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Knowledge and memory: a study of what students remember about chemistry experiments

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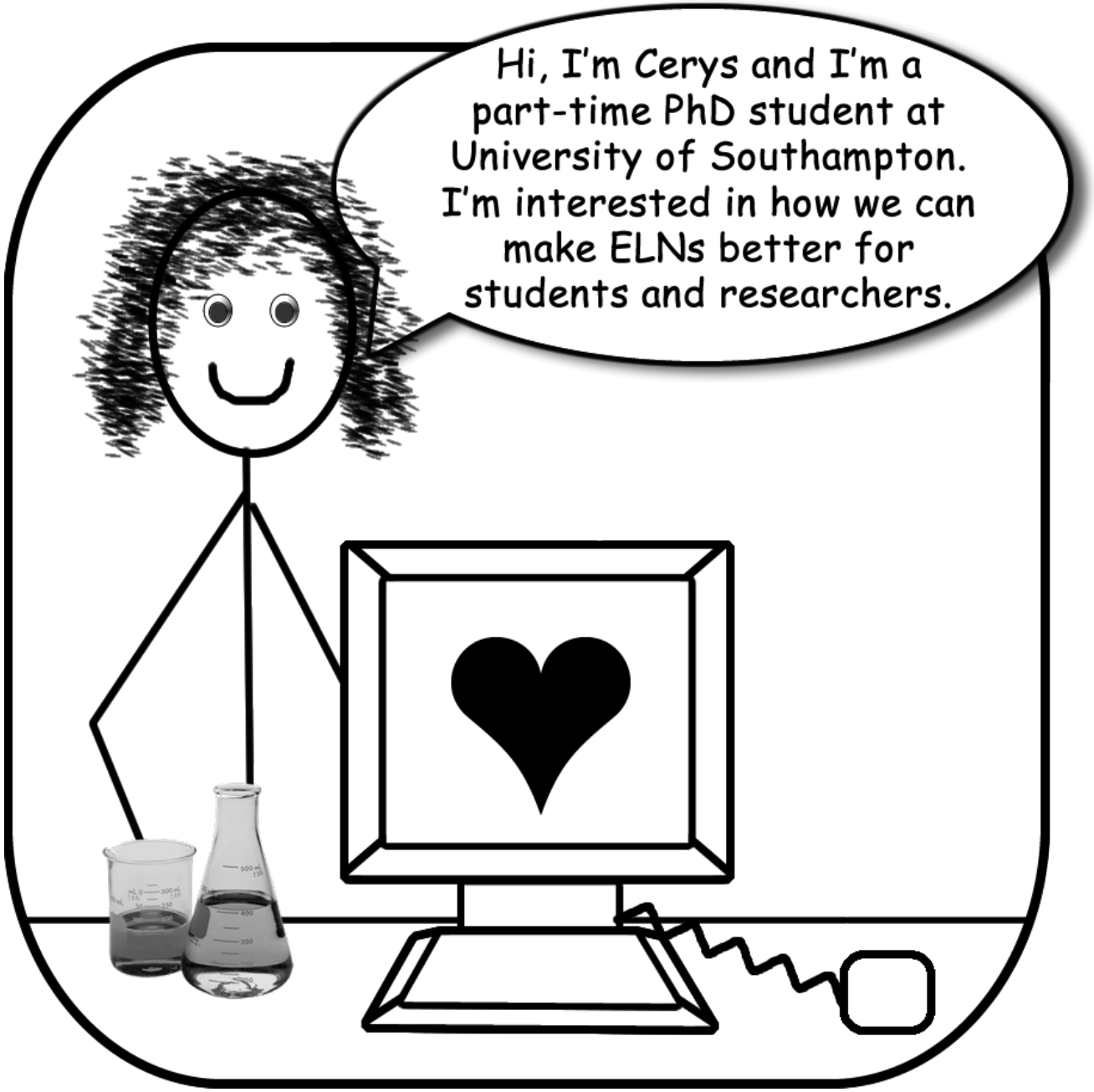
Hi, I'm Cerys and I'm a part-time PhD student at University of Southampton. I'm interested in how we can make ELNs better for students and researchers.

