

Pollution Solution Evaluation Report

Workshop Overview

With the Scientific Outreach Grant kindly awarded by the Biochemical Society we were able to develop the Pollution Solution workshop and deliver it in secondary schools across Lancashire. The workshops involved students solving the mystery of why fish in a fictitious lake were dying, through different analytical tests. Initially the grant was awarded when I was a research scientist at the University of Manchester. The Biochemical Society kindly offered to let me use the funding as part of a new role at The University of Central Lancashire and we were able to run these workshops as a trial to see whether they could be incorporated into UCLan and Ri Young Scientist Centre programme.



The workshop focused on the students independently investigating and discovering the cause of the fish deaths. They were given testimonials from local residents along with a map of the river feeding the lake and the local area. Pollution sources were identified on the map and information on

those forms of pollution were provided. As a group we went through 3 different experiments: assessing microbes in water, pH testing and nitrate testing. These tests were done on 'non polluted water' and were kept as controls. The students were then tasked with using the information they had and the tests available to them to come up with hypothesises they could test. Students were given 45-60 minutes to carry out their analysis on water samples from different points along the river and draw a conclusion.

We delivered the workshops in 3 schools in Preston and Burnley. The classes consisted of 25-30 students and were as follows:

- **School 1:** The school is a mixed sex, high attaining faith school. The class was Year 9, top set.
- **School 2:** The school is a single sex (all boys), faith school. The class was Year 7, mixed ability.
- **School 3:** The school is mixed sex and located in area of low socio-economic status. The class was year 8, top set.

Outcomes and Outputs

Students generally enjoyed the session and found it interesting, reflected by the high scores from students for these criteria (figure 1.).

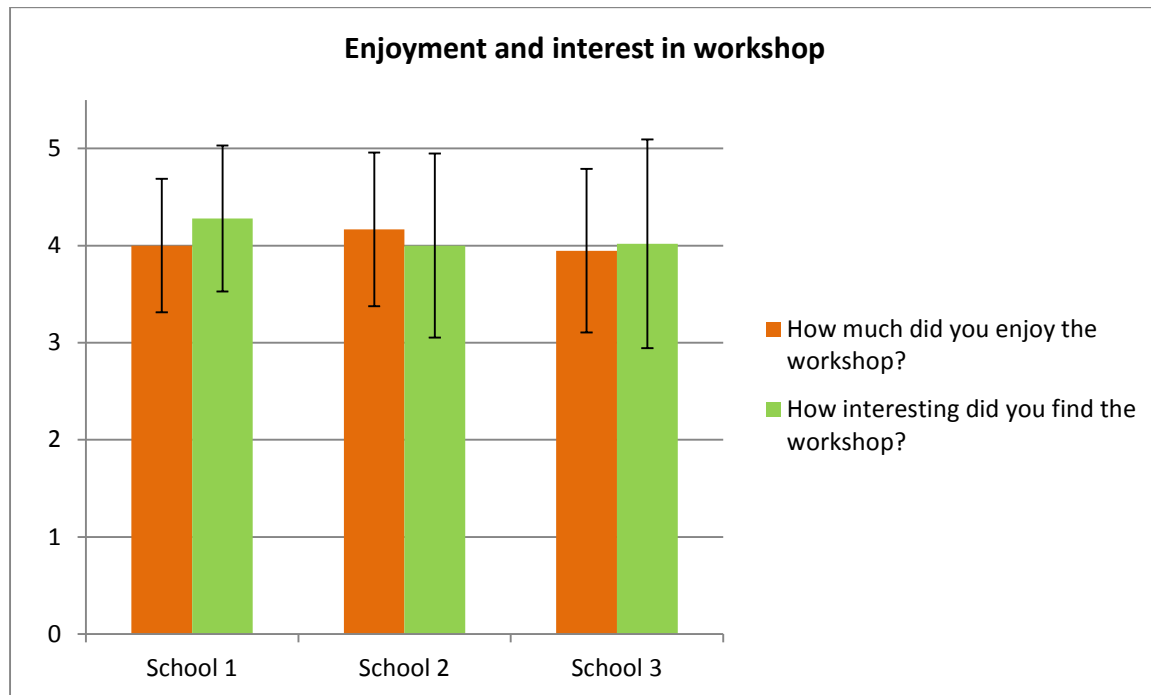


Figure 1. Students answered these questions using a score between 1-5, where 1 = not at all and 5 = a lot. Error bars represent standard deviation.

