

Constructing a Coherent STEM Strategy with Schools

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Abstract

The aim of the project is to embed good practice from the University of Plymouth with respect to a coherent STEM approach to School Liaison work at UWE. It is recognised that to attract students to study STEM subjects at university, it is necessary to enthuse school pupils before they make subject choices at GCSE and A-level. The project has been very successful. A pilot activity day based on the University of Plymouth model was run by UWE at a Bristol school for 270 year 8 pupils in November. The aims of the day were to:

- inspire pupils with respect to STEM subjects
- encourage pupils to aspire to university to study STEM subjects (do they choose to study science)
- promote future careers in science, engineering and maths
- connections/enhancement with school STEM curriculum.'

The evaluation of the pilot UWE activity day indicates that the day was very successful and the aims above achieved a positive response

Background

Schools are asked to accommodate external initiatives from a wide variety of sources and can suffer from overload with respect to scheduling all the initiatives on offer. An efficiency saving for schools is for the STEM activities to be collated into one day. It is also good for pupils, who may not be encouraged to take separate sciences at GCSE, to see how the different STEM subjects interact. It is good to expose pupils to possible STEM interactions rather than each subject being seen in isolation. In particular it is important that pupils appreciate the key role of mathematics in all the sciences. The University of Plymouth STOP activity is a model for delivering STEM activities in one school visit. UWE staff with experience of school activity work are interested in the good practice developed by Plymouth and learning from them.

HEIs do not have an infinite resource to run school liaison activities. The activities therefore need to be efficient with the use of resources, particularly staff time, but they need to be of high quality to achieve the result of attracting potential students to STEM subjects. The HE staff would have to find the STEM resource straightforward to run with little preparation time. The activity would have to be shared among many staff in order to reach a large number of schools in the region.

The partnership between the two universities can develop current activities for use in future STEM liaison work. Past experience with schools by both Plymouth and UWE suggests that for years 8-10, schools prefer visits to them rather than the pupils visiting the university.

The STEM activity day provides an excellent opportunity to promote the resource MMG in a Box which has been sent to every secondary school in England. The resource was promoted through the established STOP days by the University of Plymouth.

Implementation

The outputs of the project were

1. Two activity days: one run by Plymouth and a pilot day by UWE based on the University of Plymouth model.
2. Evaluation by UWE staff of the STOP activity run by the University of Plymouth.
3. Evaluation of the pilot STOP activity run by UWE with input from the stakeholder population.
4. Evaluation by University of Plymouth staff of an existing outreach activity run by UWE.
5. Dissemination of MMG resource, MMG in a Box, through STOP activity days.

Good practice was shared through university staff visits: University of Plymouth staff visited UWE in May to view a FunMaths Roadshow run by UWE staff. Similarly, UWE staff visited a school in Devon in June to view a University of Plymouth STEM activity day (STOP day). Both visits are documented in the interim report. Based on experience gained from the visit to the STOP day, UWE staff put together a UWE STEM activity day. Some of the ideas from the STOP day were used and other new activities based on UWE staff expertise were developed. The UWE STEM day consisted of the following six activities:

1. Dynamics
2. Bubbles
3. Aerodynamics
4. Sound
5. Microscopic Life
6. Genetics

We arranged for an external evaluator to view the pilot UWE STEM activity day. Alison Hooper and the evaluator, Sue Ponting, put together a questionnaire which was completed by all pupils who took part in the activity day. From the data provided by the questionnaire and from interviews with some pupils and teachers afterwards, the evaluator was able to measure the effectiveness of the UWE STEM Activity Day.

The MMG in a Box was disseminated through the established STOP days run by the University of Plymouth to 15 schools in June 2010.

Barriers

A key feature of the project was the implementation of a UWE STEM Activity Day based on the STOP activity run by the University of Plymouth. The activity day run by UWE was a great success, see Evidence of Success below but it was expensive to run. The pilot day cost £2056.39. That includes the staff costs of 12 student ambassadors, 1 technician, 3 academic staff and travelling expenses. It does not include the liaison time with the school before the event, (approximately ½ staff time) or the training of the student ambassadors before the event (£163.68). The resourcing of staff time to run such events is often undervalued. The pilot demonstrated that a successful day can be run. We will be working towards reducing staff costs in future STEM days, particularly those of the academic staff reducing cover from three to two or possibly one staff member. Nevertheless it should be noted that established University of Plymouth STOP days cost £1104 per school visit.

