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## Is This "Transfer Shock"? Examining the Perceptions of Engineering Students Who Articulate Within the Irish Higher Education Context.

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# Is this “transfer shock”?

## Examining the perceptions of engineering students who articulate within the Irish higher education context

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*Abstract*—“Transfer shock” is a well-known phenomenon during the process of articulation, when students move from short-cycle applied programs to more academic longer-cycle study programs. In the US context this problematic transition has been observed in students transferring from community colleges into the traditional university system. In Ireland’s binary higher education structure, one set of institutions, known as Institutes of Technology (IoTs) allow for this transition to take place entirely within individual institutions. This paper is part of an ongoing investigation into one such IoT, where engineering students who achieve high grades at the end of 3-year (so-called Level 7) “ordinary degree” programs frequently transfer into the 3<sup>rd</sup> year of 4-year Level 8 “honors degree” programs, with surprisingly successful outcomes. One surprise derives from the fact that the students who enter Level 7 engineering programs are deemed at the outset to be academically less able, particularly in mathematics, than those who go directly into Level 8 programs from secondary school. Relatively little work has been done on this transition to date. In the 3<sup>rd</sup> and 4<sup>th</sup> year of many honors engineering programs within this institution it is not unusual to have 30-50% of the students coming from an ordinary degree background, the majority from within the institution itself – with others transferring from other IoTs in Ireland. Previous research has shown that students from this background initially struggle in the 3<sup>rd</sup> year of the honors degree program when compared with students who have proceeded directly through the honors program, before going on to successfully graduate. Can this be attributed to ‘transfer shock’; even though most of these students are continuing in an institution and with faculty that they are already familiar with? In order to examine this phenomenon we interview students from several engineering disciplines at various points in this transition. We explore the perceptions of the students regarding this transition and, based on the information coming from the interviews, we conduct a large scale survey to be administered to articulating students across engineering programs in the institution. The preliminary results of this survey are also presented here.

**Keywords**—*articulation; transfer shock; engineering students*

## I. Introduction

For several decades many higher education systems across the world have been attempting to respond to the increasing demand for graduates. One method has been to encourage articulation, which is the transfer of students at the end of short-cycle applied programs into more academic degree programs at universities. In the US context this process sees students moving from community colleges [1], while in the UK students may complete a foundation degree [2] or a Higher National certificate or diploma [3] at a further education college before transferring to a university. Articulation can give students from non-traditional backgrounds, who may be economically disadvantaged; or from the first generation of their family to enter higher education; and mature students, the opportunity to gain an honors degree through this indirect route. However, the process is not without difficulty and many students who undertake this route drop out before attaining their goal or experience problems in coming to terms with the new institutional culture they encounter. This set of problems has been referred to as “transfer shock” and studies in the US and the UK have sought to analyze its effect [4], [5]. The phenomenon typically results in a dip in grades for a period after transition to university [6], [7], [8], and is thought to be attributed to the adjustment to the new “institutional habitus, including staff attitudes and relationships (community), teaching and learning strategies (curriculum) and social spaces (campus)” [9]. One solution suggested by Greenbank is to offer both short-cycle applied and honors degree programs in the same institutions [2]. This is where the Irish higher education system may have an advantage.

Ireland’s higher education system is said to be binary. On one side are the seven traditional universities, the oldest being Trinity College Dublin which was founded in 1592. On the other side are 13 Institutes of Technology (IoTs), set up originally as regional technical colleges to support the training and educational needs of their local areas. Then there is the Dublin Institute of Technology (DIT), which straddles both sides of this divide<sup>1</sup>. It grew from a group of technical

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<sup>1</sup> This binary division ignores private colleges and specialized education and art colleges, for example.

colleges, founded in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries to deal with vocational training and education, into a fully independent institution, established in 1993. Today DIT is a member of the European Universities Association and has degree-awarding powers up to doctorate level. Its so-called “ladder system” (see Table 1 below) allows a student to begin by completing an apprenticeship or short-cycle applied certificate program (known as Level 6 in the National Qualifications Authority of Ireland’s framework (NFQ) of levels in the Irish education system [10]) right through to a doctorate at Level 10 – all within the same institution. This, surely, is the ideal place in which to examine whether transfer shock can be avoided during the process of articulation.

