

TAU PROJECT

REPORT

Investigating the low pass-rate of CCNA1 students at the
Central University of Technology

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1. Introduction

The field of Information Technology (IT) has experienced rapid change over the past few decades. Since the late 90's, many businesses in the IT industry begun to require certifications for specific technologies (Andersson, 2010; Al-Rawi, Bouslama, Lansari, 2006). Prospective employers frequently stated that they are paying less attention to the results or progress reports of the graduates when hiring new employees but rather concentrate on whether the candidate has the relevant certification or not (Kocak, 2009). IT professional certifications are being increasingly used as indicators of professional skill. The certificate programs have high international standards approved by international institutions for example CISCO Corporation and Microsoft Corporation (Taquiqui, 2013). As a result, some of these Corporations begun to collaborate with traditional educational institutions so that they can control the quality and content of students that have the desire to learn their networking concepts.

South Africa (SA) suffers from one of the most enduring high rates of unemployment (Letseka, 2007). There are a number of notions to explain this persistent high rate of unemployment. Some researchers argue that this is due to the high number of school leavers who either failed the grade or dropped out of the education system (Letseka, 2007). These school leavers are the exact generation we are looking for who have the potential to turn the economy around. This is exactly what the DIT has been experiencing, a decline in student pass-rate and this has raised a lot of concern. The DIT at CUT has adopted the Cisco program for a while now and teach students from first, second, third and fourth year Cisco curriculum, which is CCNA 1-4 and CCNA Security. The student pass rate for the first semester of 2015 was 58%, meaning 42% of the students failed the CCNA-1 course and in 2014 only 63% of students passed. Hence, the main aim of this research project was to investigate the low pass-rate of CCNA-1 students at CUT. Due to time constraints, this research examined the delivery method and the assessment method as they might influence student success.

2. CCNA1 Course Background

The Cisco CCNA curriculum consists of four components covered in four semesters each of which covers from seven to eleven topics. Each component/semester builds on the previous one and each topic progresses from simple concepts to the more complex. Currently at CUT, each component is covered in a school semester (less than 6 months), meaning the students and the lecturer must have covered about 11 Chapters in less than 5 months. Compared with the other three CCNA components, CCNA-1 has enormous amount of theory to be covered, with diminutive practical component. The practical work involved in the course is designed to support the theory and vice versa. There are four key components to the Cisco Networking Academy environment: 1) a centralized curriculum distributed over the Internet; 2) standards-based testing distributed over the Internet; 3) locally customized instruction; 4) practical component, either on real equipment or on simulation and 5) an instructor support system for training, support, and certification.

2.1. Current delivery method

The current delivery method used at CUT is the typical face-to-face traditional approach, where most of the learning occurs in the physical classroom. The students attend one theory

class for an hour and a half and two practical classes (for an hour and a half each) per week. Due to the sheer volume of theoretical concepts which need to be imparted to the students, there is no significant interactivity in the class between the peers and also with the lecturer. This instructive, one-way communication medium, involves the lecturer 'pushing' the information to the students and the students tend to be in a passive role and are expected to progress in a linear sequenced fashion through a pre-planned curriculum which when completed should signify that learning has occurred. The students can also attend an optional SI class conducted by a senior student to reinforce some of the concepts covered in theory class. Web-based storage of course materials is utilised but no web-based learning is integrated. Unfortunately, this requires students to have internet connection to be able access the material when outside the campus. It is the same with the recommended textbooks, these books change every time the curriculum is updated which is mostly every 2-3 years and they are relatively expensive to own.

For the practical component, the students can access the labs to complete their practical work at any time. The hands-on labs, which are provided as part of the CCNA curriculum, follow an example-based learning approach which gives the student an expert's method of how to complete the lab exercise. These labs provide opportunities for students to be actively engaged and also allow students to socially collaborate with their peers and receive guidance from the instructor when necessary. If no lab is available, the students can also make use of simulator (Packet Tracer) activities that are available to help the students to practice and assess their practical skills. The simulator Packet Tracer (PT) is a cross-platform visual simulation program designed by Cisco Systems, it allows students to create network topologies and imitate modern computer networks. PT allows students to simulate the configuration of Cisco routers and switches using a simulated command line interface.

2.2. Current assessment method

The assessment methods currently used include formative and summative assessments and some of the assessments include; chapter online tests, quizzes, assignments, class tests, practical tests, written examinations and final online test. The students write their chapter online tests immediately after the chapter is completed in class. The Cisco online test system allows the students to get immediate feedback on their mistakes. Students are encouraged to complete these tests as they form part of their final mark for the subject, although these chapter tests count only 1% each. All the online tests are multiple choice questions which assess various levels of learning outcomes, from basic recall to application, analysis, and evaluation.

The written tests and examinations make use of a combination of questions including multiple choice, fill-in the missing word, case study, true/false, sometimes computational and short answer questions. The assignments come in different forms, it can be a case study or research. This allows students to start considering research, what research is and how to conduct research. Because of the number of students we enroll in this course, it is not possible to conduct practical tests on real equipment and hence PT tests are the most preferred tests.

