DURBAN UNIVERSITY OF TECHNOLOGY

AN INVESTIGATION INTO THE EFFECTS OF STAFF PARTICIPATION ON THE PASS RATE FOR AN ELECTRICAL ENGINEERING COURSE AT A UNIVERSITY OF TECHNOLOGY

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ABSTRACT

The purpose of this study was to test the impact of individual participation and teamwork on the pass rate of first-semester Electrical Engineering students at Durban University of Technology (DUT). South Africa's economic growth remains reliant on critical and scarce skills such as engineering. As a result, any institution of higher learning should make engineering training and education a priority. Collaboration and participation are critical components of any successful educational system. Assimilation of module content, readiness for assessment, perceptions of support from lecturers individually or collectively, and perceptions of the results are all significant variables in this study. A mixed methods approach was used to accomplish the study's objectives. The quantitative method was chosen to design the survey and collect data from all registered first-year students enrolled in the Electrical Engineering 1 laboratory module. A questionnaire was distributed to 344 students enrolled in the Electrical Engineering 1 laboratory module. Qualitative data were gathered through interviews with lecturers on the module at the Department of Electrical Engineering. The study discovered a positive and significant correlation between student pass rates and teamwork and individual participation in service. Additionally, the study discovered that first-year students have favourable attitudes toward the service provided by Electrical Engineering laboratory technicians. This implied that students were more likely to assimilate module content and be prepared for assessment if departmental teamwork was emphasised to increase pass rates. The study recommends a new approach for identifying students who require additional individual attention to improve their academic performance using these variables. Students must be viewed as partners in the lecturers' pedagogical approaches following the collaborative approach, which involves all stakeholders in decision-making for continuous improvement.

Keywords: Participation, collaboration, Electrical engineering, pass rate, laboratory module, assessment, perception of support, instructional approach, and module assimilation.

DECLARATION

I, Sunthrasagren Moodlier, hereby declare that "**An investigation into the effects of staff participation on the pass rate for an Electrical Engineering course at a University of Technology"** is my work and has never been submitted to any other university for any degree. All the sources that I have used or quoted have been indicated and acknowledged utilising relevant references.

Sunthrasagren Moodlier

Signature ……..... Date…….

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CHAPTER ONE: STATEMENT OF THE PROBLEM

1.1 INTRODUCTION

This study investigated the effects of staff participation on the pass rate for Electrical Power Engineering course at the Durban University of Technology (DUT). It was pertinent to embark on this study considering the need for sustainable options to improve teaching and learning at higher education institutions and to accommodate significant changes regarding industry requirements. Lattore-Medina and Blanco- Encomienda (2013) avow that there is an interest in each learning institution, such as a university to consider teaching staff and other stakeholders in any quest to improve and to engage and facilitate participation and collaboration between learning institutions and societies. South Africa shows low student success rates, especially in technical modules, and the condition is assessed based on the current state of the education system.

The 2012-2013 Annual Report of the Council on Higher Education (CHE) states that the challenges of universities result in only about half of undergraduates entering universities and completing their degrees. Furthermore, Lewin and Mawoyo (2014) indicate that there is a need for improvement in the quality of the university system and status of teaching and learning such as adequate staffing, resourcing and intellectual development of teaching and learning work; supporting the scholarship of teaching and learning; improving curriculum development skills and teaching practice skills; using technology to support teaching and improving teaching infrastructure. The background to this study is presented next, followed by the problem statement, research questions and objectives.

1.2 BACKGROUND TO THE STUDY

Higher education in South Africa, as in any other developing country, struggles to provide quality education. On this Baijnath (2018) notes that Economic growth in South Africa is still dependent on key skills such as engineering. The shortage of engineering skills in the country has necessitated the outsourcing of these critical skills from other countries.

to achieve economic objectives (du Toit and Roodt, 2010; Nel, 2017). To address the shortage of these skills, there has been a focus on technical qualifications in higher learning and a move to provide a solid background for first-year students in this area. Dealing with the challenges associated with the delivery of the laboratory module of the Electrical Engineering course is necessary to improve the pass rate of first-year students. Against this backdrop, the study was conducted to elicit the main drawbacks or contributing factors to the pass rate of students. It was pertinent to evaluate the internal capacity of the department to improve the pass rate for the laboratory component course. Notably, in the context, the departmental intervention attempted to address both the pass rate and low attendance for the laboratory component course.

In particular, the evaluation of the contribution that the performance of individuals versus team efforts have on the pass rate of the laboratory module deserved special attention in the department. Regarding the demand of the labour market, Leibowitz (2017) states that institutions must address the development needs of society and provide the competencies and expertise of graduates. Electrical Power Engineering is an educational programme which is based on knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist or certificated engineer in Electrical Power Engineering (DUT Handbook for Electrical Power Engineering, 2019).

In this context, the pass rate of students registered for engineering becomes an object of analysis in many institutions. However, the nature of the practical module emphasises the necessity for special attention from the facilitator or lecturer, to ensure that first-year students acquire the required knowledge as per the module content. Pass rates are key assessment statistics which are based on the number of students who pass the examinations; as per the requirements of the institution (Wyse and Anderson, 2019).

There have been increasing concerns about the pass rate found to be dropping each semester for the laboratory component in the electrical engineering department. Notably, a drop-in pass rate suggests that the students are not prepared enough to undergo tests and/or exams for the module. This can be attributed to the students being under-prepared

or irresponsible. The department in question has, however, decided to treat this issue as an internal challenge associated with the quality of service provided by staff. Staff participation within the department is critical to address shortfalls in students' performance in their module and to implement a method to meet the needs of students to improve.

The overall organisational performance of DUT will improve if the strategic intent of the institution is strengthened through reviewing the performance strategy, that is, individual performance and team effort which DUT employs to assess students. This needs to be done by aligning the departmental goals with the strategic goals of the entire university. This study also evaluated how individual performance and teamwork affected the pass rate of first-semester students within the department. Evaluating these methods of delivering the module will assist the department to take note of the challenges that result in the high rate of failure of students. Identification of the challenges will also highlight the opportunities that can be exploited to enhance the performance of staff members in a manner that is best suited to increase the pass rate of first-semester students.

The quality of service rendered by staff members of the electrical engineering department has, considering the above, been heavily scrutinised. Following this, the performance strategies, and techniques as well as delivery modes have been questioned. The performance and resulting quality of service of individuals, as well as teams to support the students during the laboratory module delivery, was the driving factor of this study.

The higher education sector has experienced a lot of turbulence in the past few months. The implication of this is that it offers a significant avenue to optimise the opportunities that have been implemented in prior years as well as in the recent past. Considering South Africa's stance as an emerging economy, skills that assist in sustaining and developing the economy must be cultivated, and this can be realised through addressing the tuition processes and identifying how students can better achieve overall success in their studies. It is critical to investigate whether the individual or team effort can pave a way for a better pass rate either by using the individual or teamwork approach for students and academics. Redress in higher education is a necessity for all and is a topic at the forefront

of all developmental discussions. AL-Othman (2014) confirms that intensification of good quality instruction is important for students to perform. This also creates a conducive environment for learning. Furthermore, quality delivery of the learning content and interventions made by university tutors should be encouraged to eliminate the negative effects in the educational process. The effectiveness of individual and teamwork participation was measured through the perceptions of students during their studies; by attesting to the impact that has been made in their achievements.

