Developing employer engagement in STEM through career mentoring
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Abstract
The Sheffield Hallam University Career Mentoring Scheme aimed to enhance the employability of engineering students by introducing mentoring partnerships between a student and an employer (i.e. a professional from industry in a job role/organisation that was of interest to the student). As students were mentored by experienced professionals from the workplace, the scheme enabled them to:

- research career opportunities
- create a network of contacts
- gain a better understanding of the typical tasks, requirements and expectations or job roles of interest to them and thereby enable them to make more informed career choices
- enhance confidence in/understanding of skills required in industry and how these can best be projected in job applications and at interview
- see the relevance of their studies in the workplace
- understand the role and value of professional bodies and the process of chartership and ongoing professional development beyond graduation
- develop their (inter)personal skills.

The scheme encouraged employer engagement by building links with alumni, professional bodies, employer networks and STEM Ambassadors.

Keywords: career, mentoring, professional development, career management, employability, engineering, maths, undergraduates, alumni, professional engineers, transferable skills, autonomy, university and industry partnerships

Background
Sheffield Hallam University (SHU) Careers Service has been running a generic Career Mentoring Scheme for a number of years, initially as part of the Impact Programme (a career coaching and employability development scheme) which proactively targeted students from widening participation backgrounds. It was noticeable, however, that although the scheme had established a reputation within some subject areas and faculties, engineering and maths students had not actively engaged with it. The HE STEM Programme support provided the opportunity to develop the scheme specifically for engineering and maths students, identifying appropriate industry-based mentors and modifying materials specifically for mentees from these subject areas.

Rationale
The project aimed to increase students' exposure to employers and enhance links between HEIs and industry.
Recent graduate employment data from, for example, the Guardian League Table (2011) and the National Student Survey (2010), illustrated the need for STEM departments in higher education institutions (HEIs) to do more to help students develop the necessary employability and non-subject specific transferable skills. A lead article in the Times Higher Educational Supplement claimed that ‘as graduates struggle to find employment, universities are having to think more creatively about how to prepare them for the workplace’ (Atwood, 2010). One very important step that can be taken is to put students directly in touch with employers in the workplace.

The project addressed the issue of diversity by particularly targeting students who, through reasons of ethnicity or gender, may be disadvantaged in terms of gaining graduate employment. The opportunity to meet with a mentor from industry was available to undergraduate engineering and maths students in any year of study.

It was envisaged that, as well as the generic benefits outlined above, level 4 students could specifically benefit from meeting with an industry-based mentor as they would have the opportunity to gain insights that would enable them to plan ahead and make the most of their time at university. For example, it might help to inform module choices most appropriate to their future career goals and help them to set a personal development “action plan” of activities they could get involved with, societies they could join or other extra curricular opportunities they could undertake in order to develop the skills, knowledge and experience appropriate to their longer term professional goals.

It was also expected that the scheme would be useful to level 5 students who were preparing for placement or those who wanted to get as much experience as possible before they entered the busy final year.

For level 6 students, the scheme would help to explore options, consolidate placement experiences or enhance their CV and expand their network of helpful contacts.

Sheffield Hallam is a very inclusive university, so whilst mentoring was offered to all students, it aimed to attract applications from diverse groups of students, especially those traditionally under-represented in the workplace. Where students don’t have connections in the employment sector to which they aspire, their ability to get valuable first-hand insights into the workplace is restricted, making it difficult for them to make well informed decisions about their future. The scheme aimed to extend to such students the opportunity for informal career planning advice.

The approach

The Career Mentoring Scheme introduced a student to a career mentor (i.e. a professional in a job role or organisation of interest to them). It was suggested that the student should arrange to meet their mentor four times over the duration of the academic year. The students were encouraged to take the lead in the partnership, identifying their objectives, negotiating the agenda with the mentor, organising and making notes of the meetings and following up on any action points agreed. By taking this proactive role, it was expected that the students would not only gain valuable insights into a job role, but also develop their personal and professional skills. Supporting framework material, including a mentee journal and a mentor “essentials pack”, was provided to all participants and included suggested agendas, action plans, objective-setting exercises and a skill development journal where students could record their personal and professional development learning process. This approach was designed to prepare them for future professional development activities and the process of gathering the evidence required when working towards Chartered Engineer status.