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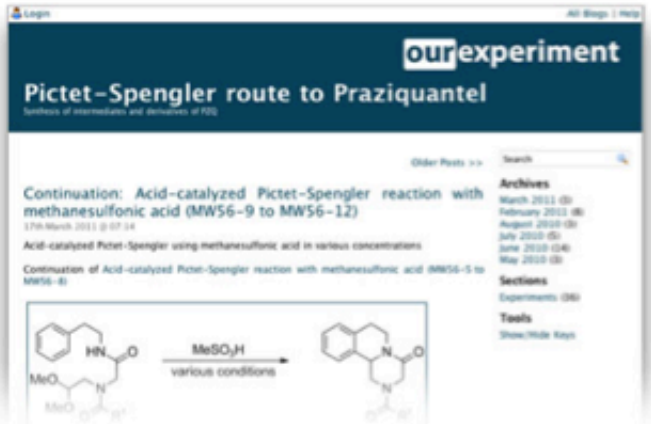

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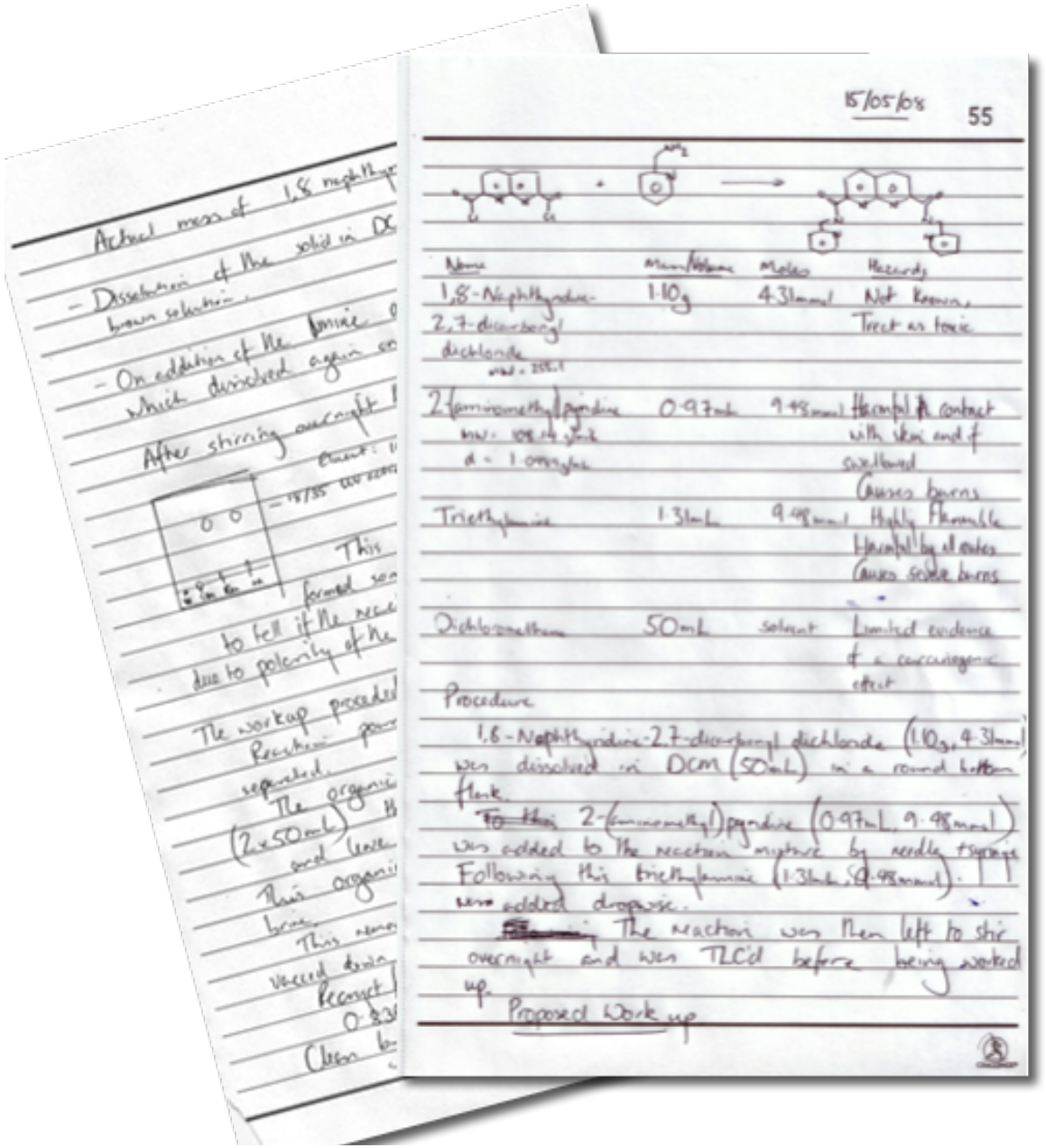
Capturing the experiment record



