

Engineering Students' and Line Managers' Perceptions of Value of Work Placements in Higher Education

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A survey of views of current students and line managers on the value of supervised and assessed work placements was undertaken prior to placement. The students were from three engineering departments (Chemical Engineering, Civil Engineering and the Institute of Polymer Technology and Materials Engineering (IPTME)) at Loughborough University and line managers from 11 different companies which takes students on placement. Results indicated that the overwhelming majority of students valued work placements as a way of developing transferable skills, but about two thirds did not think that work placements would improve their degree results. Students particularly valued work placements for the experience, in order to improve their chances of 'getting a job when they finish university' and 'to give them an idea of what industry is really like'. Lowest values were given to the items 'because it is a part of the course', 'they need a break from education' and 'because they need money'.

There were some significant differences between students from each of the departments / engineering disciplines, between males and females and between those who are planning work placements and those who are not. Overall, students have a high expectation of work placements, in order to develop their transferable skills, whilst pursuing a full-time undergraduate engineering degree programme.

Eighty six percent of the line managers interviewed, considered that a work placement had a very strong or strong impact upon the transferable skills of the students. Most of the line managers stressed that work placements increased the confidence and maturity of the students. Communication skills particularly presentation and report writing were thought to improve. But also technical and practical problem solving, team working and time management. They also gained a knowledge of how companies operate and the experience helps them to decide on their careers. There was a divided opinion from line managers regarding the impact of work placements on the students academic performance. Fifty percent of the line managers didn't think that work placement will help students get a better degree.

Keywords: Work placement, sandwich placement, summer placement, transferable skills, work-based learning, engineering, skills.

1. Introduction

Work placements have been part of engineering education in the United Kingdom since the 1950's (Brennan and Little, 2006). They are usually in the form of a 'thick sandwich' of a year in industry in which, it is claimed, students gain valuable work experience and employers and industry in general benefit from the contributions made by students in the short and long term (Blackwell *et al*, 2001; Morris, 2002).

During the early years of implementing placements, it was not thought necessary to integrate the work experience into the degree courses. There was little emphasis on preparation for work experience, on supervising work placements or using the experience in courses after returning to University. Subsequently there have been attempts to justify and integrate work placements into the structure of degrees, not wholly with success (Pickles, 1999, Ryan *et al*, 1996).

The sandwich principle has been characterised as founded upon 'the interaction of academic study and practical applications such that each serves to illuminate and stimulate the other' (Crick Report cited in Nixon, 1990). The purpose of the work based learning gained in placements has been variously described as gaining 'employability', 'transferable' or 'generic' skills, developing an understanding of world and work organisations, and understanding the 'real world' application of skills (Ryan *et al*, 1996 Kerawala *et al*, 1998, Pickles, 1999, Baird, 2005).

Of these arguments perhaps the most persuasive is the role of work placements in developing 'transferable skills' since these are arguably the basis of applying knowledge and understanding of work and of the work place. The transferable skills developed on work placements, may feed back to academic study and provide a foundation for the transfer of these skills when the students enter the engineering or other professions. However the precise nature of transferable skills is open to dispute (Bennett, Dunne and Carre, 2000).

As indicated above, the term 'transferable skills' is often used interchangeably with employment-related skills, generic skills and personal transferable skills. (Fallows and Stevens, 2000, Chadha, 2005). Bennet, (2002) defines transferable skills as the skills "needed in any job and which enable people to participate in a flexible and adaptable work force". This definition provides a useful basis for identifying a list of important transferable skills and many such lists exist (Bennett, Dunne and Carré, 2000, Dearing Report, 1997, DfES, 2005, MIT-Cambridge, 2006).

The study was undertaken in order to explore students' perception and expectations of work placements immediately before they went on placements, which may influence what they gain from placements. Also to explore the Line Managers' perception of the values of work placements to the students in developing their transferable skills

2. Methods of data collection and analysis

A questionnaire was designed, piloted, and administered to 107 current engineering students at Loughborough University during class time, one month prior to the summer vacation when placement students will be starting their work experience. All the students completed the questionnaire which consisted of structured questions on placements and transferable skills.

Also a semi-structured interview schedule was designed and piloted to fifteen line managers from 11 different engineering companies. These companies were: Lubrizol Ltd., Tyco Electronics, BP, Balfour Beatty, Interserve, British Sugar, Diageo, Rolls Royce, Cytex Engineered Material Ltd., Smiths Medical.

The interviews were recorded and transcribed and analysed by the researcher. An independent observer checked the categories and carried out a blind analysis of a sample of the transcripts. The correlation between the researcher and the observer analysis was 1, which indicates a high degree of inter common reliability.

