GO STEM!
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Abstract
The Department of Engineering, Colleges-University of Leicester Network (CULN) and School and College Services (within the University of Leicester) worked with schools and colleges in Leicestershire to offer a package of outreach support to teachers and students which included Continuing Professional Development (CPD), an integrated STEM event and an e-mentoring system to facilitate interaction between students in schools and colleges and higher education (HE) engineering undergraduates. This project aimed to encourage progression to HE in STEM subjects, specifically in engineering. Several objectives were set. It aimed to provide a full outreach package for level 2 students (particularly those from under-represented groups and difficult to reach areas) and their teachers which would encourage progression to higher level study in STEM subjects and progression to HE generally. The project aspired to improve and create new links with colleges and schools in Leicestershire. The promotion of long term communication between engineering staff at the university and teachers in schools and colleges was also a major focus of the project – this will be facilitated by CULN and School and College Services beyond the lifespan of the project. It is anticipated that the project will also provide access to and promote long term communication between level 2 students and undergraduate engineering students through an e-mentoring system. The university students will be trained using the university’s existing Student Ambassador provision. Finally, the project delivered an integrated STEM event which included input from the departments of maths, chemistry, geography, physics, engineering and biomedical sciences.

The project had several outcomes. The University of Leicester has developed strong, sustainable links with local schools and colleges and we plan to repeat the event which was delivered through this project on an annual basis. We also intend to repeat delivery of the teacher CPD which was run by the Department of Engineering.

The project was successful in that it enhanced understanding amongst level 2 students (with a particular focus on difficult to reach and under-represented groups in the region) about studying engineering at HE level and the opportunities that this could present.

Keywords: Outreach, Widening Participation, CPD, E-Mentoring

Background
Through the GO STEM! project, we worked with five schools/colleges from across the East Midlands. The project targeted level 2 students studying A Level maths or physics who were therefore eligible to apply for HE engineering courses. Due to the enthusiasm of school staff, the project was expanded to include some level 1 Gifted and Talented students. GO STEM! worked with 71 students in total.

The first half of this project focused very much on the teaching staff (11 in total) in the schools and colleges with which we worked. We felt that this was extremely important as school/college staff are often expected to inform students about engineering courses when they may be science or design specialists themselves. The second half of the project centred on students through an interdisciplinary STEM event and e-mentoring, focusing specifically on engineering. Students in
schools and colleges were paired with engineering undergraduates. The project looked to successful projects, such as the London Engineering Project (http://www.thelep.org.uk) that also used e-mentoring as a platform for outreach intervention.

Rationale
This project addressed key issues regarding progression from level 3 to HE. Statistics reveal that 57% of young people gained level 3 qualifications and 36.9% progressed onto level 4 courses in Leicester in 2008; however, only 23.4% progressed onto HE courses, compared to 30.5% nationally. There are concerns about white British students progressing to HE in the Leicester City area, with only 17% doing so (LSR Online, 2010).

The East Midlands accounts for 9% of all engineering employment and 9% of all UK engineering establishments. In the CBI’s Annual Skills Report (2010), 17% of engineering institutions in the East Midlands reported skills gaps. The main skills cited as lacking were technical and engineering skills at all levels. It is clear that the work undertaken by this project was required to meet the needs of the sector and to create a strong economy in the East Midlands and UK as a whole.

The approach we took was inspired by the London Engineering Project and, given the strong existing links between the university and local schools and colleges, it was decided that this was a format that could be sustained beyond the life of the project.

The approach
The Colleges-University of Leicester Network (CULN) and School and College Services at the University of Leicester already had strong links with schools and colleges across the region, although not specifically with teachers of engineering-related subjects. Through these established links and the East Midlands STEMNET team, we were able to make further links with science teachers in schools/colleges across Leicestershire. We initially sent out a brief project overview (see Appendix 1) which informed teachers of the aims and objectives of the project, timescales, activities and participation criteria. We received expressions of interest from the schools/colleges with whom we proceeded to work.

The Project Coordinator met with each member/s of staff in each of the schools/colleges to discuss the project in more detail and to obtain information about the student cohort that would be involved with the project (this included gender, year of study, subjects being studied and home postcode) which would help us to evaluate whether or not the project had met its objectives.

As well as meeting with teaching staff from schools and colleges, the Project Coordinator also worked closely with university staff to begin organising a teachers’ Continuing Professional Development (CPD) day which would be run by the Department of Engineering. Teaching staff from the schools and colleges came along for this day (in April 2011) which introduced them to hands-on workshops based around the first year of an engineering HE course (see Appendix 2). They also had the opportunity to hear from the Department of Engineering’s Admissions Tutor about UCAS applications and how they are processed.

The Project Coordinator and a representative from School and College Services then began recruiting undergraduate engineering students to be trained as e-mentors later in the project. University staff talked to students about the project during lectures and also sent information to them via their personal tutors. Once they had expressed an interest in getting involved, students were invited to attend group interviews where they were given role-play scenarios and asked about their perception of mentoring.

Successful undergraduates who were invited to become e-mentors were then given in-depth training pertinent to working with young people and in line with the university’s existing Ambassador Scheme training. They were also trained on how to use the e-mentoring platform and how to communicate with their mentees.

As part of the project, all of the participating level 2 students were required to attend an interdisciplinary STEM event organised by the School and College Services within the university. Although several departments were involved in the event and offered interactive workshops,
project students were required to attend mandatory workshops within the Department of Engineering. They were then able to choose workshops from the other departments. This event took place in June 2011 and occurred prior to school/college students beginning their mentoring.

