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# Engaging and Retaining Engineering Students

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## Abstract

This paper reports on the outcome of five years of experience designing, implementing and evaluating an integrated first year engineering student experience that has resulted in dramatic and sustained improvements in student retention. It includes an honest exposé of the problems, the effort involved and also the efficiencies gained, short cuts and software tools that have been used. Examples of some of the more successful innovative activities and ideas are given. One example is the 'take your tutor to breakfast' initiative that is fully explained and evaluated.

Over the years of development of this still evolving student experience, the issues of student and staff engagement have been addressed in an attempt to provide a caring, controlled and consistent environment for students – the 'Triple C' Model. Efficiency for staff along with the maintenance of academic standards in accredited degrees has been an essential factor. Risk assessment and diagnostics have been combined with ongoing evaluation of the student experience as the semester continues using minute papers and other brief evaluation methods. Personal tutoring, absence management and PDP verification have been integrated into this holistic approach with feedback constantly being provided to students. In this way a feeling of partnership has been cultivated between engineering students and academics.

This work comes straight from classrooms where widening access, engineering student recruitment problems and student retention issues present major challenges. It provides a pragmatic approach with real evaluation along with actual evidence and includes a monthly calendar of suggestions for what first year tutors should be doing as the academic year progresses.

## INTRODUCTION

After six years of effort and experience, although many efficiencies and successful initiatives have been discovered and implemented, it must be concluded that no magic formula has emerged to instantly improve the retention and progression of students in engineering disciplines. The truth is that such improvements are only achieved through hard and often repetitive work, the energy and enthusiasm of driven individuals and the occasional flash of inspiration that adds novelty and variation to well tried good practice.

On the road to reaching the above conclusion, the 'Triple C' Model for the student experience [1] was introduced to Glasgow Caledonian University as a method of managing first year engineering students in September 2001. In the 'Triple C' Model, care, control and consistency are the tenets of a student experience that provides an holistic and information driven approach to managing students which was very

different from what had gone before. Diagnostics were used to look for weaknesses in areas such as mathematics, to inform students about their learning preferences and to evaluate student drop out 'risk factors' [2,3]. Highly motivational induction activities were designed to socialise the students and give them a sense of value and 'belonging' to the campus. Early evaluation proved that absence was closely correlated to failure and absence management combined with an early intervention strategy was then adopted as the model developed, becoming the keystone of the bridge that represented the student learning experience – see Figure 1.

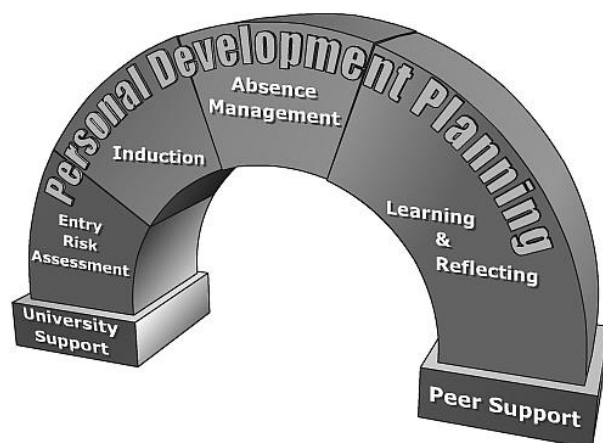


Figure 1 – The Student Learning Experience Bridge

A 'traffic light' absence management system was established and students who had excellent (green), good (amber) and poor (red) attendance were sent letters or emails of the appropriate colour every few weeks. 'Red' students were asked to come for interviews to discuss their situation and organise a recovery plan. Later, a software tool called KELPIE was developed to streamline the administration of this system [4]. Peer support and personal tutoring were combined with the central student support facilities of the University to provide a framework dedicated to the student well-being. Once this framework was in place it was anticipated that a student cohort, that included high representation from widening access routes, could get the best out of their learning environment which would then deliver successful and independent life long learners.

Figure 2 shows evidence of the sustained improvement in student retention realised by adopting the previously described model of the student experience. The first two years of data indicate the situation prior to implementation of the 'Triple C' Model. As can be seen, retention has changed from being consistently 60% to 70% to a very healthy 80% to over 90%. Once such success has become 'normal', the challenge shifts and becomes one of maintaining the momentum and avoiding complacency. It is remarkable how quickly improved retention rates can become regarded as unexceptional.

### **Error! Objects cannot be created from editing field codes.**

Figure 2 – Seven Years of Student Retention Data (%)

Looking for ways to further modify and develop the learning environment after initial dramatic improvements in retention have been achieved and maintained presents a significant challenge. In the following sections of this paper examples of more recent initiatives which have been added to the existing successful model of the student experience are presented. The intention of these initiatives was to refresh and further enhance the student experience. Further work on socialising the students, the use of

brief, real-time student experience evaluations and the 'take your tutor to breakfast' initiatives are described.

