

# The Struggles Experienced by First Year Computer Programming Students at a University in South Africa

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## **Abstract**

The highest rate of student attrition usually occurs in the first year at university where a large quantity of students either fail or drop out. The high attrition rate can be accounted to a number of determinants. In this paper we investigate what these determinants could be. A questionnaire was given to 114 first year students studying the Diploma Business Information Technology at the University of Johannesburg in South Africa. The study was quantitative. The results show that the contributing factors to computer programming students struggling in their first year of study, can be deemed to be the transition of students from high school to university, English being a student's second language (ESL) rather than first language, the difficulty of the subject computer programming, and Information Technology (IT) not being a student's first study choice.

**Keywords:** Information Technology, first year struggles, student attrition

## 1. Introduction

Information Technology (IT) courses worldwide have consistently had a high failure rate especially in the first year at university (Hoda & Andreae, 2014). As this poses a cause for concern, we conducted a survey among 114 students studying the Diploma Business Information Technology at the University of Johannesburg in South Africa. In this paper we focus on determinants that have been reported in the literature that could contribute towards first year IT students dropping out.

## 2. Literature Review

The By means of a review of international literature on the determinants which are believed to impact on a student's first year experience, it is postulated that: (1) the transition of students from high school to university, (2) English being a student's second language rather than first language, (3) the difficulty of the subject computer programming, and (4) Information Technology being a second study choice and not a first study choice, can be deemed to add to the struggles of first year students.

The transition from high school to university can be difficult for students (Colvin & Ashman, 2010; Hassel & Ridout, 2018; Ang, Lee & Dipolog-Ubanan, 2019). Students who have previously been disadvantaged and attended less than adequate schools, on entering university, face challenges such as under-preparedness, academic overload and social adjustment (Petersen, Louw & Dumont, 2009). Students expect to be "spoon fed" at university in the same way that they were at school and find the lecturer to student ratio impersonal due to large class sizes (Ang, Lee & DipologUbanan, 2019). A negative transition from school to university can result in students either performing poorly or not having a sense of belonging, which could be stressful and result in a student dropping out (Kinnunen et al, 2016).

Making an IT course even more challenging, is that the majority of learners enrolled for programming modules are not English first language speakers, even though they have been taught and assessed in English at school. Many of the students from the University of Johannesburg are black, and as a result speak an African language as a first language. South African universities also have an influx of foreign nationals from neighbouring countries and further afield (ICEF Monitor, 2017), such as Zimbabwe, Namibia, Lesotho, Swaziland, Botswana, Congo, Nigeria, Zambia and Kenya, where English is deemed a foreign language, yet the language of instruction at the University of Johannesburg is English.

Students who struggle to understand key content can also be left behind in the classroom, especially in a subject like computer programming, where one concept builds onto the next concept (Gordon, 2016, Chetty & Barlow-Jones, 2012). Programming concepts, which are interdependent, not grasped by students in the beginning stages of the module, can make it more difficult for students to comprehend at a later stage (Hoda & Andreae, 2014). The added challenge for second language English speaking students is that the programming terminology can be difficult and students spend a lot of time having to decode the content before they can understand it. This could have a negative impact on them in the exams where they may have difficulty

comprehending questions and therefore being unable to answer them satisfactorily (Dukhan & Brenner, 2017).

Many grade 12 learners feel the pressure to attend university even though they have not found their calling. These learners usually end up studying courses that they are not interested in with little idea of a future career plan. Research has shown that students who study a course that they are interested in, are far more motivated than students who are disinterested in their course content (Dejenie, 2010).

In this paper we investigate whether the struggles mentioned in the literature are true for the first year students studying the Diploma Business Information Technology at the University of Johannesburg (UJ). Students were also asked how the Applied Information Systems Department, where the course is offered, could assist them, so that they could be more successful in their studies. This is also reported on.

### 3. Methodology

The researcher collected data from a survey which produced numerical descriptions from a total of 114 students enrolled for a first year Business Information Technology Diploma at the UJ, in South Africa. Sampling for this study was based on convenience sampling as the researcher included students that were accessible to her and formed part of her lecturing classes. The data collected in the first term of 2019 were scrutinised for irregularities and cases were removed where data were incomplete. Descriptive statistics were used to analyse the quantitative data from the survey. All the guidelines prescribed by the relevant ethics committee was adhered to and permission was granted to conduct the research. Utmost care was taken to ensure that data were recorded and analysed as accurately as possible.