University staff then visited the participating schools and colleges and trained the students on how to use the mentoring software. From this point on, students had the opportunity to interact with their undergraduate e-mentors not only about engineering specifically, but also more generally about university life. We asked a teacher in each of the schools/colleges to be responsible for enabling and promoting mentoring activity.

Where requested, follow-up visits were made to the schools and colleges by both Department of Engineering and School and College Services staff. All links made with colleges and schools through this project will be sustained by CULN. An engineering working group will be established and staff from both schools and colleges (as well as from the university and external agencies, as appropriate) will be invited to meet twice a year to discuss further events and activities that could be implemented in the future. This will ensure long term communication between the University of Leicester and engineering teachers and students across the region. CULN’s expertise in this area will ensure an active and dynamic working group.

This approach ensured that we would provide both teachers and students with an outreach package focusing on engineering within HE. It also allowed for sustainability beyond the life of the project.

Evaluation

We decided to evaluate the project by asking for feedback from every teacher and student in the schools/colleges that took part in the project (see Appendices 3 and 4). We asked for more in-depth analysis from one student from each school or college and from the main teacher responsible for the project in each school/college (see Appendices 5 and 5). We were also able to analyse participant data and verify that we had reached working class white males, highlighted as a particular challenge in this area.

Analysis of completed evaluation forms/case study forms received from the schools/colleges has been challenging. This is mostly due to the fact that we have not received the feedback that was agreed upon with teachers at the beginning of the project, despite giving plenty of time and reminders for the evaluations to be completed. We have only received the full evaluation documents from one of the schools, a teacher and student case study from another of the schools, a teacher case study from one school and nothing to date from the two remaining schools. This is obviously very disappointing. However, we do feel that lessons can be drawn from this lack of response in the final stages of the project.

Student feedback

Students had very much enjoyed the workshops on offer at the interdisciplinary STEM event, with one stating that she had adapted ideas from one of the workshops to help inform the A2 research element of her coursework. Another stated that taking part in the project had helped her to ‘firm up knowledge about university’. 100% of students reported that they had enjoyed taking part in the GO STEM! project and that the project had given them more of an understanding about pursuing engineering as a subject at university.

Unfortunately, the e-mentoring element of the project was less well received. Students reported that they did not have the time to make use of their assigned mentor. A lack of rapport and communication issues were also cited as barriers to making use of the undergraduate e-mentors. 62.5% of students felt that e-mentoring was not an effective support mechanism. This feedback has informed us that we need to choose our undergraduate mentors even more carefully in the future and that it would also be expedient to incentivise their use.

Teacher feedback

Teachers commented that engineering opportunities were ‘few and far between’ and this project presented a ‘great chance’. They all enjoyed the teacher CPD event, commenting that it provided a good opportunity to see ‘the facilities the university has to offer’. One teacher ‘enjoyed meeting
other staff and having a hands-on experience’. Teachers commented that students were more inquisitive about university life/studying to degree level during participation in the project and that it had given their students a better understanding of studying engineering at HE level.

All of the teacher case studies highlighted that teachers didn’t think the e-mentoring element of the project had worked for their students. They felt that a bond between the undergraduates and school/college students had not been created and that students had either avoided or not found the time to make contact with their mentor.

Teachers commented that they had felt unsupported throughout the latter stages of the project. This could be attributed to changes in university staffing which caused confusion and a lack of cohesion throughout the project. One teacher stated that although ‘support by individuals [at the university] had been very good […] three different people in charge of the project had inevitably caused difficulties’. 67% of teachers stated that they would like to continue working with the university, particularly the Department of Engineering, beyond the life of this project. One stated that the chance to do so would be ‘inspiring for KS4 and KS5 students in the future’. Another teacher commented that he hoped that they could ‘continue the links that we have [with the university] and develop them further.’

**Discussion, summary**

The visits to the university by both the teaching staff and students were very well received and the university would definitely like to repeat this on an annual basis. A physics teacher claimed that ‘teachers really valued the opportunity to visit the engineering department to gain a better understanding of their undergraduate experience’. However, the approach to the e-mentoring aspect clearly needs to be carefully considered in the future. Because this project was based in engineering, the pilot phase targeted engineering undergraduates as potential mentors. As well as the challenges faced in terms of time, there were also issues about the balance of UK and international students taking part. International students are often keen to become engaged in volunteering activities but, depending on their country of origin, are often ill-prepared to work with young people in British schools where the cultures of learning are very different from those experienced at home. These undergraduates experience even the best-behaved British classrooms as disruptive, and their expectations of their mentees in terms of commitment and enthusiasm is often unrealistic. The team were aware of this and, as anticipated, two thirds of the undergraduate volunteers were international students from countries where the learning culture is respectful of teachers and authority and questioning is discouraged. This challenge was tackled through training but, despite this, some mentors still had difficulties understanding, for example, why they had to work so hard to engage their mentees.

The corollary to this is that, in some of the county schools, pupils being mentored had very little experience of communicating with peers from another culture. Future recruitment of mentors will be across the STEM subject areas and not limited to engineering. We will also need to work more closely with the teachers in the schools and colleges to ensure that the students are regularly encouraged to use the mentoring opportunity (by integrating it into homework, etc.).

Despite the challenges faced with the e-mentoring element of the project, we feel that the project has been a success in engaging with and inspiring level 2 students from under-represented/hard to reach areas. We are also happy with the sustainable outcomes of the project and will continue to link up with the project schools/colleges on a regular basis.

**Further development**

Repetition of the interdisciplinary STEM event and e-mentoring projects have been rolled out in other areas of the university with a greater degree of success (i.e. Medicine). We also plan to set up an engineering working group to be coordinated through CULN.
References

Further reading/bibliography

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