Preliminary evaluation of an intervention to increase student success of first year students in engineering education

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INTRODUCTION

Student success is among the most widely researched topics in higher education and the body of knowledge is extensive (e.g. [1, 2]). In general this research has not led to lasting changes in students' persistence in courses. A possible explanation is that much of the research focuses mainly on theoretically appealing concepts that are not easily translated into feasible and effective approaches or interventions. A number of researchers touched on questions of 'what works in practice' but the body of knowledge of effective and evidence-based action is fragmented and difficult to access [1]. Much of the research is done with retrospective, quantitative data, such as grades, reenrolment rates and sometimes course evaluations. When studying the effects of interventions aimed to improve student success, these data may not be the best source of information as they leave out student perceptions and experiences with the intervention.

This paper reports on part of a qualitative study on students' experiences with and perceptions of their educational environment in their first year in Delft University of Technology (DUT). The focus of this paper are students' experiences with an intervention designed specifically to increase student success in the first year of enrolment: the Exclusion of Reenrolment Rule.

1   INCEPTION OF THE 'EXCLUSION OF REENROLMENT RULE'

In the Netherlands universities are required by law to grant access to all students who comply with basic entrance requirements. For universities of technology this requirement is a diploma from preparatory university education with a focus on Science and Technology. Universities are, in general, not allowed to select student prior to enrolment. Instead, the first year of university studies is designated to select students and refer them if necessary. In 2009 Delft University of Technology (DUT) implemented the 'exclusion of reenrolment rule' (ERR). This rule implied that all first year students needed to obtain at least 50 per cent of the first year credits to be eligible for reenrolment in the second year of their courses, i.c. 30 out of 60 European Credits. It was expected that this new rule would have major implications for the student experience as lack of progress would have serious consequences for students. The anticipated effects were that students would devote more time to their studies in the first year and that students who were experiencing trouble would explore other options sooner instead of pursuing a degree that might be too hard for them.

DUT designed formal procedures to communicate on records of students' progress and to advice students on their status concerning possible exclusion of reenrolment. The procedure consisted of two formal communications on how students' progress was evaluated at that time and a final decision

whether or not a student would be allowed to reenrol in the second year. The first evaluations were sent out in December after the first round of exams and the second letter was sent in March after the second round of exams. These letters contained a preliminary advice on whether to stop or continue or that they were at risk based on the number of credits obtained until that moment. The final letter would be sent in August and contained the final decision regarding reenrolment. If student had obtained 30 or more credits the student would be allowed to reenrol. Students with exemptions for certain courses were also required to obtain 30 credits to reenrol.

Besides the ERR the university encourages students to obtain their first year diploma in one year. This is referred to as "P-in-1". Although the diploma only has a symbolic significance, students who obtain 60 credits in their first year are awarded this diploma in a special ceremony.

1.1 The importance of intentions

The perceptions that students have of their educational environment influence their dispositions, motivation and intentions, and dispositions in their turn influence student behaviour, time on task and ultimately progress. Students' goal orientations and intentions for success are important predictors for success [2]. From this point of view, the ERR would be successful if it leads to students setting goals to obtain at least 30 credits in their first year and if students who fail their courses explore their options early on. However, effectiveness of the ERR would depend on the perceptions students have of the rule. Therefore this paper focuses on this question: What intentions for success do students have in their first year of study and how is this related to the ERR?

2   SET UP OF THE STUDY

2.1 Group interviews and stimulus objects

This study was executed in the academic year of 2010/2011. The ERR had been in place for a year at that time. For this study students were interviewed two times during their first year of enrolment at DUT. The first interviews took place in the first six weeks of the academic year. The second round of interviews took place at the end of the first semester or beginning of the second semester. In both cases the interviews took place briefly after an exam period.