We want to understand what students remember about experiments and whether the use of questionnaires improves or impairs the **quality** of information they capture.

It's not about the procedure..

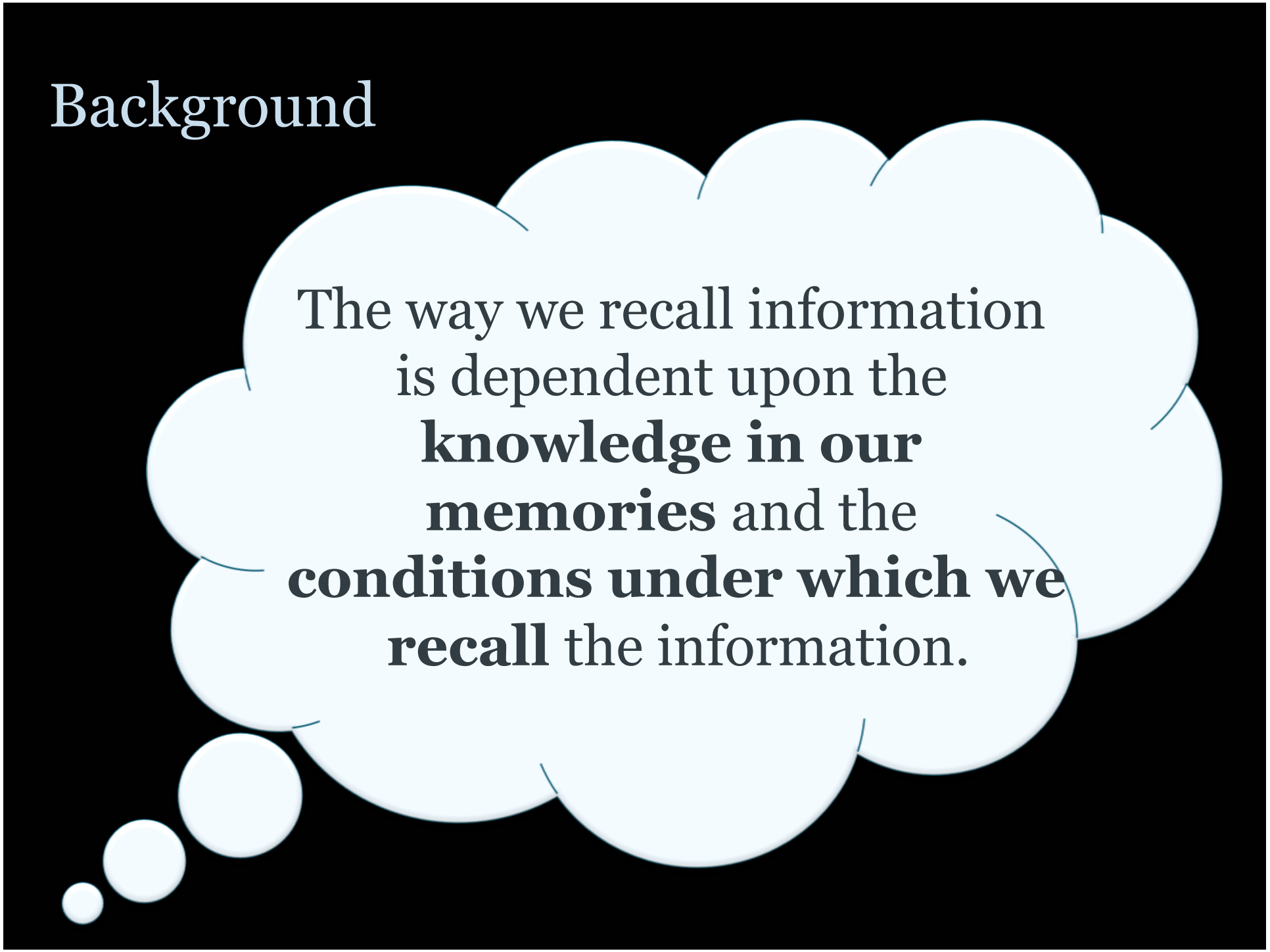
- What did I do?
- Why did I make that decision?
- What did I see?
- Why do I think that happened?
- How does it relate to my knowledge in chemistry?
- What might I forget to record that is important?
- Will what I capture help me when I come to look up the experiment in the future?