Table 1 Explanation of NFQ Levels [10]

NFQ Level	Explanation
Level 6	Advanced Certificate
Level 7	Ordinary Degree
Level 8	Honors Degree
Level 9	Masters Degree
Level 10	Doctoral Degree

A research group of faculty who teach students of various engineering disciplines at DIT has been examining the experience of articulation from 3-year engineering technology programs (at Level 7) into the 3<sup>rd</sup> year of 4-year Level 8 degree programs. This research has shown that some articulating students do indeed struggle, particularly in mathematics, when they move from Level 7 to Level 8 but that the majority recovers sufficiently to graduate with, on average, a grade higher than students who came directly through the four years of Level 8 programs [11]. This paper sets out to explore students’ own perceptions of their transition, their awareness of experiencing transfer shock, or otherwise, their motivations, difficulties and successes. Following on from the analysis of interviews with a group of currently articulating students, a survey has been created and administered to a larger group from the same engineering disciplines. Both the interview and survey analysis will propose an answer to the question of whether these students perceive transfer shock as something that has affected them during their transition into an honors degree program.

## II. Background to the study

The traditional route into a level 8 degree program in engineering in Ireland requires students at the end of their second-level schooling to achieve high proficiency in mathematics, as the professional body for engineers, Engineers Ireland, stipulates a minimum of grade C at higher level in the State Leaving Certificate examination. The numbers taking the higher level mathematics have never exceeded 25% of the examination cohort and this has greatly restricted potential entrants to level 8 engineering programs. One solution provided by DIT and other IoTs has been to provide less theoretical programs requiring a lower level of

mathematics on entry – these are the 3-year Level 7 degrees, known as Bachelor of Engineering Technology, from which many students go on to articulate into the 3<sup>rd</sup> year of Level 8 programs at DIT. Recent research into the expectations of students starting out in a Level 7 program in mechanical engineering in 2013 shows that at least 73% of them intend to transfer to a Level 8 program after graduation [11]. This is very different to the expectations of, for example, Scottish students in equivalent programs, only 13% of whom had decided at the start of their studies that they would want to articulate later [5].

Despite their proven weakness in mathematics, students articulating from Level 7 and graduating in 2009 and 2010 have been shown to have averaged a mark of 62% while, surprisingly, their direct entry colleagues with high mathematics competence at the outset achieved an average mark of only 53% [11]. This was in spite of research showing that, within the first semester after articulating, many former Level 7 students had had difficulties passing their first math modules in the honors program [12]. In order to be allowed to articulate, these students had been required to attain an average of 60% in their final grades at Level 7. They then appeared to allow their marks to dip for a semester or year after transferring to Level 8 before outshining their direct entry colleagues in the final year towards obtaining their honors degree.

Students who graduated from 2011 onwards have not been required to attain such a high grade at Level 7 in order to be permitted to articulate. Since then the average mark on entry to the 3<sup>rd</sup> year of the Level 8 degree program has been reducing year on year so that in 2013 the average mark of entrants was 51%. Perhaps not surprisingly in this case, the grade advantage of former Level 7 students on graduation from Level 8 has also reduced – now their final marks are on a par with their direct entry colleagues [13]. This is not to forget that such students, coming into DIT with weak mathematics skills and completing their level 7 programs with mediocre results, are nonetheless graduating with similar grades to those who entered with high math competence directly into the 4-year Level 8 program, admittedly by taking one year longer to do so.

The dip in results that has been observed immediately following transfer into Level 8 programs, as discussed above, mirrors the phenomenon of transfer shock seen in students moving from one institution to another. However, these students are not moving to an unfamiliar institution. In fact, in many cases they encounter the same faculty members teaching similar modules in the same environment as before they articulated. As was seen earlier, many of those who start out at Level 7 fully intend to transfer to the Level 8 program as soon as they are permitted to do so – so where does the difficulty lie? The only way to discover the answer to this question was to ask the students themselves.

### III. Methodology

This section of the paper outlines the methodology applied to answer the research question as to whether articulating engineering students perceive “transfer shock” as something that has affected them during their transition from a Level 7 program into a Level 8 program. Included are the details and justification of the research method used; the profile of the participants; the research protocol, ethical considerations and how the results were obtained and analyzed.

#### A. Research Method and participant profile

This study utilized a number of methods, namely a qualitative approach in the form of one-to-one interviews conducted by faculty members, some of whom lecture on Level 7 and/or Level 8 engineering programs, and follow-up quantitative research by means of an anonymous online survey. Given the complex nature of “transfer shock” the qualitative approach was applied first to gather insights on the “how” and “why” of student experiences in order to enable common themes to be identified. The quantitative approach was to investigate whether these identified themes or issues could be generalized to the larger articulating engineering population. As it was thought the information may be sensitive, the online survey was anonymous and only general profiling data was gathered from participating students as outlined in the next sub-section. This approach is similar to that taken by Greenbank [2] and Winter and Dismore [9].