We opted for group interviews as this would allow us to interview more students in a small time frame and group interviews bring out the range of opinions in groups. In group interviews it quickly becomes clear what the extreme opinions are and which opinions are shared [3]. The interviews focused on students' motivations for choosing their courses; the perceptions they had of their educational environment and the experiences that shaped these perceptions. Topics that were discussed included perceptions of and experiences with teachers, course content and organization, but also perceptions of the ERR and intentions for progress. In the first interview students were presented with stimulus objects to encourage the participants to dialogue with each other [4]. The researcher was part of the conversation and asked probing questions for clarification. These stimulus objects consisted of large sheets of paper with some pre structured questions: students were asked to assess subjects they took and the course as a whole. The sheet on course evaluation included rules and regulations such as the ERR. Students were given markers to write and draw on the sheets, creating a point for mutual focus. In the second interview students were presented with another stimulus object called a 'storyline' [5]. A storyline is a two-dimensional graphic representation that shows a student's experience on a time line (x-axis). Students are asked to think of those events that marked their experiences of the course of a semester and to indicate what effects these events had on their university experience (y-axis). Again the students were markers to write and draw and they were encouraged to converse about the storyline and their experiences and the researcher would ask probing questions and sometimes bring up topics deemed to be important for the conversation. In both interviews students were asked for their intentions for success, but only in the second interview students could reflect on their experiences with the ERR because by that time they had had their first exposure to formal communications concerning ERR.

2.2 Selection of participants

All faculties in DUT have mentor group systems in place. Students work on their projects in these mentor groups, while at the same time these groups are intended to create support from the students. The mentors are there to support students and help them find their way. We asked coordinators from the mentor programmes to select mentor groups at random. We set up meetings with the mentor groups to explain the research and ask for student participation. We distributed a description of the research and consent forms to the students. The students who were willing to participate were invited for a group interview over lunch briefly after the first meeting. Not everyone was able to attend both sessions.

We chose to select multiple groups from a limited number of faculties that represented three tiers that make up DUT and to complement these groups with single groups from various other courses to include a wide variety of student experiences. Multiple groups of students from Applied Physics (4 groups), Civil Engineering (4 groups) and Architecture (3 groups) were interviewed. From the following courses single groups were interviewed: Applied Earth Sciences, Industrial Design Engineering, Technology, Policy and Management, Electrical Engineering and Computer Science. These latter groups were also selected at random from the populations.

2.3 Method of analysis

The transcripts were the focus of the analysis; the stimulus objects were used to complement the transcripts where necessary. The transcripts were initially analysed using codes that had been developed in a similar study [6]. In this paper the codes that pertain to the ERR, intentions to obtain the first year diploma and intentions to be successful in other ways are reported on.

In total we interviewed 16 groups of students in the first round and 13 groups in the second round. The group interviews were recorded and transcribed verbatim. Below the outcomes of the analysis is presented.

3 RESULTS

The coding process resulted in 9 codes: Intentions for P-in-1 and ERR and Feasibility of P-in-1 were mentioned most often: 29, 20 and 17 times. Other codes concerning issues such as planning, intentions and the ERR were mentioned between 4 and 10 times.

3.1 Intentions for success: progress and understanding

The motivations of students to enrol in a particular course vary: some students have a motivation for understanding and the pleasure of increased appreciation of the topic is the kind of award they seek. Other students have the intention to be successful in a particular field later on in life. For them the course is something that will aid them in achieving those goals [7]. No matter the personal motivations of students, passing exams and progression are essentials part of the student experience. Credits represent the consolidation of formal learning in any university course. It is not surprising that all students participating in this research reported in the first interviews they were eager to make as much progress as they possibly could in their course.

A desire for deep learning is mentioned four times. A student of CE says: "I will try hard, but I'll see it when I get there. It's not that I don't find P-in-1 important, but I want to absorb this education. I want to be able to do it. The diploma in itself is a reason to party, but it's not what truly matters."

3.2 Intentions for ERR and Pin1: a two stage rocket

In the first round of exams many students report that they intent to obtain their P-in-1. Intention for P-in-1 is mentioned 29 times. Students say things such as: "If you can do it, you should go for it." and "Of course I'll go for the diploma!" Many other students express their doubt on whether it is feasible for them. Some of these students also state that they will definitely try, while other students state they aim for between 40 to 60 credits. Some students see the ERR and P-in-1 as a two stage rocket. First obtain those 30 credits, once that is achieved, they move on to the next target. A student in CE says: "I focus on the ERR, but I can always try [to obtain P-in-1]. I wouldn't sleep any less if I do not make

that. … If I would obtain only 30 credits, that would be disappointing, but once I have 40 credits, I will sleep soundly."

