Online support films and Moodle quizzes, to facilitate transition into Year 1 Chemistry

Dr Ciorsdaidh Watts¹, Dr Linnea Soler¹, Jarrett Gray²

1. Learning, Teaching and Scholarship lectures; School of Chemistry, University of Glasgow; 2. Final Year undergraduate student, School of Chemistry, University of Glasgow

Introduction

Year 1 students often struggle when entering the laboratory for the first time. Many complex factors may contribute to the challenges faced by students, including:

- Safety – dangerous chemicals, apparatus, working with others [1]
- Recognition of space – spatial awareness, physical environment
- Chemical knowledge – how this relates to the experiment at hand
- Problem-solving – problems/challenges associated with the lab
- Social stress – anxiety, confidence, large lab cohorts [2]
- Learning styles – students respond differently to support resources

Resources already available to aid transition into the Year 1 Synthesis Lab included:

- Lab Manual (written)
- Demonstrator supervision (in-lab face-to-face)
- Online Learning Science pre-lab simulations (active)

Cognitive Overload?

In Cognitive Load theory, three types of information “load” exist, that require working memory capacity:

- Extraneous (how information is presented to learners)
- Intrinsic (inherent difficulty level associated with a task)
- Germane (processing required to think through a problem)

Load makes demands on working memory – with working memory itself being of limited capacity [3]. Johnstone and Wham summarise the concept of Cognitive Load as shown in Figure 1. This demonstrates the volume of new learning environments encountered in the laboratory, particularly when students transition to a university setting and encounter labs for the first time.

Figure 1 – Load on working memory associated with a science lab, demonstrating the challenges introduced to students during practical experiments. Adapted from Johnstone and Wham [3].

Project Aim

1. Design, produce and deliver pre-lab technical videos and associated Moodle quizzes to further support transition into Year 1 Chemistry labs.
2. To broaden the type of support resources offered and increase accessibility.
3. Investigate the impact of new resources. Do students find them informative, accessible? Do they decrease student anxiety and increase lab confidence?

New Support Resources

1. Two short (5 minute) technical films – Vacuum Filtration and Reflux (animated Figure 2 below).
2. Two associated Moodle quizzes with 5 MCQ each, and instant feedback.

Next, clamp the findenser, ensure the top of the findenser is not stoppered and that there is a snug fit between the findenser and the round bottom flask.

Figure 2 – Reflux technical film (excerpt) with audio (Jarrett Gray), showing subtitles and tip / safety call-outs to draw student attention to potential challenges and safety issues.

Data Gathering Methodology

- Anonymous online questionnaires: All Year 1, 2, 3, 4 students invited to explore new film and Moodle quizzes and evaluate these via an online survey. Demonstrators and technicians also surveyed.
- Focus groups: Anecdotal evidence gained during three focus groups; two Year 2 students, six Year 4 students, and three technicians (& one post-grad demonstrator) attended the sessions.

Results

Results from anonymous online questionnaire (n=44 Chemistry students), relating to the Reflux Film. These data were very similar to those gathered for the Vacuum Filtration Film.

Results from anonymous online questionnaire (n=44 Chemistry students), relating to the Reflux Moodle Quiz. These data were very similar to those gathered for the Vacuum Filtration Moodle Quiz.

Results from anonymous online questionnaire (n=3 technicians, n=1 demonstrator), relating to the films and associated Moodle quizzes.

Results Focus Groups

“Labels work very well...to make association, which is hard from just the manual.” Student
“Learning from failure is not a bad thing. The idea of failure in the videos was helpful.” Student
“It [the video and quiz] is very good to refresh chemistry, gives a lot more confidence...” Student

Conclusions

- Student/staff feedback positive to films and Moodle quizzes as a pre-lab resource.
- Feedback suggests respondents want more films and Moodle quizzes, across other techniques and labs.
- Results show that the resources boost confidence, reduce anxiety, and reduce cognitive load.
- Films and Moodle quizzes also alleviate concerns over safety in the lab.

Future Work

1. Expand films and Moodle quizzes to develop a suite of support resources
2. Make accessible across Chemistry years and labs
3. Possibly embed in demonstrator training course
4. Expand films to support transition into Year 1 (welcome, introduction, theory, safety)


@Ciorsdaidh @DrLinneaSoler