The approach taken to setting up the mentoring scheme had several phases; namely, recruiting the mentors, recruiting the mentees, training and induction for participants, matching and monitoring the partnerships, through to the final “celebration event” and evaluation of their experience.

Potential mentors were contacted/recruited using a variety of means, including email requests through networks within the university such as:

- the alumni association
- personal/professional contacts of the maths/engineering department's teaching team
local employers from engineering organisations who had advertised vacancies and opportunities with the careers and employment service in recent years

organisations who had attended engineering recruitment fairs run by the universities in Sheffield

employers who have recruited placement students

the university's pool of STEM Ambassadors.

Networks external to the university were also targeted with email requests. These included:

- the Chamber of Commerce
- posting messages on relevant LinkedIn discussion boards
- professional bodies such as the Institution of Mechanical Engineers (IMechE) and the Institution of Engineering and Technology (IET) who were approached to circulate details of the career mentoring scheme amongst their regional membership.

Particular mentor requests from the students were also pursued. For example, where students wanted to target a particular organisation, the scheme coordinator “cold-contacted” organisations and/or encouraged and supported the students to take the initiative to approach organisations for themselves to request mentors appropriate to their choices.

All mentors applying to the scheme were met on an individual or group basis in order to find out more about their experience, background and expectations of the scheme.

Students were notified of the scheme in a number of ways:

- announcements were posted on the course virtual learning sites
- information about the scheme was included in start of year induction talks
- details were posted on the careers service vacancy website
- plasma screens and computer screensavers around campus had an “advert” about the scheme streamed to them
- the scheme coordinator went into lectures for targeted groups to give brief presentations about the scheme and the mentors available
- the placement team posted details on their virtual learning site
- course tutors were emailed about the scheme and choices of mentors available so that they could refer students to the scheme if appropriate.

Students applied to the scheme using an application form on which they identified the type of mentor required, explained their reasons for applying and what they hoped to gain from taking part and identified what they had done so far to pursue their career ideas and any challenges they felt they faced in the job market. All applicants were then invited to an interview where their expectations of the scheme were discussed in more depth and mentor preferences shortlisted. The interview was arranged not only to test the students’ motivation, time management and communication skills, but also to clarify their understanding of the requirements and commitments to the scheme, to identify/expand their objectives from meeting with a mentor and to ensure that their expectations were realistic.

A mentoring induction event for both mentors and mentees was then arranged. This event ensured that participants were clear about the commitments and expectations of the programme, that they understood the boundaries and ground rules of mentoring and had the chance to practise some mentoring skills. The event also provided an opportunity for informal networking where students could meet mentors and potentially find a match suitable to their own requirements. Those joining the scheme after this launch event had a one-to-one “preparation for mentoring” meeting as part of their interview for the scheme and selected their mentor based on the information provided on the mentor’s application form and information gained by the scheme coordinator during the mentor’s induction meeting.
Once mentoring partnerships were introduced, they were on the whole “left to get on with it” and monitoring of partnerships was kept to a minimum in order to encourage the students to be autonomous learners. Feedback was requested after the mentoring pair’s first meeting in order to confirm that they were satisfied with the allocated match and were happy to proceed. They were also invited to an optional mid-way review and an informal networking event which was an opportunity to share ideas and demonstrate materials and resources available in the careers and employment service that could support the mentoring pair in meeting their objectives (e.g. interview videos, application guides, online resources, etc.). A monthly email with a mentoring “top tip” was also sent to students to maintain contact with them and suggest ways in which they could continue to make the most of the opportunity and maintain the momentum of their mentoring partnership. It was also an opportunity to pick up on any issues arising that needed to be addressed or find out about students’ achievements along the way.

A celebration and evaluation event was arranged for the end of the scheme in order to provide the opportunity to review the experiences of both mentors and mentees. Evaluation questionnaires were also circulated and mentees were asked to submit a summary report reflecting on their experience, the skills gained, their insights into their own personal and professional development and any future actions they were going to take following the mentoring experience.

**Evaluation**

Participants in the scheme acknowledged that career mentoring provided valuable experience and contributed to employability development initiatives for engineering and maths students. 28 maths and engineering students applied to take part in the scheme, with 22 being introduced to mentors and six withdrawing their applications (citing pressure of work as the reason). 27 professionals from a range of career options allied to maths and engineering applied to volunteer their time to meet with a student from these subject disciplines. They joined a pool of 100+ other mentors who were part of the established generic scheme, many of whom could also have been suitable for maths/engineering students exploring a wider range of career options (e.g. finance, procurement, marketing and law).

