TACKLING ENGINEERING RETENTION: A FIRSTHAND EXPERIENCE

Akram Hammoudeh [1] *and Jim Barrett* [1]

Abstract ¾ *This paper describes a number of tactical interventions that were employed in the School of Electronics during the 2000/2001 academic year to improve student retention, and assesses their effectiveness. These interventions have been successful in reducing student withdrawals from 16.8% in 1999/2000 to 9.3% in 2000/2001. Additional measures to improve retention further in 2001/2002 are described and initial retention figures are given.*

Index Terms ¾ Attrition, Retention, Widening Access

INTRODUCTION

Student retention and motivation have been the focus of attention in many HE institutions [1-7], and within the University of Glamorgan as a whole. Retention of students is an important concern, since high attrition rates are undesirable from both a student's and the University point of view. A number of tactical interventions were put in place during the 2000/2001 academic session to improve student retention in the School of Electronics at the University of Glamorgan.

The School of Electronics at the University of Glamorgan had, prior to 2000, experienced a continuing decline in recruitment to traditional engineering courses for about 20 years. This decline has been partially off-set by the introduction of newer Technology courses, introduced in 1996, which combine a comprehensive technical background understanding with elements of creative practice. BSc (Hons) Media Technology initially attracted substantial recruitment but recruitment had not remained at this level. BSc(Hons) Multimedia Technology, run in conjunction with the School of Computing, and BSc(Hons) Media Technology and Media Studies, run in conjunction with the School of Humanities and Social Science, have ameliorated this situation somewhat but with a slight added problem of some student migration to courses fully within the other schools. Students transferring across schools after the first semester of their first year create upheaval for both donating and receiving schools and problems of realignment and missed modules for the student.

Student retention within the school has been a continuing problem for all courses with loss of students (rather than transfer within the University) representing an unfortunate waste of resources and opportunity for student and University alike. This problem reached something of a peak during the 1999/2000 year, with the bulk of the wastage occurring in the first semester of the first year. One of the most commonly given causes for early student withdrawal (at all universities) is 'inappropriate course'.

This paper outlines the interventions employed in 2000/2001 academic session and the additional measures in 2001/2002 to enhance student retention. An evaluation of their effectiveness is given.

RETENTION FORMULA FOR STUDENT SUCCESS

In 2000/2001 academic session the School of Electronics developed and adopted a successful formula to address student attrition.

$$RET = E_{ID} + (E + IN + C)_{IV}$$

Where retention (RET) is defined in terms of the following variables, E_{ID} = Early Identification, E = Early, IN = Intensive, C = Continuous, IV = Intervention. The success of this formula requires solid and proper foundations.

Foundations

- **Curriculum adjustment**: Considerable effort was put into redesigning modules which were either inappropriate to the stated needs of industry, repetitive of learning in other modules, or attracting significant adverse feedback from students. This was partly to address the problems of student retention, and partly to prepare for major redesign to achieve the teaching and learning objectives of the three-term year structure. Courses must be current and attractive to students and address the industry needs. Issues like this must be reflected in the planning of the curriculum and indicate the need for external accreditation.

- **The choice of staff for first year teaching**: Staff teaching on the first year are hand picked to be empathetic, approachable, available, and inspiring.

- **Practical, Engaging Delivery:** As far as is possible first year modules adopt a "Hands on" and workshop delivery approach to learning.

[1] Akram Hammoudeh and Jim Barrett, University of Glamorgan , School of Electronics, Wales, UK CF37 1DL amhammou@glam.ac.uk

Formula Variables

1. E_{ID} Early Identification

The first few weeks of the academic year are of crucial importance to identify students who are vulnerable and at risk of dropping out. Intelligence was gathered using various methods including:

- Attendance monitoring
- Poor quality or no coursework submission
- Contact with progress tutor.

On a more holistic level, the early experience of the students was carefully monitored and controlled – the perception of the students was largely down to staff involvement and attitude. Once students were identified early interventions were implemented.

2. E_{IV} Early Intervention

A number of interventions were implemented in order to remedy the situation. Students who were identified as being "at risk" were contacted by telephone and asked to attend a meeting with the course leader/scheme manager to discuss the underlying difficulties and issues. Students were then advised and directed to the appropriate resource, such as the maths drop-in centre, or support systems, such as Student Finance and Counseling Services.