### 4. Analysis

In response to students being asked how they viewed their first year subjects in terms of difficulty, students seemed to grasp the subject content for all subjects (Information Systems 1, Business Analysis 1 and Systems Software 1) except for Development Software 1 (computer programming), where 85% of students found the subject to be difficult (Q1.d). Comparably, 88% of students found the Development Software 1 tests difficult (Q2.d) compared to their other first year tests. Surprisingly, studying a diploma in business information technology was only 50% of student's first course choice (Q3). 54% of students indicated that they were having difficulty transitioning from high school to university (Q6). A number of students (80%) indicated that they were not first language English speaking and that they had difficulties understanding the lectures and text books that were in English (Q13). Worth mentioning is that 45% of students found their place of residence too noisy which affected their ability to study (Q4) and 42% of students indicated that they lived far away from campus and spent over an hour traveling to get to and from university (Q14) every day.

*Table 1: First year IT students struggles*

Problem	Agree	Disagree
1.a) The subject IFS01A1 is difficult to understand.	17%	83%
1.b) The subject BAY01A1 is difficult to understand.	25%	75%
1.c) The subject SSW01A1 is difficult to understand.	11%	89%
1.d) The subject DSW01A1 is difficult to understand.	85%	15%
2.a) The tests for IFS01A1 are difficult.	35%	65%
2.b) The tests for BAY01A1 are difficult.	38%	62%
2.c) The tests for SSW01A1 are difficult.	12%	88%
2.d) The tests for DSW01A1 are difficult.	88%	12%
3. The course was not my first choice.	50%	50%
4. The place where I live (Example: Home, Res) is noisy. It's not easy for me to study with the noise.	45%	55%
5. I usually study for my tests at the last minute.	50%	50%
6. I am struggling to adapt from high school to university. It is very different.	54%	46%
7. I have problems with my parents/boyfriend/girlfriend/other.	21%	79%
8. I have been late several times for classes.	25%	75%
9. I usually go out with my friends until late at night during the week.	3%	97%
10. I sometimes skip going to my classes.	33%	67%
11. I am a working student. I have no time to study.	7%	93%
12. I have to take care of my siblings/family members e.g. cook, clean, babysit when I am at home.	22%	78%
13. English is not my first language and I battle to understand the lecturer and text books which are English.	80%	20%
14. I live far away from campus and spend over an hour traveling to get to and from university.	42%	58%
15. I don't have many friends at UJ.	28%	72%
16. I am not part of a peer mentor group.	23%	77%
17.a) I have an eBook for IFS0A1.	86%	14%
17.b) I have an eBook for BAY01A1.	79%	21%
17.c) I have an eBook for SSW01A1.	83%	17%
17.d) I have an eBook for DSW01A1.	79%	21%
18.a) I have a printed text book for IFS0A1.	21%	79%
18.b) I have a printed text book for BAY01A1.	27%	73%
18.c) I have a printed text book for SSW01A1.	18%	82%
18.d) I have a printed text book for DSW01A1.	14%	86%
19. I need help with food.	25%	75%

Students were further asked what kind of assistance they needed to succeed in their studies? The responses included the following comments:

Student 1 – “The only problem I have is study skills. Effective study skills specifically, I want to study for remembering, knowledge and understanding while keeping track of time. I'm a slow reader”.

Student 2 – “I use the train to get to campus which takes 2 hours. I sometimes don't come to classes, because I go to sleep late. I wake up at 3h00 am in the morning to catch the first train so that I can get to campus early, and also get home late usually around 22h00. I don't get enough time to sleep or study. I only use weekends to study which is not enough time for me”.

Student 3 – “When I was at high school I had no access to computers. That is one of the reasons that I am struggling. I study hard, but when I get to the exam room I don't understand the way the questions are asked. I regret doing this course”.

Student 4 – “I am a slow learner and shy, I find it difficult to participate in a group of more than a 15 peers”.

Student 5 – “All I have to do is to study, but it takes time for me to understand what I'm reading, I'm working on it...”

(Extracted from the survey)

The main recurring themes that the students agreed would help them to be more successful in their first year, was, to have extra classes for modules; for them to be taught study skills; that the lecturers provide more practical exercises and previous question papers. Students also requested that the lecturers be more available to students and that they conduct more tests throughout the year. Interestingly, the majority of students indicated what they were struggling with in their first year, but few indicated how the department could assist them.

## 5. Conclusion

In this paper we focussed on determinants that have been reported in the literature that could contribute towards first year IT students dropping out. The results show that the contributing factors to computer programming students struggling in their first year of study, can be deemed to be the transition of students from high school to university (54%), English being a student's second language (ESL) rather than first language (80%), the difficulty of the subject computer programming (85%), and Information Technology (IT) not being a student's first study choice (50%). This is consistent with statistics presented around the world.

This is the first phase in an ongoing research study to understand why IT students struggle in their first year of study. Further research will track students who participated in the study to determine how many of them drop out, fail or stay the course.

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