In the second round of interviews some students report they have failed to pass a number of exams and the P-in-1 is no longer an option. A student in CE says: "Obtaining P-in-1 was not entirely my goals at the beginning of the year. I knew it was not completely realistic for me, but I'd rather set the bar slightly too high than too low." Most students, who have not yet passed the 30-credit threshold in the second interview, are confident they will get to 45 to 50 credits. A student in CE says: "I would like to obtain at least 35 credits, but I will try hard to pass all the tests to come. I aim for 45 credits. 60 would be better, but 45 is just as fine." A few students struggle to get to the threshold of 30 credits. A student in EE says: "I would like to pass my math exams and the ERR. I have conferred with the support officer and if I pass my project, I am getting close to obtaining ERR. I will still have to pass another subject. I had a 5 (out of 10) for Analysis, I will try the resit for that course." Other students went to see the student counsellor to discuss how to mitigate the situation. In most cases they blame their own behaviour for the lack of progress. They resolve to be more committed and to be more selective: instead of trying to pass all courses, they start focussing on a few key courses.

A number of students are right on cue with the number of credits obtained. These students continue to pursue their P-in-1. A student in AP says in the second interview: "My initial goal was to pass the ERR threshold. Now I have obtained 30 credits, I upped my goal to obtaining P-in-1."

3.3 Perceptions of feasibility of Pin1 and ERR

Many students state in the first interview that they do not believe the P-in-1 is feasible. Doubts about whether the P-in-1 is feasible are expressed 17 times. Students report that they have heard or read that only 10 per cent of the students obtain P-in-1. A student in Architecture expresses it as follows: " I happen to find life besides studying and sports important too. You have to accept that you cannot always get an 8 [out of 10]. Sometimes you get a 7, and sometimes you fail. As a result you cannot obtain all your credits or P-in-1. I know this and I accept it, but at the same time I set my own bar pretty high: I would like to obtain P-in-1, but I would not be disappointed if I fail. While I am bringing this up, I think: be realistic, you will not be able to pull this off." A student in CE says: "You are trained on a high level here. If anybody can pass exams here in one try all the time, anybody could do it. It [studying here] shows that you are competent. You have had to work for that. You have achieved something." A student from AP states it short and sweet: "You know what is fun? Not spending time on your studies. Physics is fun, but not a life-style."

Students do believe that the ERR is feasible. A student in EE says: "ERR has to work out. It is only half of your entire course load. You have just obtained half, if you can't do that, you're a bad student." A student of AP says: "If I obtain 85 per cent of my goal, like 47 or 52 credits, I am satisfied. That is not the P, but still a nice fat percentage. ERR is feasible for me. When you look at it in absolutes, you need to obtain a 6 [out of 10] for half of your classes. If you cannot do that, you're doing something wrong, I think."

A number of students, however, resent the ERR. They feel it creates a lot of pressure for them to perform. They need to pass their subjects anyway and for them the ERR just adds superfluous pressure. They experienced that in the first semester they were overwhelmed with all the things they suddenly had to deal with and they cannot control all the factors that are important for achieving success. They resent the idea that they cannot reenrol at something they enjoy if they fail one exam too many. Some other students brought up that they felt the ERR was not helpful. They knew some older students who still had not finished some first year subjects and they concluded that the ERR would still allow for people moving on with their subjects while not having satisfied the requirements of the first year. These students felt that it would be more fair to students if the ERR would be transformed into a rule requiring all students to finish P in 2 years. This would be tougher, as student can be send away after two years, but it allows students who are off to a bad start to make up and do something they love. Other students are positive about the ERR. They think it is right to set some requirements to students.