3. IN_{IV} & C_{IV} Intensive and Continuous Interventions

For the retention formula to work interventions were intensive and lasted for as long as was necessary to resolve the issue. Some of the on going interventions introduced in 2000/2001 session include:

- Courses and modules were continually re-appraised
- Flexibility and ease of student transfer between schools
- Small cohesive and functioning groups of students, with good staff support
- Full liaison between support and academic departments of the university
- Early experiences on the course were challenging, engaging and relevant

EFFECTIVENESS OF INTERVENTIONS ON RETENTION

The attrition rate measured as the percentage of lost students relative to the total number of the school population (about 500 students) is given in Fig. 1 for the last five academic years. The percentage of students withdrawing by the end of the 2000/2001 session is 9.3% (44 students) compared to 16.8% (21 students) at the end of 1999/2000. This is evidence that interventions introduced to mitigate student withdrawals were very effective and successful.

Although the overall outcome was much improved in 2000/2001, compared with the previous three years, the general shape of the 'student loss' curve remains the same. The attrition rate remains constant at approximately 2% per month for the first four months of the academic year, dropping to about 0.1% per month after this. For the previous three years the 'break point' had been the end of February or March and the slower rate between 0.1% and 0.5% per month.

This 'double attrition curve' suggests a factor or factors connected with early withdrawals, which was not entirely ameliorated by the interventions described by the retention formula, though its affect was limited to not extending beyond December. The resulting earlier 'break point' was the most significant contribution to the improved overall outcome.

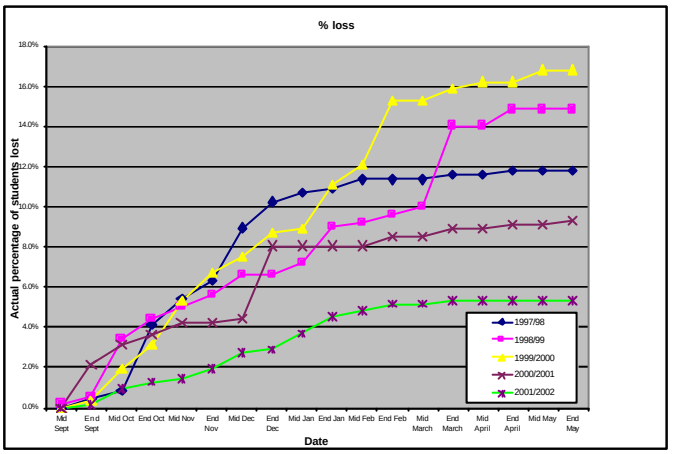

FIGURE. 1 Actual percentage of students lost at the end of each calendar month for the last five academic years

Student feedback suggested that one factor in the faster rate portion of the curve was the 'inappropriate course' phenomenon. This was a major reason for the school introducing applicant days, which include a discussion of course content, experience of course facilities, a tour of the university, and a face to face interview.

The benefits possible from such applicant days were identified as:

1 Actually showing applicants the type of practical work they would do on a course, discussing the appropriateness of the course to their long-term aspirations and exploring the realities of those aspirations with them should significantly reduce recruitment onto 'inappropriate courses'.

2 Where the course is clearly inappropriate, or there is a danger of their not achieving the required grades, alternative possibilities and strategies can be discussed with them directly.
3 Negative expectations of levels of equipment provision in the University can be directly counteracted by applicants' experience compared to their experience of provision at other universities.
4 If casual applicants, who have simply chosen Glamorgan to use a choice, can be brought to the University campus this helps them imagine themselves as students of the University enhancing the likelihood of their promoting the University to first or insurance choice.
5 Students with weaknesses in their profile can be identified for remedial interventions (this is of particular significance for Institute of Electrical Engineers accredited courses).
6 Hesitant applicants, perhaps from non-traditional educational or cultural backgrounds for higher education, see students or staff they can identify with in the University and are encouraged in their application.
7 Applicants can bring parents or friends who can be included in the events of the day. Parents are happier when they have a picture of the environment into which their children are moving.

The applicant day is essentially the applicant's 'first experience' of learning at the University. That experience may carry with it some anxieties but the outcome of the day is a sense of having been valued as an individual and of anxieties dispelled

IMPROVED RETENTION FORMULA

The refined retention formula has now become:

$$RET = E_{ID} + (E + IN + C)_{IV} - S_{IA}$$

Where SIA is defined as inappropriate students (students for whom the course is an 'inappropriate course').