Photo credit: The University of Iowa Librari

ELNs can provide a structured environment for recording information

But is that good or bad?

Background


The way we recall information is dependent upon the **knowledge in our memories** and the **conditions under which we recall** the information.

Memory and knowledge structures

Schemas

Scripts

Remembering

Cues

hoto credit: Jack Zalium

Perspectives

Anderson and Pichert (1978)

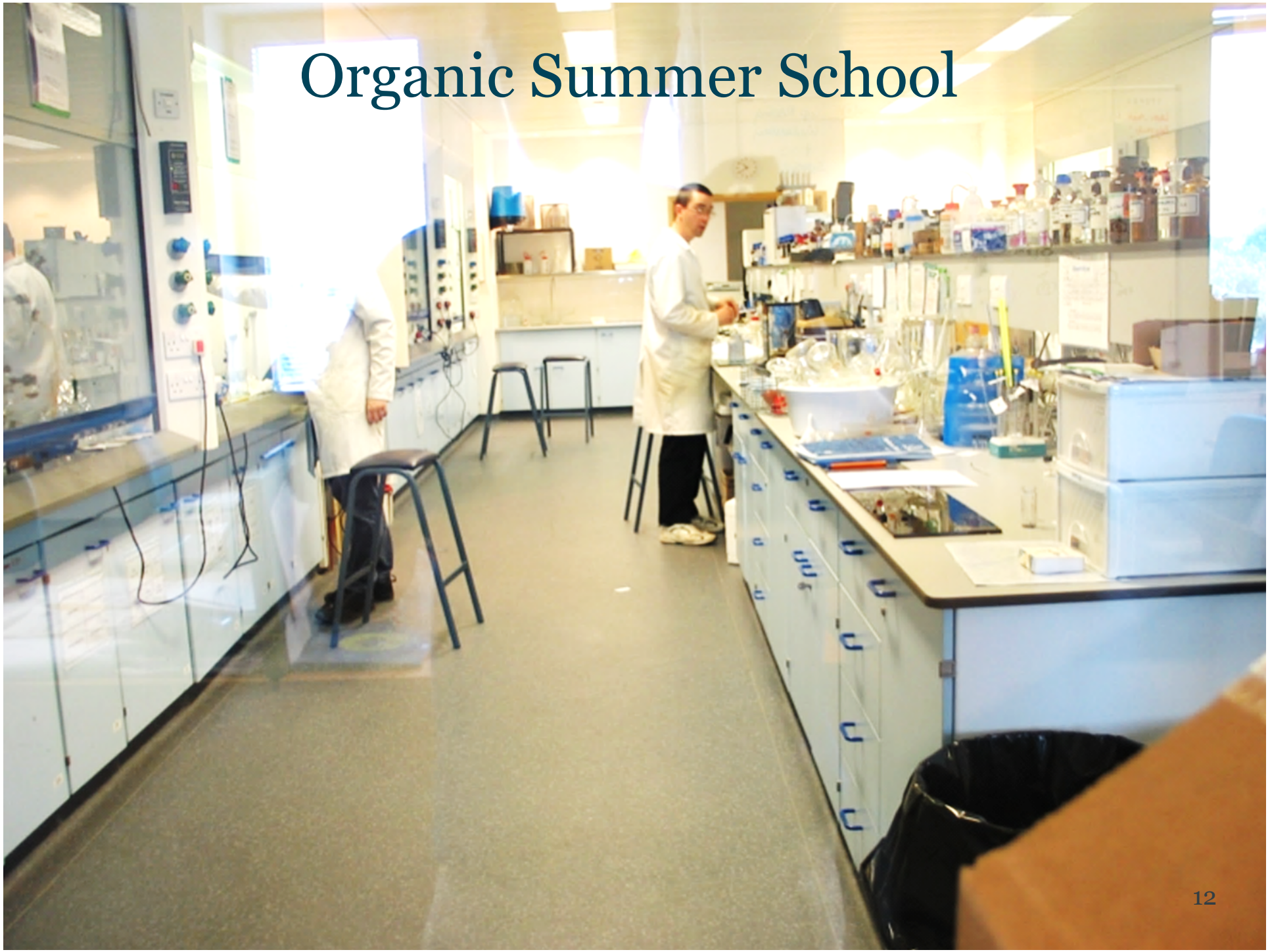
Using templates

- Structured
- Provides cues
- Potential problems

Study aimed to find out:

- What knowledge students might have about a chemistry experiment
- What differences using a template makes to the information students record

Organic Summer School



Pre-experiment questionnaire