Although it was suggested that the mentoring pairs met four times over the academic year, the number of appointments actually held varied; some having just two meetings and some combining face-to-face meetings with email contact. Flexibility was needed, as most students quoted the time available within heavily committed academic schedules as the main challenge they faced preventing them from making the most of the scheme. Having said this, some pairs met more than the suggested four times or arranged work placement/employer visits as part of their mentoring together.

Information about students' experiences of the scheme was gathered through a variety of means. All students were asked to complete a single A4 side summary report reflecting on their mentoring experiences, how they used their mentor’s time, what they achieved/learned/gained as a result of the partnership and what they learned about themselves in terms of their professionalism.

Both mentors and mentees were also asked to complete an evaluation form about the scheme and all participants were invited to the aforementioned group evaluation and celebration event in order to hear about mentoring “stories” and experiences and to evaluate the scheme. Mentees and mentors were also presented with certificates to recognise their involvement.

Comments gathered from mentees through these reports, meetings and questionnaires included:

- ‘I got a placement!’
- ‘I had the opportunity to meet and establish a good relationship with my mentor’
- ‘Real insight into professional interview tips and CV was improved in a huge manner’
- ‘Gained insights into the industry’
- ‘Gained a lot of experience through talking and was helped all the way through’
- ‘My CV has improved immensely with the help of my mentor’
• ‘Gained focus into my chosen career path’
• ‘Might get an internship with my mentor's organisation!’
• ‘Know where to look to get the job I would like. Had a really good experience with my mentor’
• ‘You have opened up my mind and eyes in the renewable energy industry, particularly solar energy. Your insight and the advice you offered me today have expanded my horizons in my career path’
• ‘I have just met my mentor for the first time and already I have achieved more than I had expected’

Mentors comments included:
• ‘Learning about my mentee, life at university, pressures, thoughts on applying for jobs’
• ‘Good opportunity to meet current students’
• ‘Fantastic opportunity to pass on tips and knowledge on a one-to-one basis’

This project is ongoing and the evaluation conducted so far has been of an interim nature. As the project continues beyond this funded stage, further evaluation will be conducted and future publications are planned in which more detailed evaluation evidence will be provided.

**Discussion, summary**

**Recruiting students**

Despite widespread publicity using a variety of means, awareness of the scheme amongst engineering students and staff was poor. Face-to-face direct promotion by presenting the scheme during lectures or meeting staff individually to explain the mentoring opportunity to them proved more effective than email and “virtual” means of encouraging referrals into the scheme. This was an interesting contrast to other subject areas, where the mentoring scheme is well established and emails about the scheme and word of mouth from one cohort of students to the next are the most effective means of publicity. The reputation of such a scheme builds up over time and students prove effective advocates; hence it is important to establish case studies and encourage scheme ambassadors to help to promote it.

**Recruiting mentors**

Direct mail campaigns, contacting companies speculatively in an effort to recruit mentors from engineering companies or specialisms proved challenging. In the current economic climate and in a region where the majority of engineering firms are small and medium sized enterprises, engineers were not necessarily able to get involved in such community initiatives, with professionals often citing work pressure as a reason for not being able to volunteer to commit time and support to the scheme.

Sending publicity via connections with professional bodies proved more effective for gaining recognition of the scheme amongst their membership and recruiting mentors. Mentoring activities within professional bodies are a well established career development activity. However, there is no mentoring offered by the professional bodies for current engineering students. This career mentoring scheme targeted at students therefore filled this gap and complemented the professional bodies’ mission of encouraging membership and more active involvement.

Establishing more formal affiliations and partnerships with regional networks via professional bodies is to be encouraged. Similarly, establishing formal recognition of the experience for mentors and their organisations in terms of volunteering their time is valuable. For example, formally establishing that mentors can gain Continuing Professional Development (CPD) credits from involvement, ensuring that new graduate mentors are aware that the mentoring experience constitutes as evidence they can use in their portfolio of evidence for Chartership, helping organisations to use the mentoring opportunity as a training and development opportunity for their staff, to raise their profile on campus, for good PR or to demonstrate their commitment to diversity
and inclusion in the workplace or corporate social responsibility, it is possible to try to offer something in return for mentors’ involvement and aim for a “win:win” relationship for all participants.