1.3 PROBLEM STATEMENT AND SETTING

The Durban University of Technology is one of the institutions of higher learning located in the Durban area in the Kwazulu-Natal Province. The institution offers an Electrical Engineering program as part of its approach to fulfilling its set objectives and satisfying the need of the community. Notably, to equip students with skills and knowledge in their field of study, theoretical and practical components of the power electrical module are required. The practical aspect of this laboratory component necessitates proper planning and control in terms of inventorying are the capacity for the department to use qualified staff and to create an environment that motivates students to attend and acquire the critical skills required for their qualification.

The Electrical Engineering department has experienced a decline in the pass rate of first- year students registered for the first-semester laboratory component. The plummeting pass rate has been attributed to the inability of the staff to successfully deliver the laboratory module to the students. Furthermore, service is provided in the Electrical Engineering laboratory through individual participation and teamwork without an understanding of the perceptions of first-semester Electrical Engineering students, regarding the service that they receive from the Electrical Engineering laboratory technicians who apply individual participation or teamwork methods to meet their vocation requirements. In this regard, it is noted that the university lecturers must be the subject experts but this does not mean that they are good teachers. This is supported by Chetty and Pather (2015) who indicate that the National Plan for Higher Education is concerned that South Africa's higher education throughput rates are too low with the graduation rate

of less than 22% for a three-year generic bachelor's degree, which is one of the lowest in the world. The first year at the university is the foundation for students. On this, Alemu (2018) states that the contact between lecturers and students must be supported by networking, cooperation, and collaboration within external academic partners to create, develop and transmit new knowledge. This requires staff participation in terms of how staff can have some influence over their jobs of assisting in problem-solving within the institution (Ngonyama and Ruggunan, 2015).

This situation is exacerbated for first-year students in technical qualifications such as engineering. AL-Othman (2014) states that good quality instruction in the early stages of university education is essential for the success of the students, especially those from disadvantaged backgrounds such as students from rural and poor communities. Schreiber and Yu (2016) point out that influences on persistence and academic success are complex and necessitate a comprehensive observation which embraces the context of productivity for both staff and students. As such, students' engagement is likely to be a reliable predictor of the pass rate. Hence, it becomes critical to evaluate how individual performance of staff and teamwork impacts service quality and ultimately the pass rate of students. The attitudes, the availability of resources and the adequacy of the educational response offered by the department aim of improving the future training and facilitating the succession (Arnaiz Sánchez, de Haro-Rodríguez and Maldonado Martínez, 2019). In this regard, management of the DUT Electrical Engineering Department has specific evidence of where the shortfalls in the success rate of the laboratory module are, in terms of securing an acceptable pass rate for first-semester students. In 2019 and 2020, the department observed major improvements in the pass rate for the critical laboratory component. The question is what were the factors that contributed to such improved pass rates?

The problem that arises and needs further investigation is to understand the level of staff participation and whether this contributes to performance at individual and team levels as well as the improved pass rate on the laboratory course. Most learning institutions measure the performance of learners through the percentage of learners who achieve the average required by the department higher education. However, universities should play various roles in South African society by both preparing a labour force and addressing societal inequalities (Swartz, et al. 2019).

1.4 RESEARCH QUESTIONS

1. What is the relationship between the Electrical Power Engineering students' pass rate success and the service provided by the laboratory technicians?
2. What perceptions do the first-semester electrical engineering students have regarding the service from the Electrical Engineering laboratory technicians?
3. What interventions can be implemented to improve the individual participation/teamwork to meet student needs?

1.5 AIM AND OBJECTIVE OF THE STUDY

The study aimed at evaluating how individual participation and teamwork affect the pass rate of first-semester students in the Electrical Power Engineering department of DUT.

The following research objectives are generated from the critical questions of the study:

i. To identify the relationship between the Electrical Power Engineering students', pass rate and the service provided by the laboratory technicians through the application of individual participation and/or teamwork systems to meet student needs.

ii. To evaluate the relationship participation of the Electrical Power Engineering laboratory technicians and the Electrical Power Engineering department students of the DUT.

iii. To assess the perceptions of first-year Electrical Power Engineering students regarding the service that they receive from the Electrical Engineering laboratory technicians; and

iv. To provide recommendations on how the needs of students within the Electrical Power Engineering department can be efficiently met by the laboratory technicians to improve the service to students and the resulting pass rate.

1.6 SIGNIFICANCE OF STUDY

This study is significant for the management of the Electrical Power Engineering Department in their effort to tap into the efficiency and effectiveness of the delivery strategy used to teach and assess students. This study highlights the strengths and weaknesses of the strategy, to assist managers to adjust the strategy following the findings of the study as well as the department's strategic goals.

This study provides a backdrop to the number of violent protests that have taken place at various academic institutions in South Africa, including the Durban University of Technology. The protests have primarily been motivated by a desire of students to have free education for those that cannot afford to pay for their studies. The implementation of this policy of free tertiary education has changed the landscape of tertiary education both academically and administratively. The changes have also disrupted teaching and learning in the classroom. Considering the changes that the higher education sector has seen, this study investigates individual as well as teamwork participation in the classroom in the tuition process and how this affects the pass rate of students. The study investigates the impact of both individual participation and teamwork on the performance of students regarding their overall pass rate. The study measures the perceived contribution of a student, as an individual in the effort to attain an overall mark, against that of teamwork participation through a mixed-method data enquiry involving a survey as well as interviews.

The results of the study are envisaged to assist the management of the DUT Electrical Engineering Department in addressing the shortfalls highlighted by the study. Addressing these gaps will also enable the department to improve as well as excel in the further implementation of changes that will be recommended to assist the staff to perform at a level where the success of the department will be achieved/ improved.

1.7 DELIMITATIONS OF THE STUDY

This research focuses on first-semester students registered for the laboratory component within the Electrical Power Engineering department of the Durban University of Technology. Only this segment of students within the entire department was identified for participation in the study. Lecturers who are directly associated with the laboratory component within the department at the DUT were included for participation, in the study to supplement the data from the students concerning the investigation, as well as provide an alternate perspective subject to evaluation through data analysis techniques.

1.8 STRUCTURE OF THE STUDY

The study investigates the effects of staff participation on the pass rate for the Electrical Power Engineering course at a University of Technology. To address the problem under investigation, this dissertation is presented in five chapters. Each of the chapters will focus on a specific area of the research process. The five chapters include:

Chapter One describes the research problem, the context of the research problem, the aim, and the objectives of the study. It also highlights the significance of the study, as well as the delimitations of the research.

Chapter Two of this study presents the literature used for the study. The literature is discussed in the context of the research problem, with the researcher highlighting the correlations between the literature and the context of the research problem.

Chapter Three describes the research methodology used to conduct the study. The rationale for the methodology used is provided in this chapter. The target population and the sampling technique used to determine the sample size and sample of the study are also discussed.

The fourth chapter of the dissertation presents and discusses the findings of the study. The data is presented in tabular and graphical formats for ease of access and comprehension of the findings. The qualitative data is presented under relevant themes following the Thematic Analysis approach.