Students enrolled in the 2014/2015 academic year from both 3<sup>rd</sup> year and 4<sup>th</sup> year stages of Level 8 programs were considered. While previous research had concentrated on mechanical engineering students [11], this study gave an opportunity to include civil, structural and manufacturing & design engineering students. The total cohort available was 105 students across all four disciplines. Students were asked to volunteer to participate in the face-to-face interviews with three students selected from each category, and where possible, across the range of academic performance. Overall, 13 student volunteers were separately interviewed – a breakdown of their profile is shown in *Fig. 1*. For the online survey, 41 students took part giving a response rate of 39%. The breakdown in *Fig. 2* shows more 3<sup>rd</sup> year than 4<sup>th</sup> year participants in contrast to the qualitative study.

A review of recent literature on the difficulties encountered by articulating students identified four main problem areas, [2], [4] [5], [6], [8] and [9]. These can be categorized as: community (both inter-student and student-faculty member relationships); curriculum (work load and learning styles); culture (expectations set by faculty members, class attendance, assignment submission guidelines and class interaction) and campus. The last category was not a factor in this study given that all those interviewed came from the same institution and did not have to deal with a new campus environment.

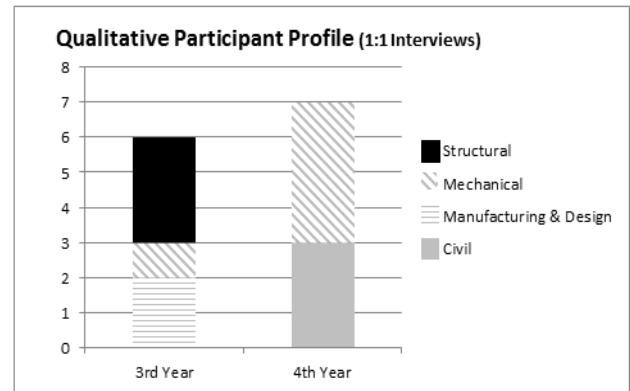


Fig. 1. Qualitative Participant Profile in 1:1 interviews

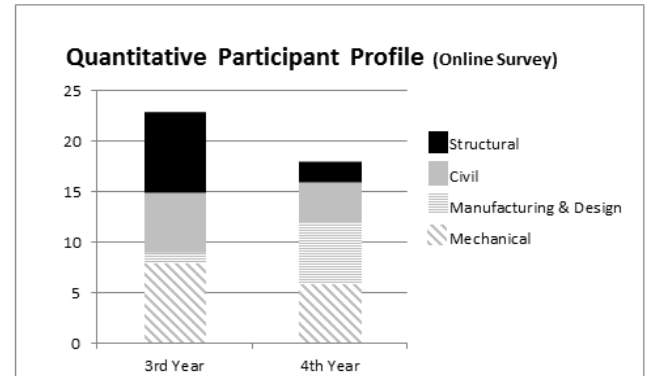


Fig. 2. Quantitative Participant Profile of online survey

#### B. Approach to conducting the research and analyzing results

The categories were used as a guide during the semi-structured interviews to ensure students considered all aspects of their transition. Faculty did not interview any student from their own discipline and the recorded interviews lasted on average 15-20 minutes. Prior to the commencement of the interview students were asked to read an information sheet outlining the parameters of the study and they also signed consent forms. It was clearly stated that they could conclude the interview at any stage.

A detailed review and analysis of the transcripts of the interviews identified themes that formed the basis for the online survey. Focus was put on the categories of culture, community and curriculum as well as specific terms such as “grades dipping” in an attempt to find evidence to support previous research that had shown particular difficulties in the first semester after transferring into Level 8 [11]. Howieson’s research on articulating students in Scotland [5], which involved a large questionnaire of approximately 50 questions, also provided a useful source for the final online version, which was chosen for ease of development and administration of the survey responses. There were 10 questions in total, with initial questions designed to gather information on student profile and their own expected performance for the end of this academic year. Most questions were structured using a Likert

5-point scale with a comment section provided for respondents to explain or justify their selection. A final open-ended question required students to sum up their overall transition experience. All students currently studying on Level 8 programs in civil, structural, mechanical and manufacturing & design engineering received an email requesting those who entered through a Level 7 program to participate in the anonymous online survey. The quantitative data received from the survey was exported and a graphical analysis was completed. The comments provided to support the selection made by the students was examined in order to help understand their responses more thoroughly.