This paper reports the main findings. Means, standard deviations and the percentage coefficients of variation (CV) were calculated to measure the central tendencies and range of scores, to provide a measure of the reliability of the scores, to enable the rank orders of students' responses to be identified and to distinguish between means with the same value. In these cases, the mean score with the lowest coefficient of variation was deemed to have the higher rank. Chi-squared tests, uncorrelated 't' tests and Spearman's rank correlation were used to identify significant relationships within the data. The conventional levels of significance were used: $p < 0.05$ is statistically significant, $p < 0.01$ is highly significant and $p < 0.001$ is very highly significant. The analysis of the results was undertaken with SPSS version 14.

3. Profile of the students' characteristics

Of the 107 questionnaires completed, there were 84 male and 20 female respondents and 3 did not indicate their gender. The age range of the sample was from 19 to over 23 years of age. Twelve of the students were international, 91 reported they were UK/EU students and 4 did not respond. One hundred and three students were second years, 1 was an Erasmus student and 3 did not complete this question. Forty nine of the students were from Civil Engineering department, 33 from Chemical Engineering and 25 from IPTME (Materials Engineering). Eighty seven students expected to do work placements and 18 reported they were not doing work placements and 2 did not respond. Seventy four percent of students had an experience of work in engineering or other work experience prior to their courses. Field of interest, company location, followed by the size of the company were the most important factors that have influenced their choice of company. Fifty eight students were not concerned about the size of the company, 18 preferred to work in a large company, 26 in a medium company, 3 preferred to work in a small company and 2 students did not respond. Sixty seven percent of the students preferred to work in companies close to their family home and friends in UK.

4. The perceived value of work placements - Students

Ninety per cent of the students agreed or strongly agreed that work placements would help them develop their transferable skills but, again, taking agree and strongly agree as a measure, only 35.5% thought it would improve their grades on return to University, whilst about 65% thought that it would have little effect upon their academic performance.

Two further questions in different parts of the questionnaire were asked concerning the specific value of work placement for developing transferable skills. In response to the question 'is a degree which includes a work placement more effective for the development of transferable skills than a degree course without?' Ninety four percent of the placement students said 'Yes' compared with only 67% of the non-placement students. Not surprisingly, there was a significant difference between students going on placements and those who were not ($\chi^2 = 10.0$, $df = 1$, $p < 0.02$). As a cross-check, the second question asked was "if you were to do (or are

doing) a work placement, would you expect it to improve your transferable skills?" Again 94% thought that work placements would help them improve their transferable skills, while 3% didn't agree and another 3% did not answer this question. Again, there was a significant difference between placement and non-placement students ($\chi^2 = 15.6$, $df = 1$ $p < 0.02$). One hundred percent of the placement students agreed with this statement compared with 82% of the non-placement students. There were no significant differences between placement and non-placement students, between genders or between engineering disciplines on these issues. The concordance between these sets of results confirms that students value highly work placements as a means of developing transferable skills.

Students particularly valued work placements for the experience to improve their chances of 'getting a job when they finish university' and 'to give them an idea of what industry is really like'. Lowest values were given to the items 'because it is a part of the course', 'they need a break from education' and 'because they need money'. But, not surprisingly, there were significant differences between placement and non-placement students on the value of placements. Overall, placement students valued placements more than non-placement students (Placement mean (P_x) = 54.39, non-Placement mean ($nonP_x$) = 50.38, $p < 0.05$). Placement students differed from non-placement students in their views on: 'to improve their chances of getting a job' ($P_x = 5.48$, $nonP_x = 4.78$, $p < 0.001$), 'to give them an idea of what industry is really like' ($P_x = 5.27$, $nonP_x = 4.78$, $p < 0.05$) and 'the year in industry counts towards getting their Chartership' ($P_x = 4.70$, $nonP_x = 4.11$, $p < 0.05$). Females were less likely to report that 'they needed a break from education' ($F_x = 3.50$, $M_x = 4.20$, $p < 0.05$) or 'because it is part of the course' ($F_x = 2.50$, $M_x = 3.46$, $p < 0.01$), more likely for 'Personal Development' ($F_x = 5.35$, $M_x = 4.71$, $p < 0.05$), 'it will be an opportunity to apply theory' ($F_x = 4.85$, $M_x = 3.95$, $p < 0.05$), and 'it will help them to choose what to do in their final project' ($F_x = 4.50$, $M_x = 3.95$, $p < 0.05$).

5. The perceived value of work placements – Line Managers

13 out of the 15 line managers considered that a work placement had a very strong or strong impact upon the transferable skills of the students. Most of the line managers stressed that work placements increased the confidence and maturity of the students. Communication skills particularly presentation and report writing were thought to improve. But also technical and practical problem solving, team working and time management. They also gained a knowledge of how companies operate and the experience helps them to decide on their careers.