What became very apparent in the student feedback was that students did not enjoy reading and writing (Figure 2) during the workshop but did enjoy the practical hands-on parts of the workshop. This was reflected in the student feedback in which many students indicated 'Looking at microbes', 'experiments' and 'nitrate testing' as their favourite activities (Figure 3). The beginning of the session involved reading through all the information on the scenario and pollution and this was perhaps not interactive enough. Many students also listed 'microbes' as their least favourite activity (Figure 2), but this can perhaps be attributed to the fact one of the schools did not have microscopes that worked very well.

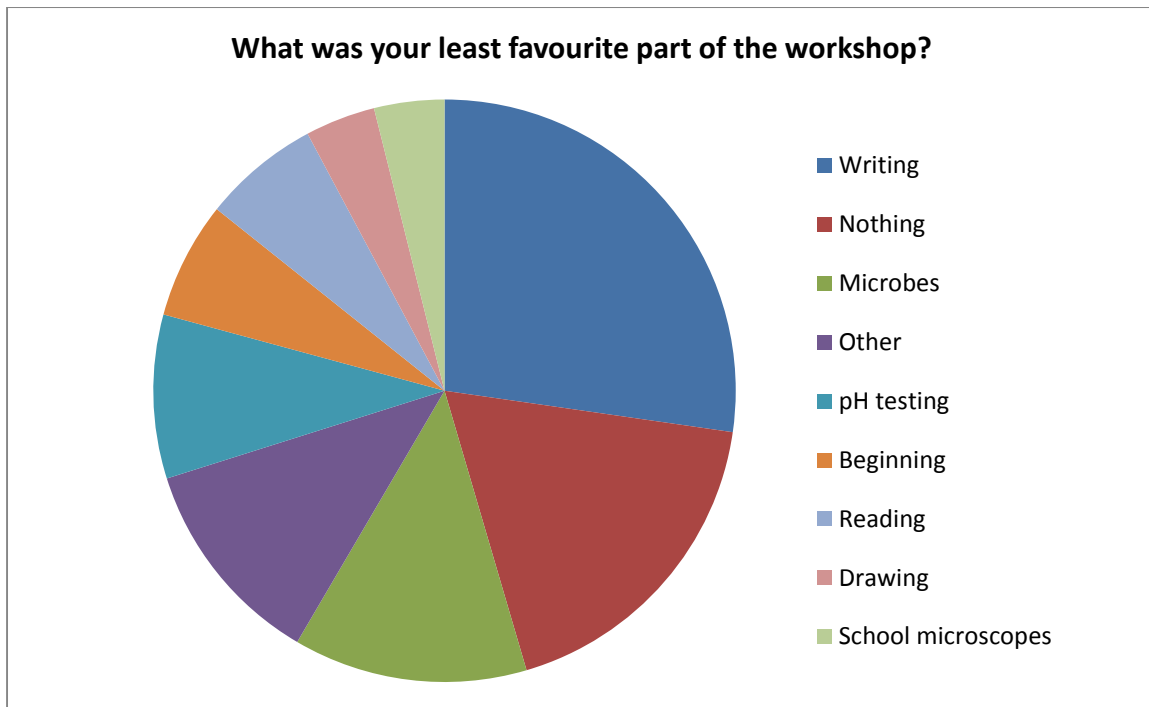


Figure 2. Activities that students enjoyed the least during the workshop. The above question was left open ended and the feedback was sorted into these categories. Answers falling under 'Other' include: Listening, deciding what experiment to do, more information, nitrate testing, shaking containers, the time it took, the topic and waiting in line.

