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Jane Ferris

*Dublin Institute of Technology, jane.ferris@dit.ie*

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For more information, please contact [yvonne.desmond@dit.ie](mailto:yvonne.desmond@dit.ie), [arrow.admin@dit.ie](mailto:arrow.admin@dit.ie), [brian.widdis@dit.ie](mailto:brian.widdis@dit.ie).



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# **Retention in Computer Science: a level 6 experience in an Irish third level institute.**

Jane Ferris  
*Dublin Institute of Technology*  
*Jane.Ferris@dit.ie*

## **Abstract**

*The current World economic recession has brought significant changes to the lives of many Irish citizens and brought many back into the education system. In 2010 in response to the need to provide retraining opportunities for the long term unemployed some third level institutes introduced re-training programmes. This paper describes the retention experience of a Computer Science department of an Irish third level institute managing level 6 part-time computing students. The paper reports the barriers for students in continuing on the programmes from exit interviews and identifies potential strategies to engage students in their chosen programmes.*

## **1. Background**

As a consequence of the World recession the Irish Government introduced new labour market activation initiatives. Many third level institutions introduced part-time re-training programmes at undergraduate and postgraduate level [1]. These part-time programmes are aimed at students with a previous education award one level below that of the programme award on the National Framework of Qualifications (NFQ) grid. This is to enable 'a one step up' approach to re-training. The primary aim is to re-train in the short term and these programmes range from 6 months to 1 academic year in duration.

2011 saw a 9% increase in the number of new entrants to level 6 programmes in third level institutions [2].

In 2010 the first level 6 computing re-training programme was introduced by the Computer Science (CS) department of a large

third level institute. This programme was delivered part-time within a programme of 50 Electronic Credits Transfer and accumulation System (ECTS) at level 6 of the NFQ for one academic year. Level 6 programmes are the first award on the NFQ framework in third level institutions and provide new opportunities and challenges for the students who have not previously benefited from higher education.

The research is based in a large third level institute in the Irish capital, offering undergraduate and postgraduate degree programmes in the sciences, engineering, business, the arts and tourism. The department of CS has a forty year tradition of providing technical education and training in specialist fields with an emphasis on research and industry links. The department has a strong tradition of student focused education within a multi-cultural teaching environment. It has a dedicated retention office and there are well established structures in place for the computer science students. These provide personal (financial, emotional and spiritual support) social (sports, clubs and society) and educational (library, programme mentor and math tutors) support throughout the academic year.

Retention is the persistence of a student in their studies. It is the positive side of the phenomena of a student 'dropping out', leaving early from or not completing their pre-determined course of study. Recent studies published in 2010 by Morgan et al. and 2012 by the Higher Education Authority (HEA) identified that on average 17% and 15% (respectively) of Irish students do not complete their studies [2][3]. The HEA reported that non-completion was significantly higher in the institutes at 22% than the universities at 9% [2]. Within the engineering and science programmes of which CS is comparable the undergraduate experience is reported to be 20% and 22% respectively [3]. Morgan et al. reported that 35% of level 6 CS students failed to complete their chosen studies. This is significantly less than the average retention figure of 86% reported in the same study and moderately less than the 75% reported for all level 6 students by the HEA in 2012.

Student engagement and retention in the Irish context has become a primary educational issue since the change of the Irish Department of education funding policy for third level institutions to one based on graduating students. Prior to this non-completion by students was considered to be an acceptable part of the education process, although potentially detrimental for those individuals 'dropping out' of the education system entirely. Despite this there are few published studies for CS students' retention. CS in the American context is reported within the 'others' category which includes agricultural science [4].

As stated previously retention was an acknowledged fact of third level education and was thought to be beyond the control of the third level institutes [5]. The high non-completion rate of the late 1990s which was directly related to the economic boom brought retention to the national interest [6]. Concern for the continuous provision of a skilled workforce for the growing economy and the poor return on Irish state investments in third level education warranted study on retention issues.

The decision to leave an educational career is a complex one and there may be numerous causal factors for individuals [7] [8]. In the Irish CS/Information Technology (IT) context Healy et al. in 1999 identified that there was no single factor to a student non-completion within a third level institute [9]. His study within three Irish institutes concluded that social, personal and institutional issues combine to influence students to non-complete or not to engage with their studies and fail.

