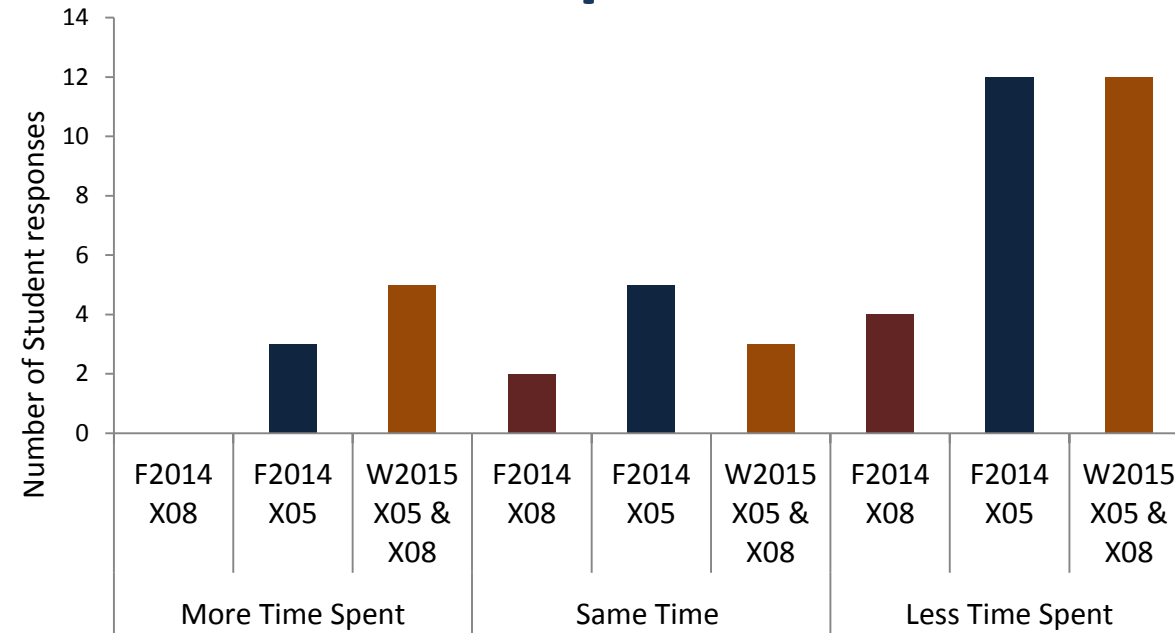
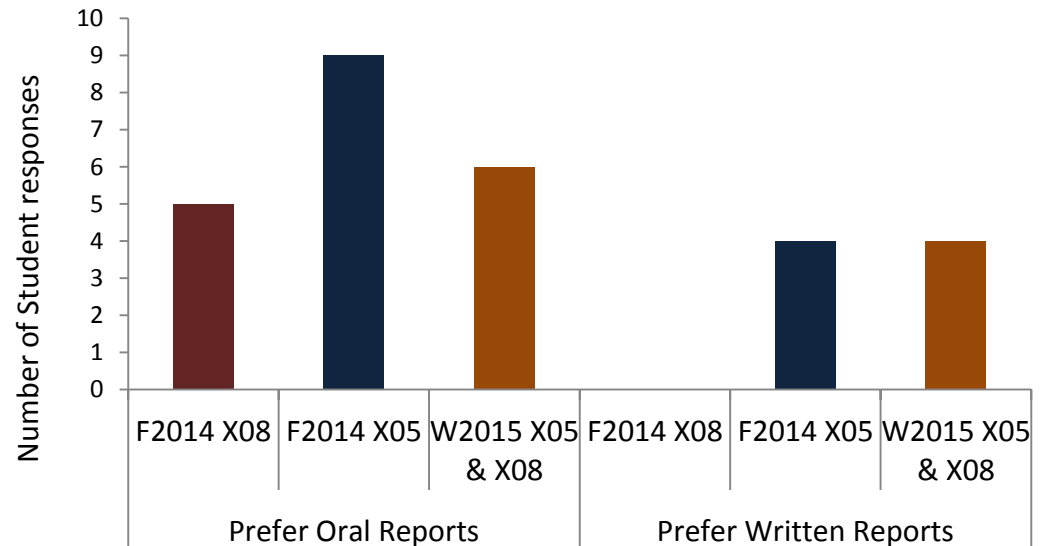


Figure 2. Evaluation of the amount of time spent preparing for the laboratory report in comparison to other written reports in 2nd year and 3rd year labs based on student responses.

Figure 3. Evaluation of the preference between oral and written reports based on student responses.



Student Led Oral Reports

One of the challenges we have faced with the oral reporting format was that students were able to:

- ✓ Answer the questions provide
- ✗ Not able to answer the follow-up questions

We found that the students had troubles visualizing the whole picture of the experiment and were unable to connect the information together.

Student Led Oral Report Format

We introduced a new oral reporting format in 2014-T2. Students were provided with questions but in a guideline format. One week later, students gave a 10 minutes oral report “chalk talk”. The talk is followed up with questions from the teaching team.

This method works best for experiments where the concepts and techniques are familiar.

Future & Challenges

Challenges:

- Examiner differences
 - Examiner preferences and background knowledge of the examiner can cause complications for equally assessing all of the students as the oral reporting format is more open to interpretation
- Student follow-up to assess improvement in transferable skills
- Deciding when to correct misconceptions and provide an answer or when to let student correct own mistakes

Future:

- Developing different tactics for oral reporting
 - Chalk talks, prompted questions and discussion type formats
- Separating questions into the pre-lab and the oral report
- Properly preparing students for new reporting format
- Grade students using a general rubric rather than a detailed marking guide
- Achieving a better grade distribution based on preparation and student understanding

Conclusion

Overall, students preferred oral report format and spent less time preparing for them. They liked having the instant feedback but found the oral reports to be more stressful.

We found that students that preformed both X-05 and X-08 experiments were more confident in the second oral reports. We believe this is because they had a getting understanding of the expectations and gained exposure to this type of laboratory format.

Overall there needs to be a balance between written and oral reports to promote both written and verbal skills. For labs that contain less data analysis and more observations and concepts, we believe that the oral reports are better format to assess student learning.

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