The final chapter presents the conclusions and recommendations of the study. The conclusions and recommendations are based on the findings presented in **Chapter Four**. This chapter also rounds off the dissertation, providing an overall sense of the achievements made in line with the aim, objectives, and research questions of the study.

1.9 SUMMARY

The current chapter provides an introduction and background to the study by pointing out the current issues facing the Electrical Engineering department of DUT. Definitions relevant to the study were also provided to contextualise the study. The following chapter reviews literature relevant to the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses the critical issues surrounding students' and educators' ability to participate in an Engineering course. It incorporates literature on the themes related to the research problem that motivated this study. To accomplish the study's objective, it is suggested that an integrative approach is necessary to align educational and management theories. The researchers conduct a critical analysis of the factors that influence both the management and educational aspects. Aspects of Human Resource Management such as recruitment, training, and development, employee performance, succession planning, teamwork, and individual skill are discussed critically. Furthermore, stakeholder management issues such as stakeholder participation and engagement are examined to ensure a successful learning process.

2.2 PREVIOUS STUDIES

Swartz (2019) states that a university's strategic objectives should include promoting effective teaching practices through increased academic staff and student participation. In the same context, Cattell-Holden (2020) affirms that demonstrations of excellence in higher education should be based on quantifiable learning and teaching, such as the necessity and legitimacy of institutional assessment and accountability systems. Thus, the quality of teaching is identified as a significant criterion for determining the effectiveness of a higher learning institution's services and products offered to students to achieve their desired outcomes and succeed academically (Cui and O'Leary, 2020). Further on this, Brookfield (2017) states that "the critical reflective teaching model clarified how a teacher's experience can have a positive or negative effect on students' performance and satisfaction." Additionally, previous research establishes that high- quality instruction and active student participation in learning were likely to predict academic outcomes in terms of students' capacity for assimilation and successful completion of their modules (Maxwell-Stuart and Huisman, 2018; Leach, 2016; Donovan, 2018; 2020).

2.3 HUMAN RESOURCE MANAGEMENT ASPECTS

Shekar (2010) posits that corporate strategy is concerned with broad issues such as which type of business a company should be in. It explains the overall direction of an organisation in terms of its attitudes toward growth and the management of its various businesses and product lines. Strategies continue to play an important role regardless of the type of organisation, whether it is a manufacturing or learning organisation such as a university. For example, the decision to enter or exit from business requires sound strategic analysis. Similarly, the decision as to the appropriate business structure and policy forms part of strategic development at the corporate level.

According to Thompson and Martin (2010), strategies can be conceptualised as means to an end. All organisations, large and small, profit or non-profit, private and public sector, have a purpose. This purpose may or may not be articulated in the form of a mission and/or vision statement. Strategies relate to the pursuit of this purpose. Strategies must be created and implemented. Successful organisations manage their strategies and what they can achieve before exploring the meaning of strategy in greater detail.

Shekar (2010) states that business policy is concerned with developing the general management point of view, which demands that the manager sublimates their departmental, functional or specialist perspective to take a balanced company-wide look. A policy is an action guide; it is a definition of common purposes or organisational components. Policies are not always clearly demarcated from other elements of planning and plans (Verger, Moschetti and Fontdevila, 2021). Furthermore, the process of strategic planning sometimes encompasses the formulation of important policies. Policies help to ensure that all units of an organisation operate under the same ground rules. They also facilitate coordination and communication between various organisational units. In addition, the policies of competitors can and do influence an organisation’s policies.

Strategic managers should always aim at achieving the predetermined goals of the organisation. Furthermore, organisations must work with brevity and variety. Thoughts should become actions and these actions will lead to results; result-oriented action is the need of the hour (Shekar, 2010).

According to Nilsson and Ellstrom (2012), the world of work has undergone changes in both the nature of work and the emergence of new forms of work, which result from innovation, the development of new knowledge and increased competition, amongst other factors (Brown, 2003; Sennett, 2006 cited in Nilsson and Ellstrom, 2012). Nowadays, work life is characterised by complexity, unpredictability, and insecurity. There has been a shift from a commodity-based economy to a knowledge-based economy, in which an increasing proportion of organisational assets are intangible. This knowledge-based economy, according to Nilsson and Ellstrom (2012), is generating new structures and new and continuously changing demands and challenges in the world of work. A principal challenge is to remain current with changes and adapt to the evolving needs of organisations. Learning is no longer solely associated with education and is no longer viewed as a pre-career affair. There has been a shift from job security and lifelong employment to lifelong learning, employability, and talent management (Nilsson and Ellstrom, 2012).

Nilsson and Ellstrom (2012) also assert that the demand and competition for highly skilled labour are intensifying on a global level. It has become clear that the most important organisational asset, especially in knowledge-intensive organisations, is the people; and the future competitiveness and prosperity of an organisation depend on its employees. Therefore, the human resource department has assumed a central role and is increasingly becoming a strategic business partner in different organisations (Alvesson and Karreman, 2007; Barney and Wright, 1998; Ulrich, 1998 cited in Nilsson and Ellstrom, 2012). It is noted that Human Resource Management (HRM) and Human Resource Development (HRD) practices, such as the recruitment, training, and development of employees, are increasingly important for the success of organisations (Collings and Mellahi, 2009; Horwitzetal, 2003; Spence and Petrick, 2000 cited in Nillson and Ellstrom, 2012).
Coyle-Shapiro (2013) states that “HRM is the management activity undertaken by commercial firms, state-owned enterprises, and other organisations to recruit, retain and motivate their employees.” In other words, HRM is the bundle of policies, programmes

and plans organisations adopt intending to make full use of the people they employ. Coyle-Shapiro (2013) further asserts that the effective management of an organisation's employees (its human resources) is arguably the single most difficult, most complex, most ambiguous, yet most important task that managers face. It is an area of management policy-making that is not characterised by rigorous globally accepted professional standards. One needs to know how and why workers behaved and reacted in the ways they did, whether as individuals or in groups; and one needs to be able to judge how they might behave and react if circumstances (for example, the HR policies) were to alter. This means, among other things, that one needs effective theories of motivation. These are formidable requirements, which imply that one needs to blend the different social science disciplines, for example, economics, industrial relations, and organisational behaviour (Coyle-Shapiro, 2013).

The literature above illustrates that management should plan and implement policies that direct the organisation to its excellence. It is the mandate of management to ensure that the organisation achieves set goals in a prescribed performance period. To achieve this, management draws roadmaps to be used as guideposts on how to achieve the set objectives of the organisation. The policies that manifest from strategic intent as well as planning direct the staff within the organisation on how best to work towards the attainment of set goals by implementing policy.

The Electrical Power Engineering department must set goals and objectives. Notably, the department functions under a parent organisation, which in turn needs to satisfy and attain its broader objectives and goals. The implementation and performance of policies of the department feed into the overall performance of the parent organisation. In this context, the department must ensure that the set goals are met. The decline in the pass rate of first-semester students suggests that there is cause for concern about the performance of staff as they are not able to achieve an acceptable pass rate within the department. This means that the strategic policy and overall corporate strategy need to be revisited to implement required changes to improve the pass rate per the department's goals.