Studies have tried to identify what the causal factors within these three broad categories of personal, social and institutional are to develop strategies for supporting students. Each study highlights that this is a very complex and evolving process a student undergoes in making the decision to persist or leave [6] [7] [10]. Institutional stressors are identified as being associated with workload, assignments,

examinations, poor provision of materials, a lack of support offered and no direction in understanding what is expected of them [7] [10].

Personal and social issues are assigned to family issues, confidence, lack of cohesion within the group, educational aptitude and lack of preparedness and demographics [6] [8] [10]. It has been a common held belief that those from a disadvantaged background or family with no history of third level education had an increased risk of non-completion [8]. This is now challenged and it appears not to be a single causal factor but a contributing factor. As there often appears to be no demographic difference between those that complete and do not complete [7]. Student motivation is a more influential factor in student persistence.

Student demographics are an evolving characteristic of the education system. Such as the increased numbers of mature students that returned to education in the past 3 years [2]. This study investigates the retention within a re-training programme for the long term unemployed the demographics of this group is expected to be predominantly male and aged from 17-35 years [11].

## **2. Introduction**

The aim of this paper is to communicate the educational environment and retention experience of a level 6 technical computing re-training programme within an Irish third level institute. The research discusses a two year period from the introduction of the programme in 2010/11 and the subsequent academic session.

### **2.1 Retention terms**

Within this study the cohort are deemed retained if they persist in their studies and submit required assignments. There are no formal summative exams in the level 6 part-time programme. A student who has been unsuccessful in their assignments and failed to progress at the graduation date is identified as

failed and is a retained student within this study.

Students are not retained if they are not persistent in their studies. Students who initially attended the programme and then discontinued attendance through transfer to another programme are considered not retained.

Students who do not start on the programme are deemed non-starters and are not considered within this study. There are no other categories of exit prior to graduation (such as student deferral) within this study other than retained or not retained.

## **2.2 Retention Strategies**

Attendance logs are not required within the institute but records of attendance on the level 6 part-time programmes were taken. The aim of which is two-fold to acknowledge to students that their absence is noted and to monitor attendance as an early indicator for those students at risk. Attendance logs are recorded in collaboration with the teaching staff. Not all staff recorded attendance.

The curriculum of the programme was designed to deliver practical and theoretically balanced technical education for careers in technical IT support and system administration. The curriculum was designed to integrate strategies for both retention and accommodate the transition for students with no prior third level experience.

The syllabus included modules on communications, career development and Cisco Certified Networking Administrator (CCNA) certificate one and two. CCNA is a heavy workload programme but rewards the students with additional industry focused qualifications. Summative examinations were removed from the programme. No maximum number of assignments per module was prescribed teaching staff designated the required number for their module.

A programme mentor strategy was implemented. The mentor was a teaching staff member who was the single point of contact for communications between the department and the programme.

## **3. Method**

The methodology used was both qualitative and quantitative in design.

Students were contacted by telephone or email to communicate issues for non-attendance identified through attendance logs or through non submission of assignments. This telephone conversation provided good qualitative information regarding the issues students were experiencing and supports could be offered if available.

When students were notifying the mentor of non-persistence with the programme a structured interview was followed when students were agreeable. This interview/survey was designed to identify the individual causal factors such as a lack of cohesion within the social group through a ranking scale of 3 (yes, no, -ish) on a sequence of questions. Such questions included: Did you miss the orientation day; do you know who your mentor was; who lives closest to you on the course?

## **4. Results**

The students of this programme were long term unemployed individuals with a fetac level 5 on the NFQ framework, international equivalent or through the recognition of non-formal learning deemed to have to an equivalent level of learning to that of the Irish leaving certificate.

Financial support for the level 6 students would be provided by the state agencies for the duration of the students' studies.

### **4.1 Student profile**

The cohort was predominantly Irish and male see table 1 and 3. This reflects well the national and international trend for low

admissions of females on CS programmes such as network administration.

Gender	2010-11		2011-12	
	N	%	N	%
Male	19	90.5	15	100
Female	2	9.5	0	0
Total	21	100	15	100

Table 1. Student gender.

Most students were travelling from Dublin and the adjacent Counties for classes, one student (retained) travelled in excess of 80km another in excess of 130km (not retained).

Age Profile	2010-11		2011-12	
	N	%	N	%
<23	1.0	4.8	0.0	0.0
<30	3.0	14.3	1.0	6.7
30-35	6.0	28.6	4.0	26.7
35-40	6.0	28.6	1.0	6.7
>40	5.0	23.8	9.0	60.0
Total	21.0	100.0	15.0	100.0

Table 2. Student age profile.