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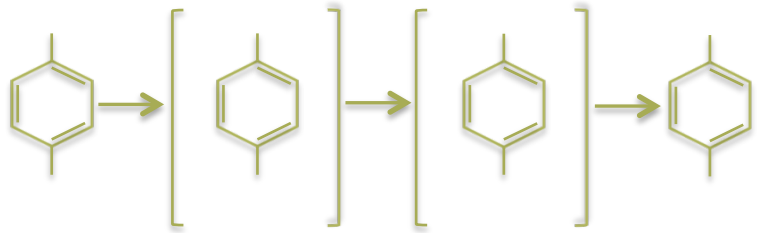
- Free recall
- Complete a reaction scheme
- Name the chemicals and identify safety information
- Identify equipment required for the experiment
- Identify measurements and observations that might be used in the experiment
- Describe step-by-step experiment instructions



Thinking about experiments

- >90% statements relate specifically to steps in the experiment
- >85% of students recalled steps in the correct order
- Equipment, chemicals and “actions”
- Some general “experiment” steps are recalled, but most are the specific to the experiment

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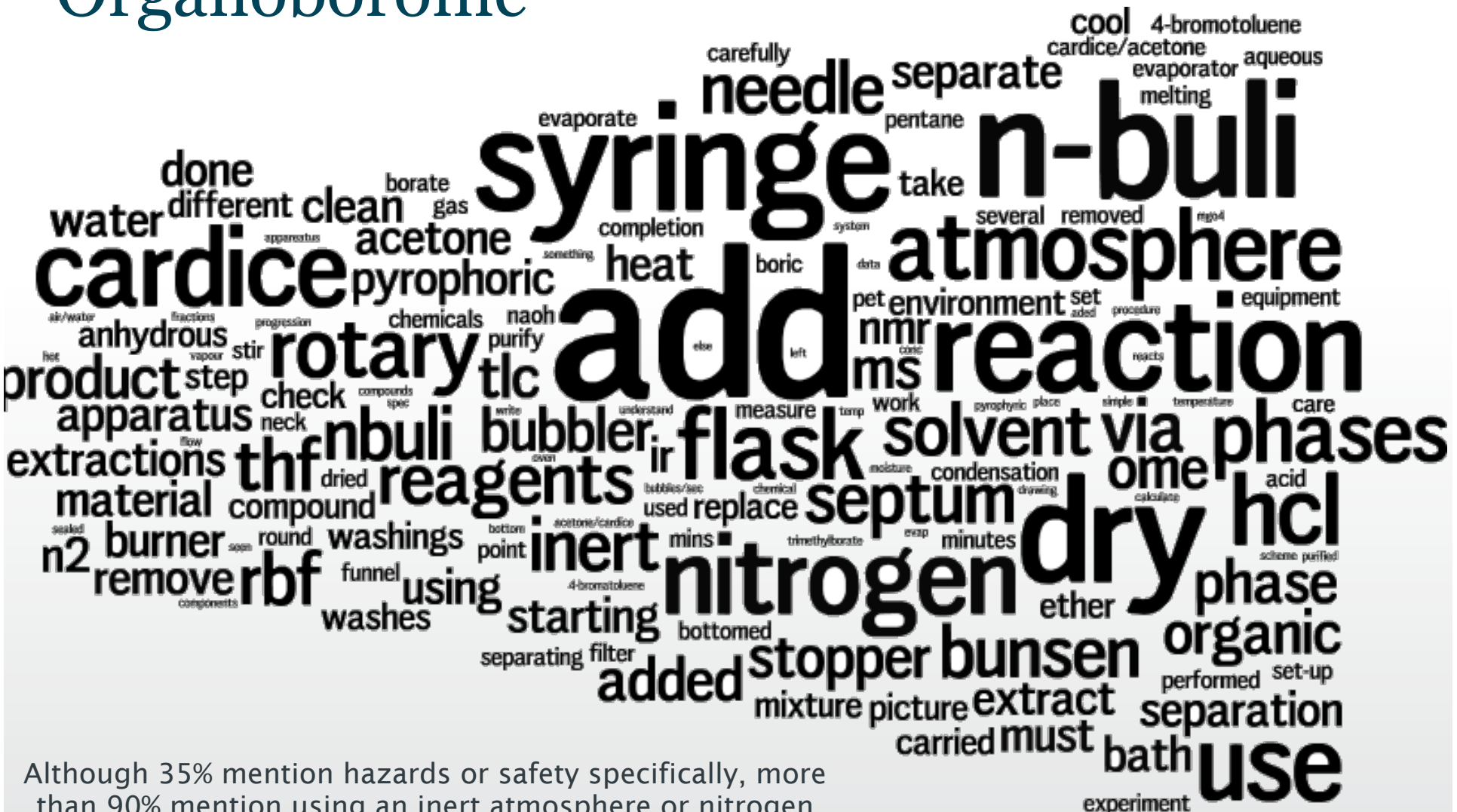
Organoboronic