While there had been substantial research undertaken on talent management as an HR initiative, Scullion (2010), Howeetal (1998) cited in Tansley (2011) note that people are rarely precise about what they mean by the term ‘‘talent’’ in organisations and the implications of defining talent for talent management practice. Tansley (2011) further argues that this is disappointing because a ‘‘working’’ definition of talent is important for robust talent management policies and practices shared across the organisation, as well as being vital for the employee development of specialists responsible for designing and planning training and development interventions. However, choosing a definition of

talent is no easy task, not least because there are several ways in which talent may be defined within a particular organisation. For example, a common notion of organisational talent refers to those who are identified as having the potential to reach high levels of achievement.

Furthermore, according to Gagne (2000) cited in Tansley (2011), talent could be observed in a few individuals through the necessary capabilities to make a difference in each field of human endeavour, whether academia, arts, leisure, sport, social action, technology, or business. The author argues that talent could emerge from ability because of an individual's learning experience. Thus, it is the superior mastery of systematically developed abilities and knowledge in at least one field of human endeavour. Management Study Guide (MSG) (2015) presents the talent management process as follows:

- **Understanding the Requirements:** This is the preparatory stage that plays a crucial role in the success of the whole process. The main objective is to determine the requirements of talent. The main activities of this stage are developing job descriptions and job specifications.
- **Sourcing the Talent:** This is the second stage of the talent management process, which involves targeting the best talent in the industry. Searching for people according to the requirements is the main activity.
- **Attracting the Talent:** it is important to attract talented people to work with the organisation and the whole process revolves around this. After all, the main aim of the talent management process is to hire the best people from the industry.
- **Recruiting the Talent:** The actual process of hiring starts here. This is the stage to which people are invited to apply to join the organisation.
- **Selecting the Talent:** This involves meeting with different people having the same or different qualifications and skill sets as mentioned in the job description. Candidates who qualify from this round are invited to join the organisation.
- **Training and Development:** After recruiting the best people, they are trained and developed to get the desired output.
- **Retention:** This is the sole purpose of the talent management process. Hiring does not serve the purpose completely. Retention depends on various factors such as pay packages, job specifications, challenges involved in a job, designation, personal development of an employee, recognition, culture and the fit between job and talent.
- **Promotion:** No one can work indefinitely in an organisation at the same designation with

the same job responsibilities. Hence, Job enrichment plays an important role.

- **Competency Mapping:** Assessing employees' skills, development, ability, and competency is the next step. If required, this stage also focuses on behaviour, attitude, knowledge, and future possibilities for improvement. It gives one a brief idea of whether the person is fit for further promotion.
- **Performance Appraisal:** Measuring the actual performance of an employee is necessary to identify his or her true potential and to check whether the person can be loaded with extra responsibilities or not.
- **Career Planning:** If the individual can handle the work pressure and extra responsibilities well, management needs to plan his or her career path so that he or she feels rewarded. It is good to recognise employees' efforts to retain them for a longer period.
- **Succession Planning:** Succession planning pertains to the issue of who will replace whom soon. The employee who has given their best to the organisation and has been serving it for a very long time deserves to hold the top position. Management needs to plan regarding when and how the succession will take place.
- **Exit:** The process ends when an individual retires or is no longer a part of the organisation.

2.4 EMPLOYEE PERFORMANCE

Ferreira and Otley (2009) found that issues in performance management and management control systems are typically complex and intertwined, but research tends to be based on simplified and partial settings. Ferreira and Otley (2009) "asserted that simplification has made the work easier to carry out, but it has introduced ambiguity and conflicting findings from different studies." The authors further caution regarding the fact that organisations tend to focus only on specific aspects of control systems, as opposed to adopting a more comprehensive and integrated approach. They mention that access or time limitations may have caused this and that the difficulty of generating and managing such complex datasets, as well as the lack of a more complete description of the totality of a control system, contributes to spurious findings, ambiguity, and potentially conflicting results. Ferreira and Otley (2009) claim that others in the field have maintained that the general understanding of MCS will remain 'piecemeal' for as long as "empirical research continues to ignore the interdependency between different control mechanisms operating at the same time in the same organisation" (Abernethy and Brownell, 1997 cited by Ferreira and Otley, 2009).

De Waal and Counet (2009) postulate that there has been an increased need for an efficient and

effective Performance Management System (PMS) over the last decade, brought about by the perception that the use of PMS improves the performance and overall quality of an organisation. According to Kumar and Gulati (2010), efficiency and effectiveness are the central terms used in assessing and measuring the performance of organisations. Bakar, Hakim, Chong, and Lin (2010) note that performance measurement is the process of quantifying action, where measurement is the process of quantification and action which leads to performance. Measuring the performance of an entire supply chain is considered vital because it allows for “tracking and tracing” efficacy and efficiency failures and leads to more informed decision-making regarding chain design (Aramyan, 2007 in Bakar, 2010).

Heathfield (2014) states that performance appraisals, performance reviews, appraisal forms, or whatever the business world wants to call them, are now obsolete especially considering that a performance appraisal is universally disliked and avoided. The author further notes that not many people in an organisation want to hear that they were less than effective in the year in which they were appraised. Moreover, not many managers want to face the arguments and diminished morale that can result from the performance appraisal process (Heathfield, 2014).

Further on the issues of performance management systems, Heathfield (2014) investigates the number of supervisors who feel that their time is well-spent professionally to document and provide proof to support their feedback during an annual period. This study needed to cite literature that describes the importance of employing staff best suited for the job. The literature further elaborates on the significance of motivation, training, and development, as well as retaining staff that have talent. It is noted from the literature that it may be a select few from the staff structure that may be deemed to be the talent of an organisation. Against this backdrop, the study hopes to ascertain how well staff are suited and able to perform their tasks within the Electrical Power Engineering department of DUT. This comes after an outcry over the declining pass rate of students within the department by management. This study will investigate how the ability of staff to deliver the laboratory component affects the students’ pass rate.

2.5 TEAMWORK AND INDIVIDUAL PERFORMANCE

According to Anaurd and Wasieleski (2014), managerial discretion refers to the latitude of options managers garner when making strategic choices. In decision-making, discretion assumes that people have responses available to them that can affect the environment (Thompson, 1981).

Strategic Choice Theory assumes that managers would utilise their discretion to benefit the firm (Hrebiniak, 1974 in Anaurd and Wisieleski, 2014). This perspective has dominated HRM research and is premised on the assumption that the managers will make situationally appropriate responses to the dynamic challenge facing the organisation. Human resource systems affect corporate performance through the management and control of employee behaviours. Through human resources systems, organisations can influence employees' actions (Anaurd and Wisieleski, 2014).

For Zhang, Fanand Zhu (2014) high-performance work systems (HPWS) are usually defined as systems of human resource practices designed to enhance employees' skills, commitment, and productivity in such a way that employees become a source of competitive advantage. From a behavioural perspective, HRM scholars assert that such a system will elicit employee commitment and organisational citizenship behaviour (OCB), leading to high organisational financial performance. Several factors influencing the quality of service, according to Kuo and Ho (2010) have been identified in past research including human resources management functions, such as training, coaching, and rewarding, job design and leadership, service delivery process, quality improvement methodologies such as problem-solving strategies, information and technology, organisational service climate, employee job satisfaction, and personal factors such as gender. From the perspective of service employees, Kuo and Ho (2010) state that it is evident that external and internal, tangible and intangible factors are critical to service performance. However, numerous previous studies have focused on the external and tangible antecedents of quality service, and there is currently no theoretical model that focuses on the internal and intangible elements that facilitate service (that is, perceptions of job design measured by the Job Characteristics Model and job enjoyment, measured by the Theory of Flow.