LM3 – "They mostly gain an appreciation of how things work/get done in industry. Those who are most able gain in confidence, learn how to work in teams, and learn about how to get their ideas across. Some are able to develop some ideas about how they want their career to develop",

LM8 – "They are learning to apply their chemistry knowledge in commercial environment, they usually almost all of them are becoming less shy, and lot more open, and a lot more happier to deal with people, obviously they are used to deal with the people of their ages but probably not that much dealing with adults or whatever, you see their communication improving a lot both written and oral and you see them gaining more confidence".

Almost all line managers preferred work placement of one year. Three main themes emerged: benefit for students, benefits for companies and obstacles. Most of the respondents focussed upon the benefits to their companies but they also considered the benefits for the students.

LM15 - “It gives the student a decent length of time to learn from the experience and also gives our company a chance to benefit from the placement”,

LM10 - “The students benefits the most from having a year placement, their contribution is much higher in the last 6 months compared to the first 6 months. So its much more valuable to both parties and it can take about 6 months before they really start to positively contribute”.

But some line managers thought that shorter placement did not benefit their company sufficiently. **LM5** - “Short placements are not worthwhile as it takes at least 3 months to understand the systems, procedures and processes before the Intern is able to contribute useful work. Summer placements are impossible because with summer holidays, there is never enough experienced staff to look after the Interns, with the lean manning now in the process industries”.

Others pointed out that the investment/training/supervision of the students for short placement is not workable. **LM9** - “Our industry sector requires close supervision for the first six months and its only in the second six months we regain the cost of supervision and training”.

6. The importance of developing transferable skills

Students were asked give their views on the importance of developing transferable skills. In descending order, the top four were ‘communication skills’, ‘working as a team member’, ‘problem-solving’ and ‘planning and organising’. The lowest ratings in ascending order were given to ‘management skills’, ‘research skills’ and ‘technical skills’. There were no significant differences between males and females, students from different departments or those going or not going on placements. Table 1 below summarises the students’ views on the importance of developing transferable skills. Most of the students thought that these transferable skills were important to develop on placements.

Table 1 – The importance of developing transferable skills

	1	2	3	4	5	6	Mean	Standard Deviation	%CV
Communication skills	3	0	0	3	26	74	5.56	0.94	16.9
Ability to solve problems	3	1	3	11	47	41	5.08	1.07	21.06
Ability to work as a team member	3	1	1	6	35	60	5.35	1.04	19.4
Planning and organising skills	2	3	0	13	56	33	5.03	1	19.9
Management skills	2	5	5	31	44	20	4.59	1.11	24.2
Technical skills	2	2	7	22	55	19	4.71	1.02	21.66
Personal effectiveness skills	3	1	3	20	48	32	4.92	1.07	21.75
Research skills	2	6	13	35	36	15	4.33	1.15	26.6
Information Technology skills	3	0	2	18	45	22	4.87	1.03	21.15
Decision making skills	4	0	4	22	53	24	4.79	1.07	22.3
Time management	5	0	2	17	44	38	4.97	1.17	23.5

1 = very unimportant, 2 = unimportant, 3 = slightly unimportant,
4 = slightly important, 5 = important, 6 = very important.

Table 2 below shows the comparison of the results obtained from line managers and the students on the importance of developing transferable skill and table 2 shows the spearman’s correlation coefficient .

Table 2 – Comparison between line managers’ and students’ feedbacks on the importance of developing the following transferable skills

	Students	Line Managers
Communication skills	5.56 (1)	5.53 (1)
Ability to solve problems	5.08 (3)	5.00 (4)
Ability to work as a team member	5.35 (2)	5.20 (2)
Planning and organising skills	5.03 (4)	4.67 (7)
Management skills	4.59 (10)	3.27 (11)
Technical skills	4.71 (9)	5.07 (3)
Personal effectiveness skills	4.92 (6)	4.87 (6)
Research skills	4.33 (11)	4.13 (9)
Information Technology skills	4.87 (7)	4.07 (10)
Decision making skills	4.79 (8)	4.13 (8)
Time management	4.97 (5)	4.93 (5)

Mean score on 1 – 6 scale: **1** = Very unimportant, **6** = Very important.

Table 3 – Spearman’s Correlation Coefficient

		Students	Line Managers
Students	Correlation Coefficient	1.000	0.715*
	Sig. (2-tailed)		0.013
	N	11	11
Line Managers	Correlation coefficient	0.715*	1.000
	Sig. (2-tailed)	0.013	
	N	11	11

* Correlation is significant at the 0.05 level (2-tailed)

As you can see from the table 3, there is a close agreement from line managers and students views on the importance of transferable skills, spearman’s rho ($\rho = 0.013$). The line managers and students regarded communications skills as the most important to develop followed by ability to work as a team member and ability to solve problems.