Although 35% mention hazards or safety specifically, more than 90% mention using an inert atmosphere or nitrogen bubbler, and 65% mention using heating to dry the flask.

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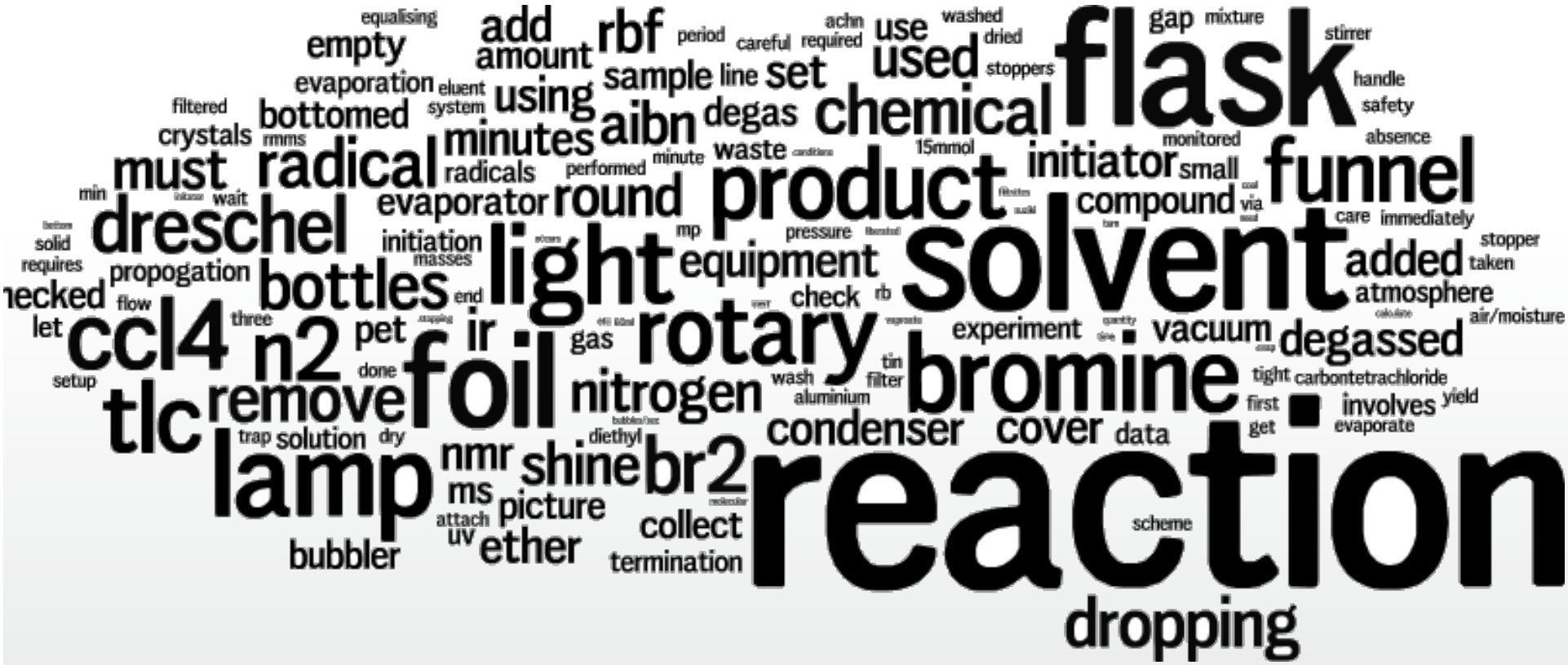
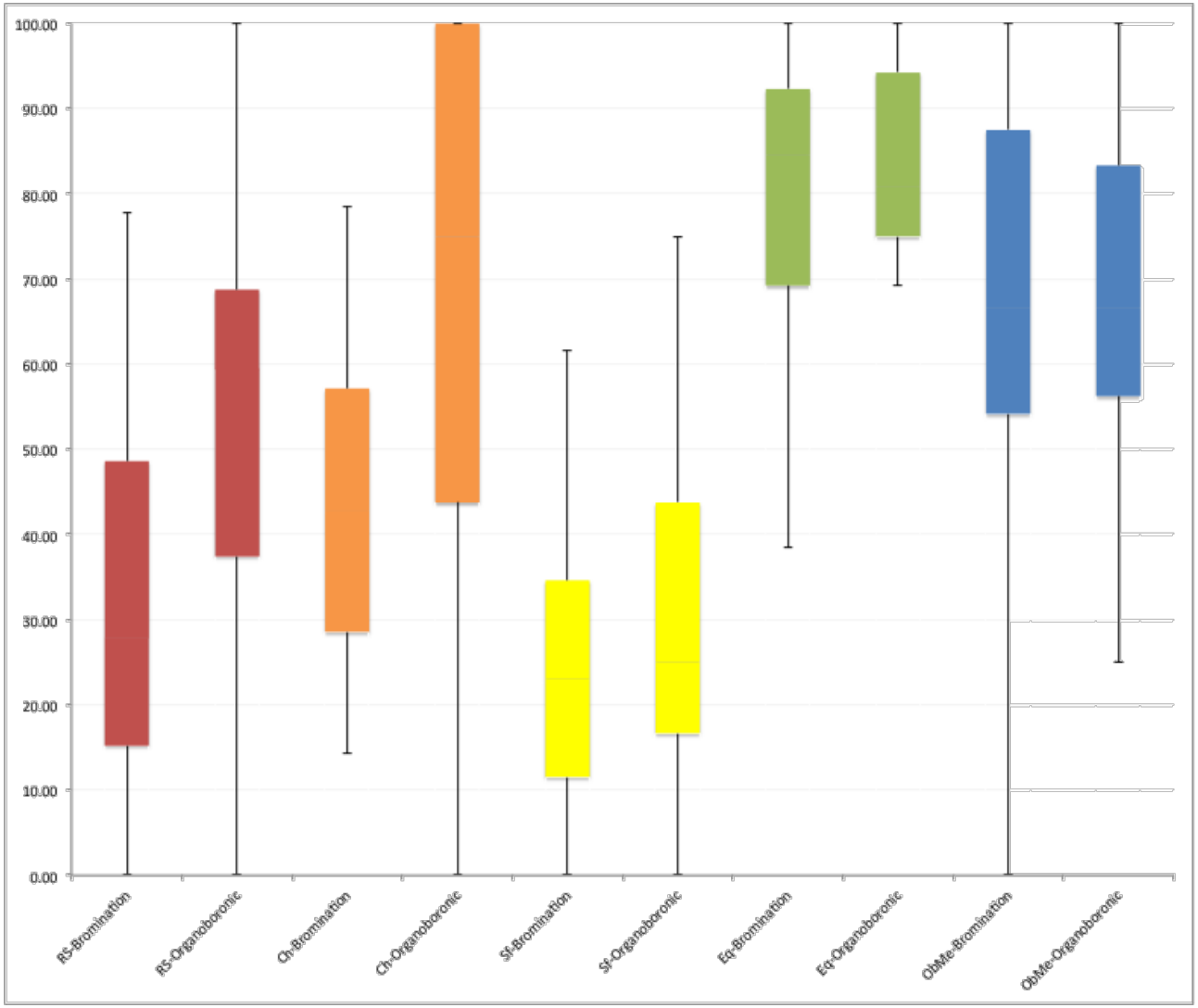
Bromination