Furthermore, Kuo and Ho (2010) and Csikszentmihalyi (1991) describe flow as a condition in which people are so immersed in an activity that nothing else seems to matter, and such an experience is so pleasurable that people will do it at any cost. Some other researchers describe flow as a temporary and subjective experience, and personal perception plays a vital role in determining why people continue to perform the same activity over and over. Flow is considered an intrinsic motivation, which is like peak experience or peak performance. As Csikszentmihalyi (1996) points out, flow refers to optimal experience. Other researchers have also shown a positive correlation between the state of flow and learning, attitude, and exploratory behaviour. Moneta and Csikszentmihalyi (1996) cited in Kuo and Ho (2010) found that challenge and skill are two key factors of flow experience. Only when the set of actors is appropriately balanced can the individual's full

devotion activate the flow of experience.

Huys (2002) argues that considering its prominent place in the prevailing organisational discourse, team-based work has proven to be a favourite formula for organisational re- design. It is a prominent concept which offers autonomy, responsibility, and job enrichment to meet the aspirations of employees. At the same time, team-based work is believed to enhance performance outcomes such as productivity and quality at both the team and the organisational level. Hence management fashions such as business process re-engineering, lean production, the modern socio-technical approach and HRM embrace the principles of team-based work (Huys, 2002).

A major argument for introducing and developing team-based work, according to Huys (2002), stems from recent insights into the impact of Human Resources on organisational performance. In the current debate on HRM, the resource-based view of the firm states that the intangible, perfectly imitable and imperfectly substitutable internal resources of the organisation enable a firm to generate and sustain its competitive advantage. Huys (2002) further notes that this statement is true, especially regarding the impact of human resources on organisational performance in team-based work organisations. The performance of team-based working largely depends on the employees' competencies and attitudes about planning, performing, and controlling team tasks in an autonomous way (Huys, 2002). Moreover, Huys (2002) asserts that when analysing the features of team-based work that add to the enhancement of team performance, management literature focuses on the team responsibility structure. The division of job regulation tasks within the team amongst team members is supposed to contribute more effectively to organisational goals than the allocation of these tasks to a separate team leader.

Yauch (2007) asserts that manufacturing agility is the ability to prosper in an environment characterised by constant and unpredictable change. The purpose of her paper was to analyse the team attributes necessary to facilitate agile manufacturing. Using Balance Theory as a framework, the paper evaluates the potential positive and negative impacts related to these team attributes that could alter the balance of work system elements and the resulting "stress load experienced by persons working on agile teams. Teams operating within the context of agile manufacturing are characterised as multi-functional, dynamic, cooperative, and virtual" (Yauch, 2007).

Lewis (2015) asserts that team-based work groups can provide business owners and managers

with an opportunity to boost efficiency by using teamwork to get tasks accomplished. However, trying to create teams in a workplace where none existed in the past can be a problem. Resistance to team-based work groups amongst workers can be overcome, but it may take a considerable amount of persuasion. Lau (2013) states that working effectively as part of a team is incredibly important for output quality, morale, and retention. From the perspective of efficiency, a traditional argument against staffing large teams comes from Frederick Brook's "*The Mythical Man-Month"* Lau (2013). A man- month or person-month refers to the unit of work that one person can accomplish in one month. Lau (2013) explains that the basic premise that Brooks argues against is the notion that a software project that takes one person a year to complete (twelve person- months) can have its timeline shortened to a single month simply by staffing the project with a dozen engineers. Upon seeing projects falling behind, many managers want to put schedules back on track by simply adding more engineers to the project.

The problem with this logic and the reason it is considered a myth, according to Lau (2013), is that each additional engineer added to a project incurs both communication and coordination overhead with everyone else on the team, hence the time to complete a project does not decrease linearly with increased staffing. This leads to what is commonly known as Brook's Law, that "adding manpower to a late software project makes it later" (Lau, 2013).

The PIRK framework, based on Lawler, Mohrman and Ledford (1995), states that employees must have the power to make decisions and to become involved. In addition, to make these decisions, employees need knowledge of the business and information regarding the goals and results of the organisation. Finally, an employee must be rewarded for actions based on this knowledge and for his or her informed decisions. Based on the PIRK framework, a high employee involvement climate is characterised in this thesis by "high degrees of participative decision-making, information sharing, training, and performance-based rewards" (Riordan, Vandenberg, and Richardson, 2005). West

(2010) states that the “basic reason for the creation of teams in work organisations is the expectation that they will carry out tasks more effectively than individuals and so further organisation objectives overall.” There are two dimensions of team functioning: the tasks that must be completed and the social aspects that determine how members perceive the team as a social unit (West, 2010). Furthermore, according to West (2010), “these two aspects must be constantly reviewed by the team to guarantee a well-functioning team.” Team reflexivity is concretely defined as “the extent to which a team actively reviews its objectives, strategies and team processes and is prepared to adapt them as necessary to changing circumstances” (Carter and West, 1998). Based on this definition, team reflexivity has two dimensions: task reflexivity and social reflexivity (West, 2010). The extent to which a team shows task reflexivity, as well as social reflexivity, affects the task effectiveness, mental health (well-being and development) and viability (continuing working together as a team) of a team (West, 2010).

In Figure 5 both dimensions are drawn together, illustrating the four resulting extreme types of teams (West, 2010). A team with high social reflexivity and high task reflexivity is called a *fully functioning team*, having high task effectiveness, good mental health, and long-term viability (West, 2010). In comparison, a team high on social reflexivity but with low task reflexivity is called a *cosy team*, characterised by warmth and cohesion within the team, but with a poor ability to get tasks done effectively (West, 2010). A team low on social reflexivity but with high task reflexivity is called a cold efficiency team (West, 2010). The task efficacy of this type of team is high. However, members will probably not be staying in such a team due to a lack of support from the group and a bad social climate (West, 2010). The last team type is called dysfunctional teams, characterised by low task reflexivity as well as low social reflexivity (West, 2010). Members of this type of team will be dissatisfied with the social support within the group as well as the lack of achievement, resulting in low team viability (West, 2010).

Koopmans (2014) postulates that although an individual’s performance at work is one of the most important outcomes of studies in the occupational setting, recent research has shown that there is no consensus on the definition and measurement of individual work performance. Koopmans. (2014) asserts that “various terms (often used interchangeably)

are used to describe individual work performance (IWP), such as presentism, performance, or productivity." The definitions of these terms are often unclear. This is undesirable because a clear definition and theoretical framework of IWP is a prerequisite for its valid measurement. Valid measurement, in turn, is necessary to accurately establish the causes and consequences of IWP (Koopmans, 2014).

Considering the importance of IWP, Koopmans (2014) states that it is not surprising that disciplines other than occupational medicine have concerned themselves with defining and measuring the concept. Within work and organisational psychology, defining the construct of IWP and attempting to understand its underlying structure has received much attention. In the latter discipline, Koopmans (2014) explains that IWP was generally defined as "behaviours or actions that are relevant to the goals of the organisation." Thus, IWP is defined in terms of behaviours or actions of employees, rather than the results of the sections. In addition, IWP consists of behaviours that are under the control of the individual, thus excluding behaviours that are constrained by the environment (Koopmans, 2014).