Approaching companies with whom the university already has established contacts and “warm leads” proved an effective mechanism for recruiting mentors, with STEM Ambassadors, placement providers and companies known to recruit graduates from the university being the most effective recruitment channels. Offering mentoring as a low-risk, cost-effective way for a company to establish and maintain links with the university and academic community proved effective.

Timing
According to those who expressed a preference, level 5 was considered the ideal time to embark upon career mentoring. The scheme received applications from students in all years: a keen foundation year student wanting to join in order to help them decide about which specific engineering pathway to progress into after the foundation year, motivated level 4 students wanting to join the scheme to “set themselves apart from the crowd” while they felt able, students preparing for placement through to finalists who wanted to do more or go above and beyond their course to establish networks or who wanted to discuss their placement experience so they could face the reality of the competitive graduate job market confidently. This emphasised the need to not restrict the scheme exclusively to level 5 students, but to keep the offer of the mentoring scheme open to students for whenever they feel ready/able to consider career planning.

Although the scheme ran from November to May within the academic year, some mentoring pairs were not matched until January/February, thereby restricting the time available for them to meet during the remainder of the academic year. One possibility is to encourage earlier application to the scheme (i.e. at the end of one academic year in preparation for the next). Alternatively, it may be possible to offer the scheme around the year on a “roll on, roll off” basis and across summer vacations. This would add flexibility for the students and could mean that more would be able to take part and benefit from the experience without increasing the number of mentors.

Matching
Choice of the mentor was noted as one of the most important factors that determined the students’ recognition of the benefits of the scheme. Although most mentors felt able to help students across engineering disciplines and felt they were able to offer objective and practical career planning and job search support, in general students requested mentors that had a direct match to their career aspirations, preferring to have no mentor at all rather than what they considered to be a “generic” career mentor. Providing information on the background/experience of the mentor is essential in order to help the student make informed choices.

Offering the career mentoring scheme across all engineering disciplines therefore presented a challenge, as this meant that a wide range of mentors had to be found appropriate to the career aspirations and course backgrounds of students in areas as varied as electronics, aerospace, mechanical renewable energy and power engineering. It also meant that some mentors had volunteered their time by applying to the scheme but were not selected as a mentor and matched to a student. Managing the expectations of all participants was therefore paramount and maintaining relationships with mentors was important in order to sustain their commitment and support. A future development of the scheme will work with specific targeted course teams in order to ensure that the availability of mentors reflects the career aspirations of the students.

Having said this, some mentees recognised that the suitability of their mentor and the basis for making the match of mentor to mentee could be based upon many criteria, not just career path: ‘make sure you find the mentor that you believe will be best for you. Maybe their passion for things or hobbies is similar to yours as this can be really useful when wanting to break [the ice] and it enables you to socialise whilst working.’

Students liked to be involved in the choice of mentor. In the selection interviews they had the opportunity to shortlist and prioritise the mentors that most appealed to them, and the induction event also provided opportunities for mentors/mentees to meet informally and identify a mentoring partner with whom they would like to work. Several of the mentees identified the mentor of their choice in this way and appreciated the opportunity to meet other mentors/students and the group induction event.
Holding the training and networking event off-campus at a mentor's offices also helped to create the professional “standard” and expectation of the scheme, with students being introduced to business etiquette and workplace culture, amongst other things.

Progression

Partnerships that were not maintained over the academic year were mainly as a result of poor time management and the student not being able to cope with the pressures of work and study: ‘I am unsure however if I would still like to take part in the scheme. With my usual uni workload and with trying to secure a placement for next year and my part time job, I feel that I won't have the time to make full use of the scheme.'

Positive learning outcomes about professionalism and time management were still gained from a premature end to a mentoring partnership: "Since starting university I have signed up to so many meetings, organisations and committees that I have stretched myself foolishly. I won't be making the same mistake next year, I think my ambition got the better of me and I reached for too much. I appreciate the time that you would and have put aside for me and feel terribly guilty for disappointing you, and myself.'

Face-to-face meetings were valued by the mentees as most effective for professional relationship building, especially when mentees gained access to the mentor’s workplace, had the opportunity to meet colleagues, attend events with their mentor, gain insights into the work culture and even shadow or gain work experience.