35% mention safety specifically, but the use of the flask wrapped in foil and the use of light/lamp is more significant in this experiment. 50% use the term “radical”

Other pre-experiment questions

- Reaction schemes
- Chemicals
- Safety
- Equipment
- Observations and measurements



And step-by-step experiment instructions

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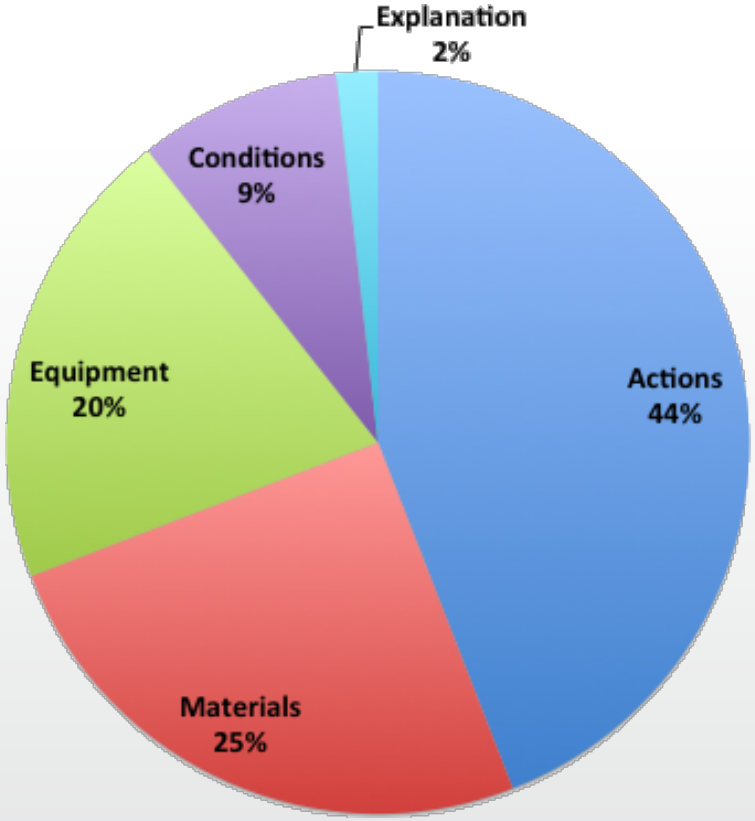
High-level experiment script

- "Do safety"
- Set up equipment
- "Weigh out" reagents (calculate RMMs)
- "Do reaction"
- "Get" product
- Analyze product



Post-experiment questionnaires

Template condition

1. Name of experiment
2. Aim of the experiment
3. Balanced equation with relative molecular masses
4. Step-by-step experiment procedure
5. Results
6. Discussion
7. Conclusions

No Template condition

Study findings

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Templates (cued)

- Give us information we ask for: reaction schemes, RMMs, results, details of the analysis
- Fewer observations and explanations
- Learning and theory

No Templates (free)

- Give more of the personal experience: observations and explanations
- Fewer reaction schemes, no RMMs, fewer results and analysis, much less learning and theory

Unexpected findings

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A change in the style of reporting

"What I Did"

90% used this style with no template

Do this

More than half of those students switched to this style when they used the template

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Summary

- Students tend to remember “procedure” information, especially unique aspects
- Using cues encourages students to record additional information
- But, need to make sure personal experiences are not lost
- Cues can be provided for information they might forget
- Cues can be provided to encourage discussion
- More to be done on cues and changing perspectives

Acknowledgements

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Metadata Study

http://sites.google.com/site/cmetastudy/