## **FURTHER SOCIALISATION OF THE STUDENTS**

In the early years of the retention improvement project the efforts to socialise the students (get to know each other and feel at home on the campus) had largely been concentrated in the induction week [4]. It was recognised that some of this type of socialisation activity could also be beneficial if more of it was done during the academic year. A number of social events were tried - often involving Personal Tutors. The turn-out at these events was high when, as in 2005, incentives like free USB memory pens, food and drinks were exchanged for an entry ticket to the event. Students also responded well to group competitions in the following year where prizes were offered, but the timing of such events had to be carefully planned to fit around timetable and student's part time job commitments.

A limerick competition and an attempt to get students to upload digital photographs to an online social network failed to interest the first year engineers in the second semester of 2004, but a five-a-side football tournament introduced in the first semester of 2007 resulted in more than 50% class participation throughout the semester. In the fourth week of the 2007 second semester, students were taken off campus to a team building event. Clearly, some types of event capture the attention of the students but others do not. Also, the use of incentives (even when fairly modest) appears to encourage participation in socialisation activities.

## **REAL TIME STUDENT EXPERIENCE EVALUATION**

In the opinion of the authors, much of the traditional evaluation of the student experience is flawed by a number of factors including the low proportion of the student body that normally takes part in these studies and surveys. This means that the results obtained may not always be representative. In addition to this low participation, the evaluation of a module, programme or academic year is normally done close to its end - well after the current cohort providing the data can receive feedback and thus benefit from expressing their opinions. It was decided that these established evaluation methods should be supplemented by using some informal and real time evaluation of the first year engineering student experience. The materials used were modified from a published guide for lecturers and from other reviews in the literature [6,7]. The methodology was to give first year students seven minutes, without conferring, to anonymously complete a survey paper of one double sided page of A4. On one side of this paper there were 24 randomly positioned words and the students were asked to circle the words that best represented how they felt about their programme of study. There was a mixture of positive and negative words and students were also invited to add and circle their own words if they felt that these better expressed their feelings. On the other side of the paper there were a number of questions which can be seen in Table 1.

Table 1 - Questions Asked in the Seven Minute Survey

|   |   |
|---|---|
| 1 | What was the most useful or meaningful thing you learned during this course so far? |
| 2 | What questions remain uppermost in your mind?                                       |

|   |  |
|---|--|
| 3 | What was the muddiest point in this course so far?   |
| 4 | What would you like us to stop doing?  |
| 5 | What would you like us to start doing?   |
| 6 | What do you want us to continue to do?   |
| 7 | What are 1 or 2 specific things we do that help you learn in this course?                                    |
| 8 | What are 1 or 2 specific things we do that hinder or interfere with your learning?                           |
| 9 | Please give us 1 or 2 specific practical suggestion on ways to help you improve your learning in this course |

80% of first year engineering students completed this evaluation during Week 5 of Semester A of academic year 2007/8. 67% of the words circled by students had positive connotations. The week after the survey was completed, the main student concerns were raised for discussion by a member of staff at the beginning of one of their lectures. Some points of concern which had emerged from the survey were able to be resolved during this discussion. Students were kept up to date as the semester continued about progress being made to address other points that they had raised. The evaluation seemed to be very successful in terms of the amount of information harvested, the opportunity to quickly clarify concerns for students and the value given to the student voice. The only drawback identified was the time taken to gather the information together since the initial evaluation was paper based. To improve the efficiency of analysis, the survey has now been developed into an online questionnaire [8].

### **TAKE YOUR TUTOR TO BREAKFAST**

Over a number of years in the engineering disciplines at Glasgow Caledonian University, the Personal Tutor system and the need to offer students an opportunity for Personal Development Planning (PDP) have become merged. Academic staff (Personal Tutors) are each assigned a group of 3 or 4 first year students and, in addition to offering conventional guidance, they verify that students have achieved certain PDP goals. It was certainly found, after a variety of models were tried, that embedding PDP into modules was more effective. Making the completion of goals worth assessment marks improved the engagement of students. Making some goals achievable by participating in online tasks, such as completion of learning preference questionnaires and the use of online tools for CV creation [9] made the monitoring processes much easier.

In an attempt to further improve the Personal Tutor system in 2007, an arrangement was made with the Students' Association café to accept vouchers for an 'All Day Breakfast' that would be valid for the first 4 weeks of the semester. First year students were all given a voucher during induction. In the first week of teaching, at the beginning of one of their laboratories, students were given the name and contact information for their Personal Tutor and were asked to send her/him an e-mail introducing themselves and issuing an 'invitation' to breakfast. Having received their own voucher and an e-mail from each of their students, the Personal Tutor then negotiated a day and time and go with their Tutor Group for breakfast at the café when members of the group met the tutor and each other. The initiative was well received by students and staff who seemed to respond positively to the novelty of the idea.