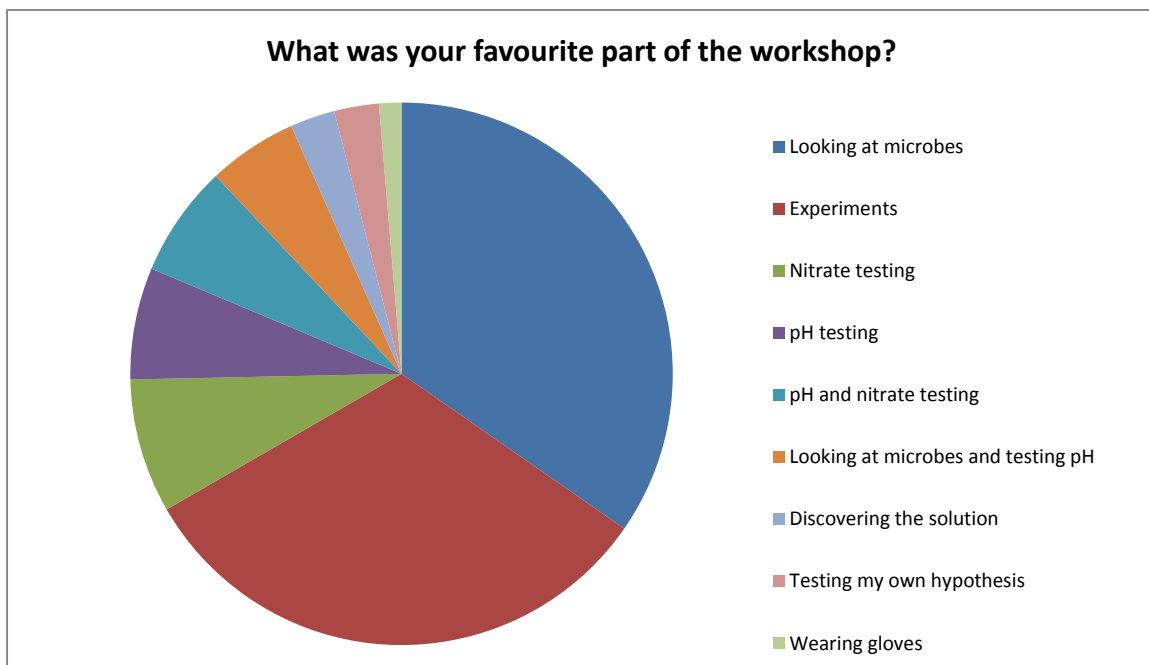


Figure 3. Activities that students enjoyed the most during the workshop. The above question was left open ended and the feedback was sorted into these categories.

During the workshop it was clear students enjoyed being in charge of their own experiments. Although some students were apprehensive initially, with one-on-one discussion and facilitation they made their own hypotheses and began experimentation. There were many instances where students realised what was causing the pollution (whether it fit with their hypothesis or not) and had a moment where the 'penny drops'. This was one of the main aims of the workshop; to allow students to find out the answers for themselves. One quote from a feedback form indicates the students enjoyment of this aspect (Figure 4).

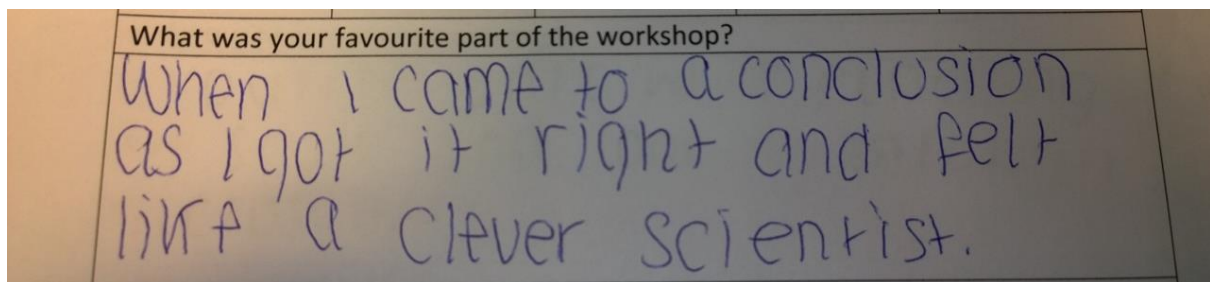


Figure 4. An example of feedback from school 3.



Feedback from teachers

Teachers from all three schools gave positive feedback and said they would want to run the workshop again. When asked what areas they would like to see expanded on teachers wanted us to cover more types of pollution and go into more detail about eutrophication. Teachers were also keen to see data analysis and graph work incorporated into the workshop. Two of the teachers suggested a more interactive beginning. Teacher feedback about adjustments to the practical experiments included, creating experiment stations for students to work at and bringing better microscopes as the school microscopes did not work very well.

Future Work

We used the funding from the Biochemical Society to trial these workshops in schools. Overall the workshops were very successful and trialling them allowed us to see how we can adjust the workshops in the future. We plan to offer the Pollution Solution in the UCLan and Ri YSC, with minor adjustments. We will make interactive videos of the testimonials at the beginning and create a map the students have to label for themselves in order to make the introduction more interactive. To incorporate data analysis and interrogation students will make measurements and create graphs they can refer to when carrying out their investigation. Finally, the equipment we have available in the UCLan and Ri YSC (better microscopes, micropipettes, vortexes etc.) will allow the practical experiments to run more smoothly.

Over all the workshops were very successful and we are looking forward to running more in the UCLan and Ri YSC.