Distinguishing between individual staff performance as well as teamwork was necessary for this study as the researcher envisaged evaluating the effects of both these approaches on the pass rate of first-semester students. The literature demonstrates how teamwork may lessen the workload of staff if careful planning by team leaders is executed and ultimately, organisational success is achieved. Individual performance was dealt with in the literature, where it was revealed that individual performance needs to be evaluated to ensure that the employee is still performing at their optimal level and is still able to satisfy the requirements of their position.

This information was significant for the study as it highlights the necessity for this study to evaluate the approach used in the Electrical Power Engineering department to attain organisational goals. One of the goals is to ensure that the students are well-trained and equipped to pass the laboratory module. After noting the significance of individual and team-based performance, the study intends to gather information on how the students perceive the effectiveness of the current methods used to educate and train

them in the laboratory. Data on how well the lecturers succeed in their delivery of the laboratory module will also be sought to identify where the shortcomings are and as such, address them to enhance their performance as well as the performance of the students within the department.

2.6 STAKEHOLDER MANAGEMENT

This section critically discusses the role-players, their responsibilities, and their interests in the teaching-learning process within the department. Any role-player in the learning process requires special attention to achieve the expected academic outcomes. There is always great pressure from stakeholders to be accommodated (Strydom, 2013). De Oliveira and Rabechini (2018) note that stakeholders should be identified and analysed and there should be an understanding of their expectations and impact before developing strategies for effectively engaging stakeholders in decision-making. Students and teachers have legitimate expectations of the organisation to ensure that they achieve both their objectives and those of the organisation. Smit (2017) found that the organisation has the responsibility to assess and respond to the legitimate claims of its stakeholders. Identifying and responding to students' and teachers' needs is likely to lead to a positive pass rate for the module.

2.6.1 Stakeholder Management Decisions

Karlsen (2008) also states that trust is important for problem-solving because it encourages the exchange of relevant information and determines if team members are willing to allow others to influence their decisions and actions. Stakeholder management decisions are a strategic management system within the educational sector. However, there remains a deficiency of knowledge on what strategies, tools, and practices to transmit to make sure that the decisions taken by the stakeholders are properly implemented. In this context, decisions should foster an effective educational setting which focuses on building cooperative, productive relationships that enhance and improve educational outcomes (Chang, 2018); Latorre-Medina and Blanco-Encomienda, 2013). Furthermore, Vargas. (2019) states that stakeholder participation might improve decisions and depends on the clarity of organisational support and direction.

2.6.2 Stakeholder Dynamics and Alliance

According to Blanco-Mesa, Gil-Lafuente and Merigo (2018), stakeholder dynamics in the decision-making process implies how decisions or actions are affected or affect stakeholders, considering factors such as policies, processes, systems and support. De Oliveira and Rabechini (2019) indicate that well-established relationships, communication, and leadership were common social activities, with the objectives to be achieved requiring the participation of people, even if indirectly. These authors further point out that relationships of trust, communication, leadership, and interpersonal relationships are facilitated to increase stakeholder resilience and provide solutions to problems. According to Li (2021), stakeholder alliances may be defined as people or organisations that interact with or within an organisation and that are impacted through that interaction to achieve organisational performance. The role and implications of stakeholder participation in the change process within the university have an impact on sustainability and educational performance (Vargas, 2019).

2.6.3 Techniques for Stakeholder Engagement in Education

In higher education institutions, participation is key to addressing the many challenges that institutions face. Ferrero (2017) found that stakeholder engagement should focus on identifying and categorising stakeholders to meet their needs and expectations. Furthermore, higher education institutions should implement stakeholder engagement to link the activities of institutions to stakeholder expectations (Ferrero, 2017). This process has an impact on the quality of education through the support systems available to teachers and students (Harris, 2019). The same authors discussed the practical educational factors related to teacher work conditions and the role they play in teaching effectiveness. The early study of Ewell (1999) found different management techniques applied in education, such as Management by Objectives (MBO), Total Quality Management (TQM) and Continuous Quality Improvement (CQI), planning, Responsibility-Centred Management (RCM), benchmarking and performance-rewards. These techniques are still applicable in the academic environment today, where students interact with lecturers as well as other students to perform, improve and achieve learning objectives.

2.7 THEORETICAL AND CONCEPTUAL FRAMEWORK

This section addresses the management and educational theories that underpin this study. It concludes with the study's model, which is based on the literature.

2.7.1 Management Theory

In an earlier study by Leithwood (1994) on leadership theory applied to education, the author conceptualised Transformational Leadership as based on dimensions such as providing intellectual stimulation; offering individualised support; modelling best practices; demonstrating high-performance expectations; creating a productive institutional culture; and developing structures to foster participation in learning decisions. This was supported by Smit (2017), who emphasised that Transformational Leadership promotes engagement and performance through positive change. A supportive and team-oriented leadership style is likely to stimulate individual participation and teamwork to improve teaching approaches, support, learning environment and consequently the pass rate. As indicated by Cheng (2008), support and partnership could contribute to the efforts to formulate comprehensive education development plans and programmes for improvement. In the context of this study, the partnership between the lecturers, laboratory technicians and students would ensure high pass rates in the Electrical Engineering laboratory module. Other management theories in education include staff development and the nature and facilitation of change (Keith, 2006) assist to understand the link between management and education.

2.7.2 Educational Theory, including the Action-Research cycle

Thu Hien (2009) indicates that "action-research is appropriate in education as both teachers and students are beneficiaries in the teaching and learning process. The framework is also useful in addressing the needs of education and continuity in research with its cyclic process." In the same context, Mockler and Groundwater-Smith (2015) point out that more attention should be given to the state of teaching and learning practices to not only focus on what was currently done and how productive teaching and learning appeared to be but should emphasise both individual participation and teamwork to ensure the effectiveness of the process through improved pass rates of students. On this, Ngonyama and Ruggunan (2015) argue that higher learning organisations should encourage participation as it is rooted in individuals making a difference between their unique experiences and knowledge and what learning was taking place. Lingard (2016) is of the view that more performative and test-based modes accounted for teacher and student performance in this

context's teaching and learning practices, thereby improving organisational processes.

2.7.3 Conceptual Framework

Brookfield's (1995) model was built to challenge the one-sided assumptions that dominated teaching and learning. The author argues that it is critical to consider both students' and colleagues' perspectives to provide different interpretations or feedback of one's actions in different frames. Through student learning, teachers are likely to encourage and evaluate the effectiveness of their teaching. In contrast, O'Leary and Cui's (2018) model confirms that students and staff are likely to be active in their roles in critically reflecting on their practices. The model is based on individual perspectives being brought together to observe teaching and learning at a programme-specific level. Moreover, central to the approach is that improving teaching and learning needs students and teaching staff to take shared responsibility for developing mutual understanding. This is presented in Figure 2.1.