Some weeks after, students and academics were asked to complete online surveys of this initiative to measure its success and to look for further improvements. One of

the questions in the survey gave some particularly useful insight into how the initiative had worked - see Table 2.

Table 2 - Personal Tutor Email Response Time

| <i>How quickly did your personal tutor respond to your first email?</i> | <i>%</i> |
|---|----------|
| Responded within a few days   | 61.0     |
| Responded within one week   | 7.3      |
| Responded within two weeks  | 4.9      |
| Responded after two weeks   | 2.4      |
| Never responded   | 17.1     |
| I have never emailed my personal tutor                                  | 7.3      |

Almost 93% of the first year students who responded had initially invited their Personal Tutor to go for breakfast but, in the final evaluation rather disappointingly, only 50% of the students actually went for breakfast by the time the 4 weeks of voucher validity had passed. Nearly 25% of unused vouchers were a direct result of lack of engagement by staff or students. The fact that some students chose not to make contact with their Personal Tutor is perhaps expected, but academic staff not answering students who emailed them was a highly de-motivating factor that jeopardises the future of such initiatives. In these circumstances it would actually have been better not to run the activity since this would avoid students being disappointed when staff did not reply to their messages. Reasons for the other 25% of the unused vouchers included students not turning up for arranged meetings and difficulties with the organisation of the meeting (for legitimate and unavoidable reasons). The initiative will be tried again in future, but Personal Tutors will be given more information about student timetables, students will be told which other students are in their tutor group and the vouchers will be made redeemable in a larger number of food outlets on the campus.

## MONTHLY CALENDAR

Throughout the academic year there are peaks and troughs in the mood of a class of first year students and, as a result, it seems that the incentives offered and the timing of social events are critical to the level of student engagement that is realised. Students are very excited and nervous at the beginning of the first semester of year one, but after about 4 weeks their mood starts to settle. The start of the second semester can be difficult after the Christmas and New Year holiday period and the students almost need to re-engage with the campus, staff and their fellow students. By about week 4 or 5 of the second semester the students' mood may be at its lowest point, especially for students who receive confirmation of disappointing results from the first semester assessments.

Table 3 gives a suggested schedule for the main socialisation and motivational activities for first year students. This schedule is based on a two semester academic year with first semester starting in late September and second semester starting in early February. The precise timings can easily be modified for other academic calendar arrangements.

Table 3 Calendar of Events

| <i>Month</i> | <i>Action</i>  | <i>Month</i> | <i>Action</i>   |
|--------------|--|--------------|---|
| September    | Preparation and delivery of induction. Early diagnostics and individual learning plans.  | March        | Reflection workshop on first semester results. Interviews with students who have more than one re-sit. Recovery plans produced.         |
| October      | Allocation of Personal Tutors. 'Take your Tutor to breakfast.' Close monitoring of attendance and interviews for poor attendees. | April        | Off campus team building to improve motivation. Ongoing attendance monitoring.  |
| November     | Seven Minute Survey conducted in class and feedback given to students.   | May          | Peer support online and drop-in support sessions during exam period.  |
| December     | Study skills and examination preparation workshop. Ongoing attendance monitoring.  | June         | In addition to formal first diet results letters, letters to students to offer congratulations, advice or interview where appropriate.  |
| January      | Online peer support and drop-in support sessions during exam period.   | July         | Online peer support and drop-in sessions to support re-sit coursework and examinations.   |
| February     | Welcome back to second semester. Close monitoring of attendance and interviews for poor attendees.                               | August       | In addition to formal second diet results letters, letters to students to offer congratulations, advice or interview where appropriate. |

## CONCLUSIONS

Once a successful first year retention system is in place and is working well and producing good retention rates consistently, it is useful to continue to explore fresh ideas and approaches in an attempt to seek even minor further improvements. Although every intake of students sees the first year experience as 'new' from their perspective, it is important to have innovations taking place routinely so that the staff involved in the process continue to be motivated and enthused by this important area of activity. It is unlikely that any first year experience could ever be considered to be 'perfect' and thus efforts to discover new techniques, methods and ideas aimed at improvement, no matter how incremental, are justified. Of the recent innovations tested it is clear that the Seven Minute Survey technique has been valuable and should be used in future. The 'Take Your Tutor to Breakfast' initiative resulted in mixed outcomes. Those students (and staff) who took it seriously and engaged with the idea gained benefits. The students who experienced problems getting their Personal Tutors to reply to messages undoubtedly had a negative experience and it would have been better if these students had not been exposed to this demotivational effect. The idea behind the 'Take Your Tutor to Breakfast' activity is sound and has been shown to yield benefits.

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