One development for the future could be to explore other mechanisms by which mentoring pairs could work together. One student, for example, met his mentor in Singapore using Skype. This would have its limitations, but would obviously expand the range of mentors that could be recruited to the programme, would mean there is less of a regional emphasis to the scheme and could help international students wanting to generate contacts in their home countries.

Establishing an email mentoring scheme is another option, as this could mean that contact could be arranged to fit in more flexibly within the students’ limited availability. It would mean, however, that some of the more transferable skills that face-to-face mentoring would support may not be developed. Skill development and confidence are valuable outcomes of the scheme, especially for students from diverse social backgrounds where meeting with professionals from industry, even in the semi-formal context of mentoring and out of the “comfort zone” by meeting in a work environment, means that students are developing their social capital and building confidence, enabling them to better handle interviews and professional relationships: ‘I have learned that I am more confident than I thought. [The mentor] passed comment on this several times. I felt my communicating skills, face-to-face have improved greatly as a result of the scheme.'

Integration and sustainability

A steering group was established comprising staff from the careers service, placement team, maths and engineering academics, a student representative of the IMechE and a representative of a local Russell Group university's Engineering Gateway. Irrespective of the type of institution, strategies for sustainability were common. It was identified that, to ensure it was sustainable and became embedded within general practice, the scheme needed to be integrated within the “student journey” so it was clear to all parties where it fitted within a bigger framework and in the context of other activity both within the course and the university. The “topography” of students' learning was plotted and the inter-relationship of all the parts and the relationship to mentoring for different stakeholders was clearly seen, as illustrated in Figures 1 and 2.

Sustainability beyond the course or faculty structure was also secured when mentoring was written into the university's Access Statement as a means whereby students from diverse backgrounds could be offered additional employability support. This confirms its longer term continuity and demonstrates the university's commitment to developing and integrating it further.
Figure 1. Developing and reinforcing students' knowledge and skills, including employability skills
Further development

Through this pilot, the value of the Career Mentoring Scheme and how it complemented faculty-wide employability support was evident; however, it was also evident that to be sustainable it needed to be integrated within faculty-wide processes and systems. For future development, there are discussions to ensure that the Career Mentoring Scheme is:

- integrated within the Academic Learning Support Process for level 4 students. This academic support module “inducts” the student into university life and encourages them to see their course within the context of the university and the wider industry. The mentoring scheme will therefore be introduced to students towards the end of this level 4 module when they could be encouraged to apply in preparation for level 5
- presented to level 5 students during placement preparation modules undertaken by all students. It would be explicitly offered to complement the placement search process
- offered to all students who did not secure placement so they have an alternative opportunity to gain an insight into the workplace and to establish a professional network. Other level 6 students returning to university following placement would be offered the mentoring opportunity in order to help them “debrief” from placement and prepare for the graduate job search.

In this way, the mentoring could be integrated within a sustainable faculty-wide framework where its benefits could be explicitly set within the students' course experience.

The creation of the diagrams of the student journey which mapped out the contribution of various academic and extracurricular activities and how they fitted within the context of the students' experience and their development of personal/professional skills had a wider relevance beyond the faculty. The outcomes of Steering Group discussions and resulting “visual aids” have subsequently been presented to committees within the university and are now contributing to informing university-wide practice on student support Personal Development Planning (PDP) frameworks. This collaboration between the Careers and Employment Service (a central university service) and colleagues within the faculty has provided a conduit for learning from a faculty context to be presented to a wider audience and which will contribute to university-wide action groups.
Collaboration between the faculty and the central Careers and Employment Service has led to other valuable learning outcomes which can inform future development. The Careers and Employment Service has worked over a number of years to establish its generic Career Mentoring Scheme and, although having been successful in its task (introducing over 100 mentoring partnerships in an academic year), has worked in relative isolation for most of that time. Establishing a Steering Group for the purposes of this project has been invaluable for identifying a plan that integrates the scheme within the fabric of the faculty, helps to identify key influencers within the faculty and, at course level, has helped to get the scheme included in a number of faculty events (such as an Industry Day and Engineering Conference) and involved in developing a Women's Engineering Network. Having the insights and influences of colleagues within the faculty has helped to identify more appropriate communication mechanisms through which it is possible to promote the scheme, generate appropriate referrals into the scheme, recruit mentors and build on existing industry relations and alumni networks. This is a learning outcome that the scheme will adopt on a wider basis when expanding its outreach into other subject and faculty areas.

References

Further reading/bibliography


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