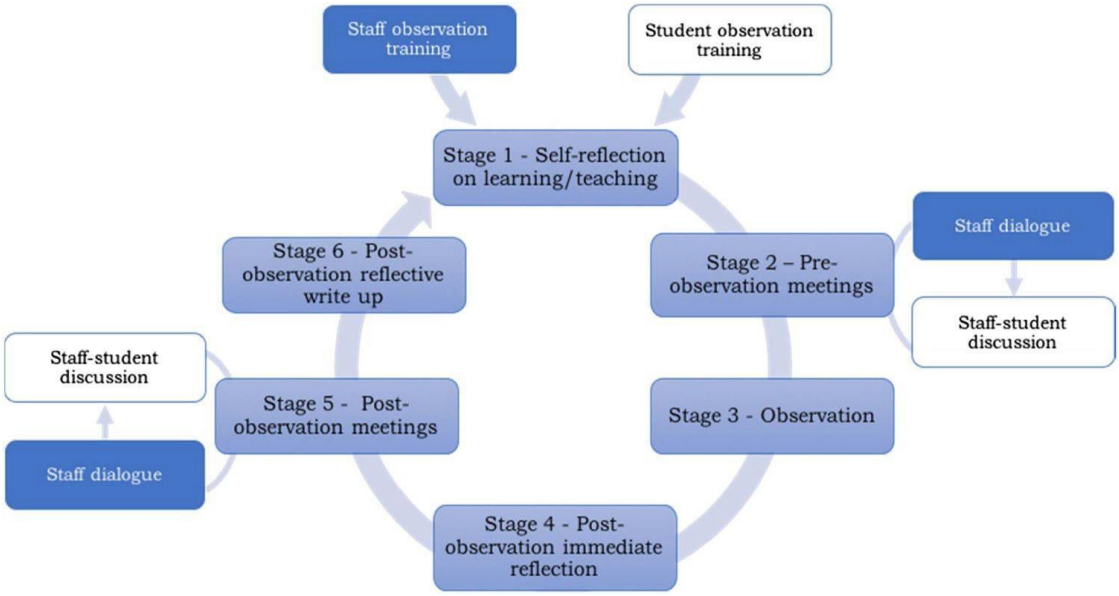

Figure 2. 1 Cycle of Collaborative Observation Source: O'Leary and Cui (2018)

The Cycle of Collaborative Observation model focuses on reflecting on the teaching and learning context. The next model, the Classroom Innovation Model: effective teaching principles, addresses innovativeness in the classroom as the result of changing circumstances within the teaching and learning environment.

In Figure 2.2, The Classroom Innovation Model: effective teaching principles focus on the teaching staff delivery of the module, with emphasis on the importance of good practice and a supportive environment to make a difference in the learning outcomes of students (Latorre-Medina and Blanco-Encomienda, 2014).

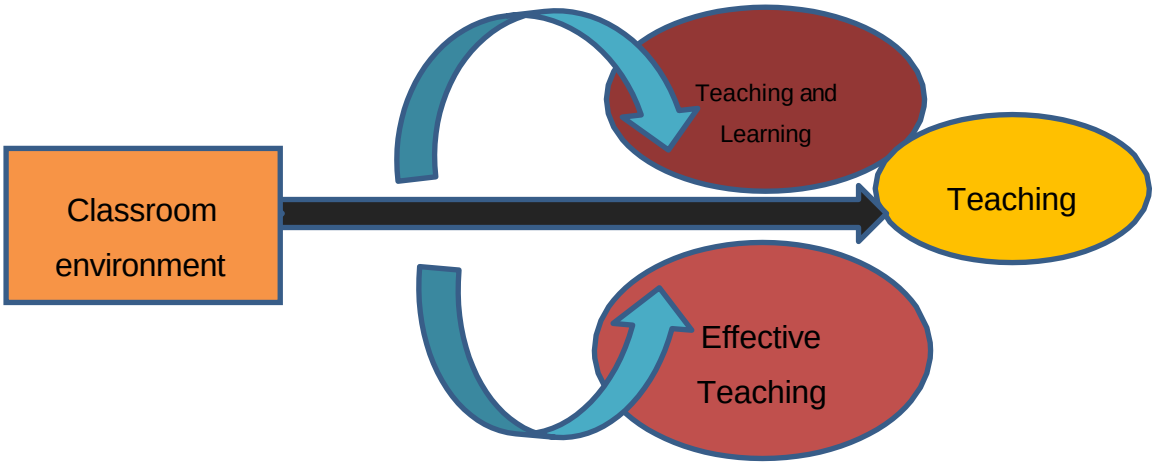

Figure 2. 2 The Classroom Innovation Model: effective teaching principles Source: Latorre-Medina and Blanco-Encomienda (2014)

The model indicates that improvements in education rest on the capacity of the institution and its teaching staff to manage to respond to the challenges of their educational practices (Latorre-Medina and Blanco-Encomienda, 2014). Informed by the literature review, as well as the Cycle of Collaboration Observation model developed by O'Leary and Cui (2018) and the "Classroom Innovation Model: effective teaching principles by Latorre- Medina and Blanco-Encomienda (2014), the researcher develops the model presented in Figure 2.3. Schreiber and Yu (2016) institutional conditions which in turn promote student persistence, engagement and retention for students success.

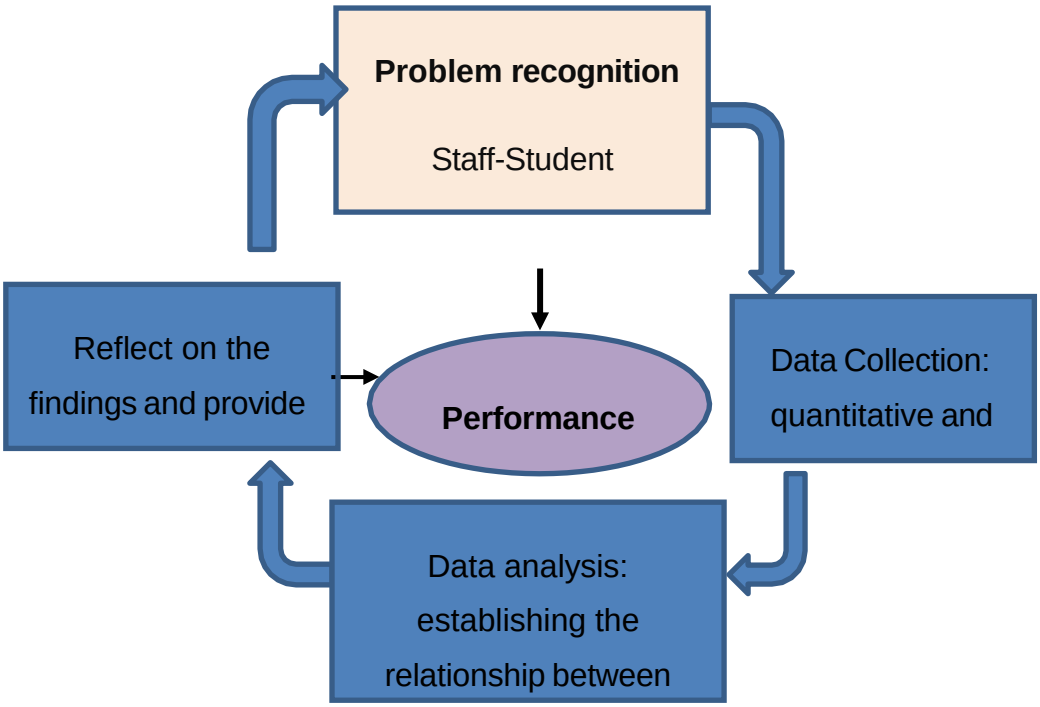

Figure 2. 3 Conceptual Framework of the study

Figure 2.3 represents the model, which recognises that teaching and learning take place and results in lecturer and student participation and reflection about what transpired in the teaching and learning process. Lari (2019) indicates that action research is a cyclical research process that may be used to improve instructional practice, assessment tools, and student outcomes. Action research focuses on collectively identifying a problem and searching for a solution in an environment such as a laboratory. Through a participative approach, quantitative and qualitative data are collected and analysed to establish the relationship between participation and performance. The reflection should include how the students, after learning, evaluate the process in terms of the assimilation of the module content; readiness to write assessments; perception of the support system in the department and the institution; and their results. In addition, the lecturer also reflects on the teaching approach or methodology used, perception of the support system and student results. The support system refers to teamwork and various interventions within the department to assist students and lecturers in the teaching and learning process.