3.4 Perceptions of ERR communications

Most students found the letters they received regarding the ERR silly. A student in CE states: "I can come up with the idea that if I have obtained 50 credits, I will have a positive advice on the ERR. I don't need to read that in a letter." Most students mention that they already knew what was in the letter and that it mainly served as a means to let their parents know they were doing well. In some cases this led to situations where the parents would give the students a hard time, although these students were doing quite well, but the parents knew too little about the context to be able to assess whether their child had done well or not. The students elaborated on this: they both had older siblings. One was struggling in school and the parents were upset that the DUT student was not working harder to take on extra coursework. It can be the small push that makes the difference in the end. The other student's sibling was more successful in her course, but she took a course with far less lecture hours a week. Therefore it was hard to compare progress, according to the student.

Some students were quite upset because of the letter. Their letters stated that the students were 'at risk'. These students failed one or more exams, but they did not make a big thing out of it. They were certain they could make up for it, but the letter felt like a vote of no confidence. One student had not received the preliminary advice at the time of the interview, but he had failed a number of subjects and had visited with the support officer for advice. He could still obtain the ERR and probably even more than that. He felt the letter would not add anything for him.

One student states that he liked the letter, because it confirmed to him that all his results were properly administered. The letter was proof of that.

4   CONCLUSIONS AND DISCUSSION

The research questions of this paper was: What intentions for success do students have in their first year of study and how is this related to the ERR? Overall we can say that at the start of the academic year students are motivated and ambitious in what they want to achieve in their first year. Most students do not consider P-in-1 a feasible goal but it serves as a beacon, as something to strive for. As subjects need to be passed anyway, it is a goal that makes sense. They are also quite aware of the consequences of not passing exams. This leads to increased course load later on and it can lead to a negative advice on reenrolment the year after. We can conclude that the intentions for success student have are a range between 40 to 60 credits in their first year. Reasons to be less ambitious than Pin1, or "more realistic" in the words of the students, are multiple. The first year of studying can be overwhelming for students. They have a large course load, the pace is high and they are required to spend much time on task, whether it is in lectures and practicals, or at home on independent study. Other reasons students bring up is that they want to spend time on other activities besides studying. They want to 'have a life', e.g. be part of a student association or fraternity, they want to practice sports and sometimes they need to veg out.

The ERR was introduced to support students in studying faster. Overall it seems that most students opt to obtain between 40 and 60 credits, while the ERR threshold is 30 credits. In that regard students do not seem to be impressed with the ERR. It is not challenging them. It only becomes challenging when students start failing subjects and get into trouble with the ERR. At that point they become more strategic and try to make decisions that will help them make the best of it. In that respect the ERR seems to have an effect on students: failure is seen as a problem early on.

The ERR may not be successful in the sense that the threshold seems to be too low for students to challenge them upfront. However, it does challenge students who failed courses to get their act together and learn to make choices that benefit their studies. Communications are not perceived to be very helpful: a letter after the first round of exams may not be the most supportive as students who failed some of their subjects experience it as a vote of no confidence, while the letter could also be phrased as an encouragement.

That brings us to more fundamental issues. The first concerns evaluation of interventions. In DUT the faculties have a system for the evaluation of subjects, but they do not carry out systematic evaluation on course level. The University Bureau did no plan for preliminary evaluation of the ERR either. Instead, it was proposed that the evaluation would take place a few years after inception, when possible effects would become visible in the stop out and drop out numbers. In the academic year of 2012/2013 the ERR threshold was raised to 45 credits. From this study it became clear much earlier

on that the threshold of 30 credits would probably not be effective. Based on the outcomes it is advised to DUT to implement a form of action research along with intervention for student success.

The second issue has to do with accountability. With the ERR the students are held accountable for their own success, which makes a lot of sense considering that effective student behaviour and time on task are essential for success. Behaviour and allocation of time is the prime responsibility of individual students. However, the educational environment plays a major role in that as well (e.g. [2]). Students have very few means to influence their environment or to hold the institution accountable for creating circumstances that make it hard for the students to spend enough time on their work. The DUT curriculum is overloaded and fast paced [6, 8]. Students spend many hours a week on university on learning activities, that are usually helpful, but leave little time for necessary independent study [8, 9]. This makes a intervention such as ERR a lopsided one.

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