#### iv. Results

This section presents briefly the qualitative and quantitative data from the research conducted through the face-to-face interviews and the online anonymous survey. Analysis and discussion of these findings will be presented later.

##### A. Qualitative Results

Five main themes were identified from the interviews: a dip in grades; the expectations of faculty; class integration; study behavior and challenges related to the content of the Level 8 programs. The students' perception of whether their performance dropped as measured by the grades they attained in the first year of transition was mixed overall, with some having experienced a drop in grades while others claimed no effect or even increasing grades at Level 8. The content of the program was perceived to be delivered at a faster pace and more in-depth theoretical aspects were explored. In relation to the expectations of faculty, one key finding was that students perceived more self-directed learning was expected and that a higher quality and depth of analysis was required for Level 8 success. There was little "hand-holding" observed as compared with Level 7 programs. Effective peer-learning and an overall positive interaction between Level 7 articulating students and the existing Level 8 cohort was noted. With regard to study behavior, students indicated that an adjustment was required to balance the workload, giving less time for ongoing study and more time needed for continuous assignments because of the greater workload in Level 8 programs. On the other hand, transitioning students felt they had benefited from their experience of having already completed a final year project at Level 7 and that this increased their ability to plan assignments and projects on the honors program.

##### B. Quantitative Results

From the online survey, 38% of students stated that articulating was very easy or easy, but the majority (62%, Fig. 3) found it either somewhat challenging or difficult. Many commented on the fact that some repetition of module content enabled a smooth transition, while comments made in relation to the increased workload evidenced a more challenging aspect of the transition process. The academic performance of the articulating students was mixed, with 57% stating they

were successful or very successful with another 30% stating they were somewhat successful. Only 14% felt they were unsuccessful, explaining that they were mentally exhausted or experiencing a lack of motivation (see Fig. 4). Eighty percent of participants responded to the question regarding specific difficulties with module content, with a quarter not finding that any specific content was challenging. Modules that were mentioned as challenging were mathematically based. A higher volume and level of theory was highlighted as a problematic aspect of transition but there was an even spread over other modules based on individual abilities, preferences or learning styles.

Many students perceived no or only minor differences (57%, Fig. 5) with respect to the teaching styles of faculty between Level 7 and Level 8. Students supported their opinions by commenting that they felt more self-learning was expected and in Level 8 a hands-off approach was more evident. Also, it was mentioned that fewer practical "worked through" examples were given at Level 8 with a greater focus on theoretical knowledge proving somewhat more of a challenge to understand. The majority of students found that they had to change their study habits a lot or at least to some degree (62%, Fig. 6) to deal with the Level 8 workload. Predominantly, their comments suggested that there was less time available for study due to projects and group assignments. More personal focus and interest in the program was indicated by some whilst others, now in their 4<sup>th</sup> year of the Level 8 program and 5<sup>th</sup> year overall, just wanted to pass and get finished at this stage. Due to their heavy workload, end of semester study rather than consistent study throughout the semester was the main observation here.

A Cronbach Alpha test was carried out to determine the level of internal consistency of responses between the student perceptions of transfer challenge and successful transfer based on their academic performance. The calculated Cronbach alpha value was 0.495. This value indicates that there is a low level of consistency which is evident in some responses. For example, some students considered that the transfer was easy, but were unsuccessful with regard to academic performance.