Management skills were not thought to be important by either group. The main disagreement was upon technical skills, line managers regarded this most important at work while students did not.

7. Benefits of placements to students

Most of the line managers stressed that work placements helped students to make and improve their careers choice and employability. **LM11** - “If the students does a good work placement, the biggest advantages, they might get a graduate job with us, if they do a good work placement we will then hopefully get them back as a graduates, so we can guarantee them a job hopefully”, **LM15** - “The student gains a better CV by being able to state they have worked for a certain time with, in our case, a high profile company. It therefore increases their chance of gaining employment in the future. It could result in a job opportunity within our company”,

LM1 – “Permanent job after graduating, confirming career choice”, **LM2** - “Students can either confirm (or otherwise) that they have chosen the right field of engineering for them, in addition to the confidence, self-esteem, communication issues mentioned above”.

8. Impact of work placement on academic performance and transferable skills

There was a divided opinion from line managers regarding the impact of work placements on the students academic performance. 50% of the line managers didn't think that work placements will help students get a better degree. But the main theme emerged from the line managers in this question, seems that they value work placements more.

When line managers were asked that, would they expect work placements to improve students transferable skills? All of them agreed and believe that some transferable skills can be developed better at work place as the students gets the opportunity to work in a team in a real work environment as well as learning a lot from others.

LM5 - “Opportunity to work in a Team in a real work environment. Communication and presentation at all levels. May be opportunities for formal training in time management, influencing skills, negotiating skills etc”,

LM15 - “The student is placed in a situation where he/she is using these skills daily and getting coaching and feedback on a regular basis”.

Another line manager thought that work placements, usually reveals what skills the students already has, more than actually developing them, **LM3** - “There should normally be opportunities to work in teams, solve problems, present conclusions, and recommend courses of action. But, ultimately, I think the work placement more usually reveals what skills the student already has, more than actually developing them”.

One line manager believe that, many of the skills could be developed reasonably effectively during the degree course. Another issue emerged was the length of the placement, **LM3** - “A work placement clearly has some value in the development of transferable skills, though it is not clear to me (i) whether a formal/official placement is entirely necessary, and (ii) how long it needs to be. Many of the skills above could be developed reasonably effectively during the degree course”.

9. Discussion

The overall majority (90%) of students and 87% of the line managers valued work placements highly as a means of developing transferable skills. The majority of students agreed that it was important to develop transferable skills and, of these skills, the most important to develop were communication, team working, problem solving and planning and organizing. They rated fairly highly their competences in these skills and reflected most frequently on two of these skills: planning and organizing and problem solving. The students did also reflect frequently upon time management and IT skills. These are skills which are necessary for their current academic achievement.

The skills which students thought were least important at this stage during their placements were research skills and management skills. These were also the skills they regarded as their weakest and were amongst the skills least reflected upon. These skills do not figure largely in the first two years of their undergraduate

courses. Majority of the line managers interviewed also thought that the research skills and management skills were not very important for the students during their work experiences. From the data collected from the students, these skills had high coefficients of variation which indicate a wide spectrum of views on the importance, self-assessment and frequency of assessment of these skills.

The students had less confidence that work placements would assist them to obtain better degrees even though it is sometimes argued that work placements do enhance transferable skills and therefore feedback into academic performance (Blackwell *et al*, 2001). Perhaps the students' views are realistic. It is likely that their experience in the workplace will develop their transferable skills and understanding of work and work organisations (Ryan *et al*, 1996). But whether these experiences and skills will transfer depends, in part on the nature of the placement and the existing capabilities of the students. A student who does an IT project on a placement is obviously better equipped in the final year to do a similar project than one whose experience has been confined to shop floor management. The variability of work placements is a vexing problem in the assessment of the impact of placements on transferable skills. Further, if work placements have a relatively uniform effect upon transferable skills relevant to academic performance, this effect would not necessarily change the rank order of performance in the final year of the degree (Brown, Bull and Pendlebury, 1997).

Some caution should be taken in drawing conclusions from these results. Only 15 line managers took part in the survey, and the sample of the students surveyed was drawn from only three engineering disciplines, only 18 of the sample were not going on placements and the results are based on students' perceptions. But, insofar as this sample is typical of other engineering students, it would seem that, regardless of gender or discipline, most students value work placements very highly and regard transferable skills as very important to develop. They regard themselves as fairly competent in transferable skills but in need of further support and development during work placements. They do reflect upon transferable skills which are relevant to their immediate tasks and, by induction, one can assume they will continue to do so. In short, the students have high expectations of work placements. It remains to be seen if these expectations are realised.

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