In 2001/2002 academic session the School applied similar interventions to improve retention as outlined above for the year before (2000/2001 academic year). In addition the School introduced a conversion model [8] that includes an applicant day and selection interview. 63.3% of the new first year intake has been accepted through this process with the UCAS conversion rate of those who were engaged in the process at 36.1%. This was a considerable improvement on the previous conversion rate of 12%, a major factor in increased recruitment in September 2002 to all courses, with significant improvements for traditional Electrical and Electronic Engineering.

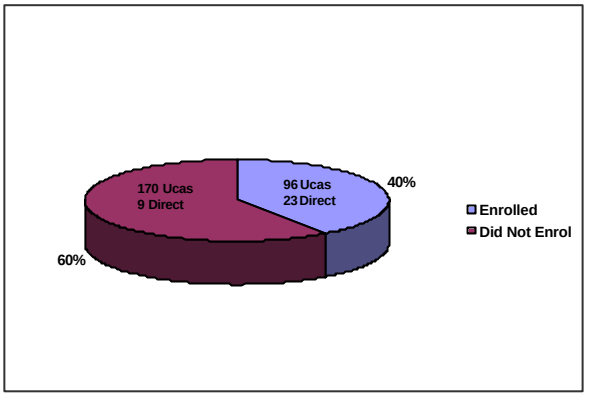

FIGURE. 2 Students who did and did not enrol following interviews

The rest of the new intake has been accepted through the UCAS clearing process and direct applications that were dealt with between mid July 2001 and end September 2001. Fig. 2 shows the number of candidates who did and did not enrol following their interviews.

EVALUATION OF THE IMPROVED RECRUITMENT AND RETENTION PROCESS

The student withdrawal figures for 2001/2002 are currently only available to the end of April. These are plotted as a percentage student attrition curve as shown in Fig. 1.

This shows a constant attrition rate of 0.7% a month, well below the first stage attrition rate shown in the 'double attrition curve' of the four previous years (about 2%). This would suggest that the number of students leaving courses within the first semester due to being on an 'inappropriate course' has fallen considerably. Feedback from early withdrawers indicates that the great majority of those who have left due to an 'inappropriate course' are from the 36.7% of students who were not participants in the applicant day and interview process.

Whatever the effect of the applicant day/interview conversion model on those students who participated, there is still slightly more than one third of the year cohort who were not participants. It is reasonable to suppose that for these students, at least, a 'double attrition curve' will still apply and therefore to expect a break point in the curve to occur no later than the end of March. Assuming that the post break point attrition rate is no better than for last academic session, then final withdrawals will be of the order of 5% of total student numbers. Even with the attrition rate remaining constant projected withdrawals will only just exceed 6%.

CONCLUSIONS

A number of tactical interventions were described and put in place to improve student retention amongst first year students. The interventions employed are based on the early identification of students who are at risk and then early and appropriate interventions. These interventions were continuous and lasted as long as the issues prevailed. Withdrawals were reduced from 16.8% in 1999/2000 to 9.3% in 2000/2001. Retention was further improved during the 2001/2002 session by reducing the number of students who withdraw because of being on an "inappropriate course". Figures indicate attrition rate of 3.4% at the end of January compared to 8.1%, and 8.9% at the same time during 2000/2001 and 1999/2000 respectively.

REFERENCES

[1] Baillie, C, and G., Fitzgerald, "Motivation and attrition in Engineering Students, EUR.J.ED., Vol. 25, No2, 2000.

[2] J. Goodyer, and A. Halstead, "Motivation and Retention of First Year Engineering, Students", Progress 1, Student Progression and *Retention in Engineering, The University of Hull, December 2001*.

[3] *Edwards, N. S., and J. C. R., Middleton, "Activity-based Student Induction, Motivation, Performance, and Professional Socialisation: A Case Study", Int. Conf. on Engineering Education, Norway, August 2001.*

[4] W. Middleton, "Electronically Tracking and Supporting Students at Risk", Progress 1, Student Progression and Retention in Engineering, The University of Hull, December 2001.

[5] B. Tomkinson and R. Warner, Developing a Strategy for Student Retention", Progress 1, Student Progression and Retention in Engineering, The University of Hull, December 2001.

[6] S Page, and M kilkey, "Aspects of Student Experience", Progress 1, Student Progression and Retention in Engineering, The University of Hull, December 2001.

[7] G. Cutler, "Investigating UK Engineering Attrition and Countermeasures", Progress 1, Student Progression and Retention in Engineering, The University of Hull, December 2001.

[8] A. Hammoudeh, "Conversion Model- Analysis and Evaluation", University of Glamorgan, Central Report, November 2001.