3. Research methodology

The research methodology used for this study was a quantitative research design. The participants were 2015 and 2016 CCNA-1 students studying at the CUT, Bloemfontein campus. CCNA lecturers at CUT were also consulted for their views on the questionnaire and to also get some of their opinions on this issue. In order to examine student perceptions, an online survey was developed and delivered using Google forms. The questionnaire comprised of a combination of dichotomous, nominal, rating scale, bipolar, open-ended and contingency questions that gathered straightforward information relating to the participant's study behaviour and basic opinions on the delivery and assessment methods used in CCNA 1 course.

A pilot test was done in order to inform the survey design process. The questionnaire was evaluated by several content and methodological professionals in order to assess bias, ambiguity, or potential semantic problems. Firstly, the questionnaire was circulated to other CCNA instructors in an attempt to attain their views on their students learning experiences while studying CCNA and to reveal different approaches taken to teach this subject. Secondly, the questionnaire was given to an expert in the Education Department at CUT so to get views on the structure and appropriateness of the questionnaire. Finally, the questionnaire was pilot tested prior to implementation in order to test the efficacy of the research methodology and was modified accordingly. The questionnaire was administered at the end of the semester, just before the exams. From 248 students who were registered for the course, 188 completed the questionnaire.

4. Findings and discussion

4.1. Student study behaviour

The results indicated that the students do not make time to study, whether before class (preparation) or after class (emphasis). The students also said that they do not visit the library to expand on their knowledge and what they have learnt in class. But, some of the students indicated that the content they received was too much and this coupled with little contact time they have with the lecturer, exacerbated the situation. The CCNA-1 curriculum is a rich thick content which comprises of online course material, books, animations, hands-on laboratory and Packet tracer exercises. The students are presented with large amounts of rich thick content and the over-abundance of information can cause cognitive overload, result in superficial / surface learning (students put minimal effort in to order complete the task), obliterate the need for students to engage in high order thinking and problem-solving activities and students become reluctant to invest time in areas which are not directly assessed.

4.2. Improvements on delivery method

Based on the findings, 53% of the participants suggested that the delivery method must be improved. Amongst the comments the students made, two themes emerged: "lecturers should spend more time on things the student battle with" and "lecturers are currently not interacting with students during theory class, they just read the slides". On the first issue, the students explicitly expressed few concepts that they seriously struggle with in CCNA-1 course. These concepts include: Network components; IOS Bootcamp; Media Access Control; Address Resolution Protocol; Routing and routers; OSI Model and Layer protocols. Enormous attentiveness and time should be allocated to these concepts to ensure students understand

and follow. This will require that lecturers constantly adapt to meet students' changing needs and strengths on a particular task, as suggested by Vygotsky (1978). Also, the instruction should consist of experiences that facilitate knowledge construction, instead of simply transmitting knowledge between lecturer and students (Feuerstein, 1980; Mayer & Chandler, 2001). The second issue the students mentioned is that the lecturers are currently not interacting with them during theory class. Scheele *et al.* (2007) submit that the main difficulty with the lecture mode of teaching is the lack of interactivity with the students. Kafai & Resnick (1996) suggests that learners are more likely to create new knowledge when they are actively engaged in making some external artefact which can be reflected upon.

4.3. Improvements on the assessment method

The findings also indicated that students do not understand most of the work but they memorise the content in order to pass the tests. This means that students are engaging in surface learning. It quite evident that the problem is the students' learning styles that needs interrogation and not the current assessment method as we predicted. Probably it is essential that we revisit what learning is and how students learn. Then the assessment methods can be evaluated based on that.

The proposed improvements in the delivery method includes a more student-centered learning approach that offers an optimised teaching and learning experience and places the student in the center of the learning process. Collins & O'Brien (2003) state that properly implemented student-centered learning can lead to improved eagerness to learn, greater retention of knowledge, deeper understanding, and more positive attitudes towards the subject. The challenge that the lecturers are faced with is that they have to consider the time-schedule (less than 5 months), the content that has to be covered (12 chapters) and the student intake (+- 180 students). It is very difficult to make content rich course interactive and student-centered when considering the challenges presented above. It is indispensable that the delivery and assessment methods must be improvement, accompanied by a thorough assessment of the content itself and the relationship it has with the timeframe. This should be purely for our context and not in comparison with other universities more especially universities from abroad.

5. Conclusions

Higher education is evolving and the teaching and learning methods and strategies should also evolve. For this reason and together with the low pass rate at CUT, has provided the impetus for the researcher to explore the current delivery and assessment methods used in CCNA-1 course. Improving student achievement cannot be done without understanding the critical classroom processes of Curriculum, Instruction and Assessment. This study evaluated the current delivery and assessment methods and discovered that compared to what we predicted, students engage in surface learning and also some of the students do not take their studies seriously. There is no doubt that the delivery method requires improvement and this research project proposed a multidimensional approach that has the potential to provide personalised student-centered teaching and learning.

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