The project required a school in which to run the pilot. Bristol Local Authority was instrumental in finding us a school and arranged for meetings in advance to work out how the day would run. Bristol Local Authority were not involved at the inception of the project

proposal but were involved from the start of the project itself. A representative joined us for the visit to the school in Devon and his input was invaluable with deciding what the aims and objectives of the STEM Activity Day should be.

The activity day requires careful planning with the school and close liaison with the school beforehand was vital. After an initial meeting with the school, we agreed to run the STEM activity day for 270 year 8 pupils. This was quite different from the STOP activity day of the University of Plymouth that we had viewed. The day was highly structured. Three batches of 90 pupils (split into six groups of 15 pupils) rotated around the six STEM activities, spending 12-15 mins at each activity. Each activity was manned by two student ambassadors. We kept to the strict timetable - Batch 1 9.00-10.30, Batch 2 11.00-12.30, Batch 3 13.15-14.45.

The school did not foresee that the UWE staff would require refreshments during the day such as bottles of water and lunch. This should be sorted out during liaison with the school prior to the STEM activity day.

It can be difficult to find an independent evaluator. We were lucky that Sue Ponting agreed to carry out the evaluation at relatively short notice.

Enablers

The STEM project enabled us to share good practice between the University of Plymouth and UWE and gave each institution ideas about developing new initiatives.

The project enabled us to create good STEM activities for the UWE STEM Activity Day. The activities themselves required careful planning and three key staff involved (Ben Drew, Darren Reynolds and Alison Hooper) met regularly to review progress. Input from technical staff was essential with technical staff building equipment and helping to develop ideas.

The school provided a good venue for the day, a large hall with seating to one side and sufficient power sockets for the equipment. The school staff kept discipline throughout the day so that the student ambassadors could concentrate on showcasing the activities.

The evaluator and project leader discussed beforehand the aims of the STEM Activity Day and together they constructed an appropriate questionnaire. Sue Ponting has done an excellent job assessing the response and provided us with a very useful evaluation with some suggestions for further development.

Evidence of Success.

The project successfully met all five outputs (see Implementation section) of the project and achieved all project milestones. UWE ran a pilot STEM Activity Day at Brislington Enterprise College for 270 year 8 pupils on 17 November. The day was based on a fact-finding visit to a STOP day run by the University of Plymouth at Honiton Community College on 9 June.

Sue Ponting evaluated the UWE STEM Activity Day. Her report (attached) demonstrates that there was a very positive response to the activity day, with an overall positive response to the aims:

1. Inspire pupils with respect to STEM subjects. Students clearly enjoyed the activities finding them both interesting and fun.
2. encourage pupils to aspire to university to study STEM subjects and
3. promote future careers in science engineering and maths

In a summary of her recommendations, she says

- Overall the day was well received and marked the beginning of a process of developing this type of experience to promote pupils understanding of STEM careers.
- This was an engaging, interesting and fun experience for pupils at BEC which will have a positive impact on their perception of STEM subjects.
- Teachers were also enthusiastic about the experience for their pupils.

Quality Assurance

A Risk Assessment for the UWE STEM Activity Day was carried out before the visit and sent to the school for comment and adjustment.

Reports were written of all visits between UWE and the University of Plymouth.

The funding body HE STEM was kept informed of progress through the interim report and report attachments of all visits.

Recommendations to others.

Enthusiastic academic and technical staff are key to project success. Staff time is always underestimated. Time spent liaising with the school before the visit was not factored into the project beforehand.

Contact with schools and/or the local authority is essential before embarking on a similar project. Without the support of Bristol Local Authority, we would not have been able to arrange a pilot STEM Activity Day.

Other

Another output of this project was that a contents list (including what material is appropriate for which age group) of the MMG box was produced by Hazel Kendrick of the IMA. We believe that this was useful to teachers who otherwise had to work through the CD's to find out what might be useful to their pupils and should have been included in the original box.

The Plymouth STOP visits indicated that several of the boxes had not been opened by schools (some denied having received them when rung by Martin Lavelle before the STOP visit) although others had been studied in some detail by appreciative school teachers. Boxes were in every visit eventually found to be present in the school. One school requested further copies as one teacher had sole use of their box. Around 30 more boxes were distributed at a meeting for mathematics teachers in Plymouth in July 2010 where Hazel Kendrick held a workshop explaining the contents of the box. Although it is prohibitively expensive to visit every school, we feel it is important to explain the contents of the box at a wide range of regional and LEA meetings or many of the boxes will not be used.