Figure 1. 'This is what a Computer Scientist looks like.' An American movement to progress away from negative stereotypes perpetuated in the media and having a detrimental effect on female enrollment in CS programmes.

Nationality	2010-11		2011-12	
	N	%	N	%
Irish	19	90.5	14	93.3
Non EU	2	9.5	1	6.7
Total	21	100	15	100.0

Table 3. Student Nationality.

100% of females were retained in 2010/11 session. There were no female students in 2011/12 session see table 5.

Over the two years 100% of the non-EU students were retained.

Persistence	2010-11		2011-12	
	N	%	N	%
Persistent	16	76.2	10	76.9
Non persistent	5	23.8	3	23.1
Total	21	100.0	13	100.0

Table 4. Student retention (non starts are not considered part of the cohort).

Persistence	2010-11		2011-12	
	N	%	N	%
Male	14	87.5	10	100
Female	2	12.5	0	0
Total	16	100	15	100

Table 5. Retention and gender.

Persistence	2010-11		2011-12	
	N	%	N	%
<23	1.0	6.3	na	0.0
<30	2.0	12.5	0	0.0
30-35	3.0	18.8	1.0	10.0
35-40	6.0	37.5	1.0	10.0
>40	4.0	25.0	8.0	80.0
Total	16.0	100.0	10.0	100.0

Table 6. Retention and age group.

In the non mature group the one student that attended the programme was retained. This and the age group of 35-40 years old in 2010/11 and 2011/12 are the highest retention rate of 100%. The lowest retention rate is experienced in the 30-35 year old group which was 25% in 2011 please refer to figure 2.

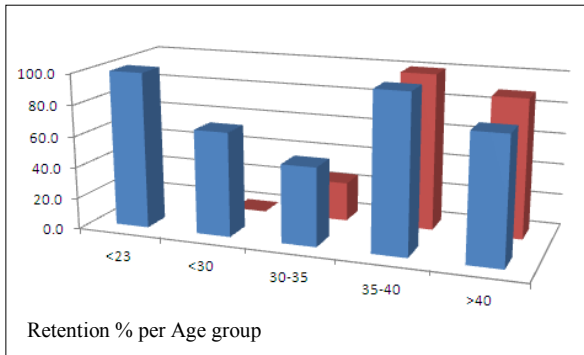


Figure 2. Retention % and age group.

### 4.3 Reasons for non-completion

The reasons for non-completion are illustrated in figures 3 and 4 for the years 2010/11 and 2011/12 respectively. These figures are a tally of number of times the factor was selected as a causal factor by students. They are not weighted. A student may choose any number of factors. However students identified one or two prime factors as the main contributing factors to the non-completion on the programme such as obtaining a job. One student did not respond to any communications.

Students of the programme were part-time students and continued to be in receipt of Irish state unemployment payments. As part-time students there were no funds available from within the institute for financial support. Financial assistance for the additional costs incurred such as travel was inconsistently administered to students via their local community welfare office. Communications with the state bodies who service the unemployed was a noted stressor for students and frequent reason for absence from initial classes.

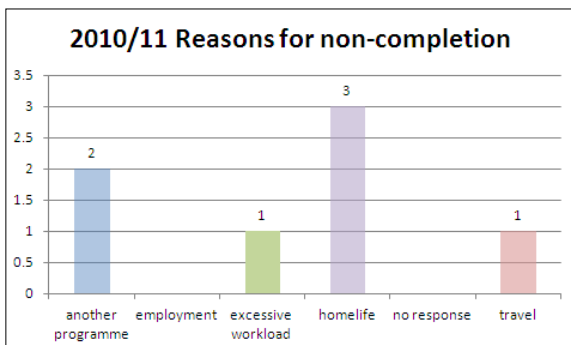


Figure 3. Reasons for non-completion 2010.

The most significant factor for non-completion in 2010/11 was ‘home-life’ which encompasses most family considerations. This was identified primarily as childcare issues in the 23-35 year ranges. In 2011/12 the most significant factor for non-completion was obtaining a job this was in the age range of 23-35 years.