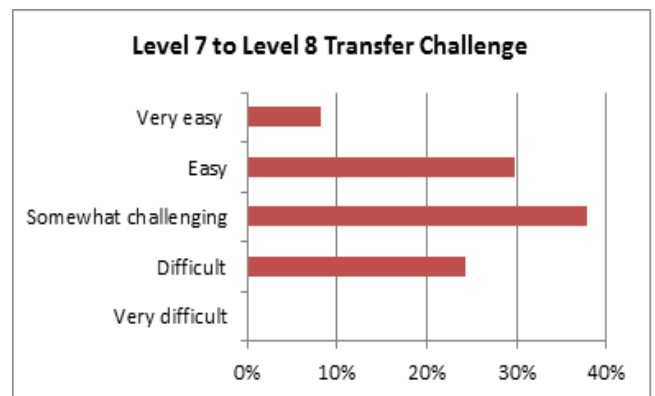


Fig. 3. Students' perception of the challenge in articulating



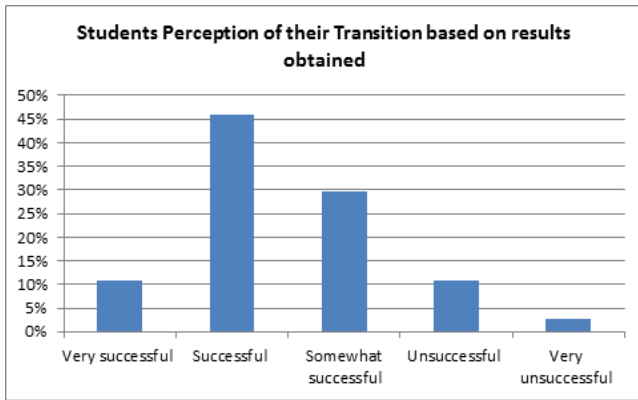


Fig. 4. Students' perception of how well they transitioned based on their academic performance

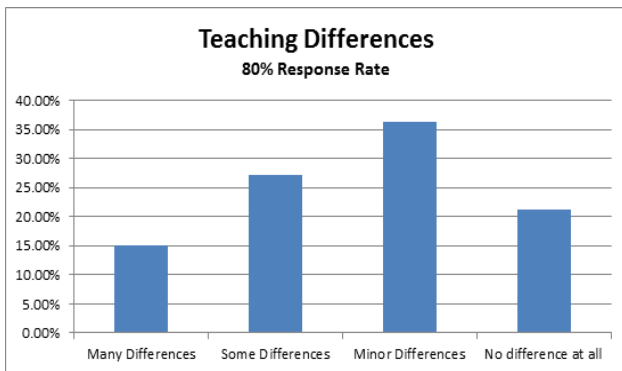


Fig. 5. Students' perception of the difference in teaching styles by faculty members

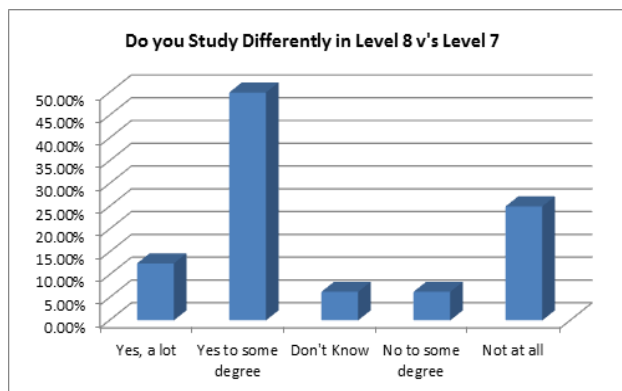


Fig. 6. Students' perception of the difference in their study behavior

## v. Analysis and discussion

This paper set out to answer the question: do articulating students perceive transfer shock as something that has affected them? This question was analyzed using quantitative and qualitative data and was examined under several themes which now provide a useful framework for discussion of the results. The themes were derived from students' comments collated

during interviews with faculty. It is worth observing, however, that these themes fit well with those already identified in research by Winter and Dismore [9] – which are: community, curriculum and culture.

### A. Dips in grades

Thirty percent of the interviewees stated that they were somewhat successful in articulating, while only 14% felt they were unsuccessful. Fifty seven percent said they were successful. Since this study involved both 3<sup>rd</sup> and 4<sup>th</sup> year students, the findings of this study could be assumed to compare favorably with results from previous studies, [12] and [13], which show that, while identifying initial difficulties in transferring, these appear to be resolved at the end of year 4, when articulating students are on a par with direct entry colleagues in terms of average grades. When grades did not dip the reasons given included the intensity of effort required to complete the Level 7 programs and the level of difficulty at Level 8 not being significantly greater than in Level 7. In contrast, reasons given for grades dipping included a lack of motivation and that the “difficulty was so high”.

### B. Faculty expectations

While 57% of respondents perceived only minor differences or some differences in the teaching styles of faculty, comments collated from the interviews show faculty expectations are perceived by some students to be quite different at Level 8. The following quotes emphasize the need for self-directed learning:

- “You have to do a lot more research yourself.”
- “Even the likes of printed out notes, that was left up to yourself.”
- “Left to your own devices.”

Other comments emphasized the faster pace and higher intensity of the requirements of the Level 8 program:

- “It’s just tough to keep up with everything.”
- “There was a significant increase in the workload.”
- “We are expected to up our game.”
- “Maths moved at a slightly quicker pace.”

### C. Class integration

Comments made during interviews indicated that students consider integration of former Level 7 and Level 8 students to pose no problems. Comments include “there is not a huge difference between the way they do things and the way I do.” While initially “we would sit on either side of the room”, in semester 2 one student observed “more mixing going on”. Several students perceived the mix to be advantageous to both articulating and traditional Level 8 students, commenting that

they “spur us on” and “some of the stuff I would have done in Level 7 and they wouldn’t have touched on, I’d help them with that, and other students would help us with stuff we hadn’t done.” Hence, the positive experience and advantages of peer learning are evident.

#### *D. Study behavior*

The majority of students found that they had to change their study habits a lot or at least to some degree (62%) in order to deal with the Level 8 workload. Predominantly, their comments suggested that there was less time available for study due to projects and group assignments. Additional comments collected during interviews indicate again that students feel the Level 7 experience has given them an advantage over their Level 8 colleagues because “we have done a final year project before, we have a good idea of what is needed” and “from the first final year we did, we were slow off the mark, we won’t let that happen again.” Some overlap with the theme of faculty expectations is evident here, with one student commenting “you are being asked to think about what you are doing ... and see if you can come up with new ideas.”

#### *E. Challenges related to content*

Eighty percent of participants responded to the question regarding specific module content challenges, with a quarter not finding that any specific content was challenging. More than 50% of respondents said the transfer to Level 8 was either somewhat challenging or difficult. Some modules (with high theoretical and mathematical content) were highlighted by some as posing difficulties – “it’s a lot more in depth”. Further, the importance of regular attendance at lectures was highlighted – “even if you have covered it before, you have to be in the vicinity to pick things up again”, while other students commented on the amount of repetition between Level 7 modules and their corresponding Level 8 modules. Some saw this as an advantage, especially in the more theoretical modules – “that kinda eased the transition”, while others complained. It was noted that this problem is specific to some engineering disciplines and not to others.

A recurring challenge highlighted by respondents was the volume of assignment work required. Answers included comments like “it’s tough to keep going” and “a significant increase in workload”, “the biggest challenge is to try to get them all done on time”. One student recommended that “people in Level 7 need to be notified more about how difficult Level 8 is”. Another student, however, commented that the “pace increased slightly”.

## **IV. Conclusions**

Previous research at DIT [11] has shown that some articulating students do struggle when they move from Level 7 to Level 8. Other recent research [12] shows that, while

students initially struggle with their math modules, their final average marks are on a par with their direct entry colleagues [13]. The purpose of this paper has been to explore students’ own perceptions of their transition, in particular their awareness of experiencing transfer shock or not, their motivations, difficulties and successes. The question this study set out to answer was: do articulating students perceive transfer shock as something that has affected them?

Whilst 38% of students in the online survey stated that articulating was very easy or easy, 62% found it somewhat challenging (38%) or difficult (24%). This provides the clearest indicator of transfer shock. Analysis of the interviews shows that a significant proportion of students do perceive challenges and significant changes in transferring from Level 7 to Level 8 – which concurs with previous studies. The difficulties identified by students correspond to the themes such as faculty expectations, study behavior and content challenges. Integration of former Level 7 and Level 8 students is seen by many interviewees as advantageous, with one cohort being able to help the other, thereby demonstrating the positive experience of peer learning.

Another indicator of transfer shock is that of academic achievement or dips in grades. The academic performance of the articulating students was mixed, with 57% stating they were either successful or very successful and another 30% stating they were somewhat successful, whilst only 14% felt they were unsuccessful. This divergence in student perception of academic performance could be explained by the fact that the cohort studied as part of this paper includes both 3<sup>rd</sup> year and 4<sup>th</sup> year students. It is our contention that the 4<sup>th</sup> year students have either recovered from the challenges faced in transferring or, indeed, have forgotten that they ever experienced challenges in the first place. This view is supported by findings from a parallel study [13] which shows that the final marks of articulating students are on a par with their direct entry colleagues. The Cronbach Alpha test performed on the internal consistency of responses could indicate the presence of transfer shock also.

Finally, while adjusting to a new campus cannot be considered a factor in contributing to transfer shock in this study, since students articulate within the same campus, it might well ease the articulation process, as suggested by Greenbank [2]. This is validated by analyzing the comments captured by students who responded (38%) that they found the transfer between level 7 and level 8 as ‘somewhat challenging’.

Further research into articulation of DIT engineering students is planned. Areas to be focused on will include:

- The practice of peer learning between articulating and direct entry students.
- The extent to which faculty expectations differ between Level 7 and Level 8 programs.
- Has Ireland set the correct drivers for its Level 8 engineering programs?

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