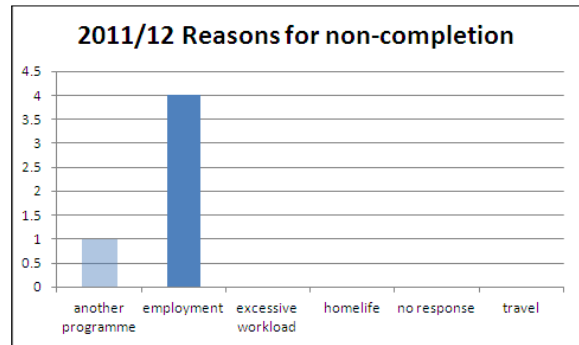


Figure 4. Reasons for non-completion 2010.

## 5. Discussion

This study reports a retention figure of 76% and 77%. This is above that reported for full-time level 6 students [3]. For such re-training programmes this computing programme has been very successful in retaining students. For comparison the same CS department experienced 40% and 63% retention for level 7 and 8 re-training programmes respectively.

This study included those that changed to a different programme and deemed them not retained. This group attributes 28% and 20% of the non-competed in 2010/11 and 2011/12 (respectively).

Non-starters who accept the programme and then fail to attend at all were not included in this study. If they were included as not retained students the retention for this group would drop significantly. Non-starters and those that submit to change to another programme contribute to a high proportion of students accepted on level 6, 7 and 8 programmes. This may be more that 50% of those applicants accepted on the programmes.

A strategy that may reduce this significant loss of students with ‘buyers’ remorse’ is the introduction of an interview process. This

process would perform two primary roles. One it informs students of curriculum, workload and ethos [12] and two it empowers the students in the knowledge that they earned their placement on the programme.

This study includes those students that failed the programme as retained. This is contrary to the current funding policy for third level institutions. It is the role of the student to engage with the material and perform well in assignments and examinations. Students have the right to fail. If it is the institutions remit to ensure that all students pass programmes then a discussion on the quality of such programmes must be explored.

The HEA defines a mature student as being 'at least 23 years of age on 1 January of the year of entry'. 92% of level 6, 81% of level 7 and 11% of level 8 full-time students were mature in 2011 [2]. This study supports this finding for part-time students. One student in the two years was not mature. The reported demographic of the unemployed is not well represented in this study and unemployed persons older than 35 are taking the opportunity to re-train in this third level institute: 67% in 2011-12 (please refer to table 2).

Full-time mature students on level 6 programmes have a reported 82% persistence compared to 73-74% for younger students [2]. This study reflects the reported full-time figures and illustrates the commitment that more mature students show in education. 100% of 35-40 year olds were retained. In 2010/11 and 2011/12 80% and 89% (respectively) of those older than 40 years were retained.

This study also indicates that students of a younger age group are more likely to obtain employment and leave the programme than more mature students. Four students aged between 25 and 35 left the 2011/12 programme for employment not related to their current studies.

In most institutes student information is held and contains detailed information provided by the student on registration and obtained from state examinations. This is very important information and is useful for analysing emerging trends in demographics and identifying weaker students who will be at risk of non-completion. This information is available to the managers of the programmes and often not communicated to the 'coal face' or frontline teachers. Provision of such information may help to better track at risk student through their studies.

Any student in addition to those at risk may disengage from or not persist with their studies. In order to enlighten the process by which students fall away from their studies better tracking by attendance logs, electronic tagging or through the close monitoring of students' assignment submissions is required. As these records may not be available or kept consistently by all lecturers. A staff tutoring system may be beneficial. Limiting the tutor group to a maximum of five has been seen to be effective in other institutions [12]. Within the current programme mentor system the group or team size is typically in excess of 15 students.

## **6. Conclusions**

An overall retention rate of 77% was reported for the level 6 re-training computing programme. The programmes retention figures makes the programme a success in the short term re-training category of fetac level 6 awards. It performs better than retention figures for full-time level 6 students [3].

In 2011 100% of the students of this computing level 6 part-time re-training programme were male and 100% were over 23 years old. 9.5% of the students were international students.

100% of the females and international students on this programme were retained in 2010/11. There were no female students in 2011/12.

Consistently the lowest retention rates are seen in the age range of 24-35 years old. In 2011 0% of the 23-30 year old age range was retained but this corresponds to one student leaving the programme.

For the two academic sessions from 2010-12 100% of the 35-40 age groups were retained.

Retention is an extremely important education issue nationally and internationally. It is vital that student supports remain in place and students deemed at risk are systematically inducted to those support services.

To leave or remain on a programme is a complex and life changing decision that students face and is most often dependent on personal circumstances. This study identified that personal home-life issues such as childcare and obtaining employment were the most significant causal factors when non-completing a part-time level 6 computing programme. These personal factors are currently outside the control of the institute.

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