According to Moodley and Singh (2015), the inadequate academic support in higher education institutions was likely to negatively impact on the desired national norm of an 80% success rate targeted by the Department of Higher Education and Training. In terms of pedagogy used, the nature of the module requires an approach to teaching that accommodates both theory and practice of learning, and how this process impacts the development of learners by using a cooperative learning strategy (Oke and Fernandes, 2020).

For Almetov, et al., (2020) there was a set of problems for training future engineers in the context of the competency approach because engineering education students require personal self-development, engineering creativity; and professional skills for future engineers. This goes belong the relationship between lecturers and students in the laboratory. Andrews, et al. (2019) proposes humanising pedagogy for collective effort toward critical consciousness and the commitments to critical self-reflection, curricula alignment, and instructional practice.

Qualitative Analysis

1. On completion of each practical was your results according to your calculations.

   Control group student response:

   No, there were times, I used the wrong resistors, or I didn't understand the colour code values, to calculate the values of certain resistors. At times, I used the wrong values to calculate the resistor values. Sometimes, the lecturer was unable to assist all the students.

   Experimental group student response:

   The results were not correct when I did the practical on my own. We had to wait for lecturer to come around to each one of us, to explain, how to calculate the resistor values. After the lecturer and the support staff explained each concept of construction of the circuit and measuring, I was able to get the measurements, according to my calculations.

2. Did you understand, why you got a different reading on the multimeter, when you were asked to connect a wire across a resistor/s? Can you explain the concept?

   Control group student response:

   Initially, I didn't understand, until the lecturer explained again.

Experimental group response:

Yes, Current takes the easiest path., so the current past through the wire and not the resistor. The resistance across the wire when measured with the multimeter was zero, that is the reason for not getting the calculated value.

3. What is the reason for not getting the exact reading as your calculated values, when measured with the multimeter? Explain.

Control group student response:

The resistor has a tolerance band, which is 5%. For example, if the calculated value is 100 ohms and if the tolerance band is gold, the tolerance band is 5%, i.e., 5% of 100 ohms is 5, which gives a minimum and maximum value, therefore, any reading on the multimeter, therefore, if the meter reads, between 95 ohms and 105 ohms it is correct.

Experimental group response:

The 4th band on the resistor, is the tolerance band. The resistors that I was using had a gold, which is +- 5%. If the resistor is 1000 ohms, the 5% of 1000% was calculated to know the minimum and maximum values. The minimum is 950 ohms and maximum is 1050 ohms. The multimeter must read within this ranch, for it to be correct. Researcher's Analysis:

4. How is a series circuit connected?

Control group student response:

It is connected in a straight line.

Experimental group student's response

The input of the power supply is connected to the left-hand side of the resistor and the right – hand side of the resistor is connected to left – hand side of the next resistor and the output is connected to the right-hand side of the last resistor.

5. How is the voltage measured in a circuit?

Control group student's response:

The voltage is measured in parallel.

Experimental group student's Analysis:

The voltage is measured across the resistor or circuit.

6. How is the current measured in a circuit?

Control group student's response:

The current is measured in series.

Experimental group student's response:

The circuit is broken wherever the current is to be measured and the multimeter is inserted in series.

7. How do you construct a parallel circuit?

Control group student's response:

A parallel circuit relates to all the inputs are connected and the outputs are connected.

Experimental group student's response:

A parallel circuit is connected to the right-side of one resistor to the next resistor and all the left-hand-side is connected of the next resistor.

8. Explain the voltage across each resistor in the series circuit.

Control group student's responses

The voltage is divided in the series circuit.

Experimental group student's responses:

The sum of the voltage in a series circuit is equal to the voltage of the supply voltage.

9. Explain the current in the series circuit.

Control group's student's response:

The current in a series circuit is the equal to the supply current.

Experimental group's response:

The current in a series circuit across each resistor is the same as the supply current.

10. Explain the voltage in the parallel circuit.

Control group student's response:

In a parallel circuit, the voltage across each resist is equal to the supply voltage.

Experimental group student's response:

In a parallel circuit, the voltage across each resist is the same and is the same as the supply voltage.

11. Explain the current in the parallel circuit.

Control group student's response:

The current in the parallel circuit, is divided.

Experimental group student's response:

The sum of the current across each resistor in the parallel circuit, is the equal to the supply current.

12. Did you manage to construct all the circuits without any assistance from your lecturer?

Control group student's response:

No. I had to seek assistance from my lecturer but fail to do some circuits.

Experimental group student's response:

No. I had to seek assistance from my lecturer and the support staff.

13. In your opinion, will you like the style of the practical to be changed and if your answer is yes, please give your input.

Control group student's response:

I will prefer more support staff to be present in the laboratory to assist the students to do the practical.

Experimental group student's response:

No, I had enough support from the lecturer and support staff.

Researcher's Analysis:

Most students were unable to calculate and verify the resistor values. The pre-practical session assisted the experimental group to understand the resistor-colour coding. This was not evident for the control group.

Most students in the control group were unable to explain the concept of the short-circuit. The experimental group had a deep understanding of the concept due to the pre-practical and post-practical session. They were able to relate the concept, to real life situation when electrical systems are by-passed in informal settlements

Both the group's understood the reason for the difference in the reading on the multimeter and knew that the resistor had a tolerance and there was minimum and maximum value of a resistor and the multimeter must read within that range. The control group understood how to connect, per the theory. The experimental group understood how to connect according to how the lecturer and the support staff taught them. In conclusion, the Control group depended on the theory while Experiment group understood the theory and practical applications due to the interventions by academic and support staff.

Moreover, the model reflects an attempt by the researcher to uncover the barriers that inhibit a high pass rate, as well as the role played by different stakeholders for teaching and learning to achieve the intended outcome.

Arnaiz Sánchez, et al., (2019) confirmed that the "barriers to learning and participation have different natures and can occur at different levels such as the attitudinal, the organisational and the contextual. For this reason, it is essential that professionals in the field of education are aware of their existence, know how to identify them and are capable of proposing changes and improvements that eliminate them in order to offer inclusive responses to students".

2.8 CONCLUSION

This chapter provided the theoretical background on the topic under investigation. Management and educational theories were explored to provide strong theoretical support for this study. Individual participation and teamwork in the context of stakeholder engagement were critically discussed. This was addressed with reference to higher education institutions such as the Durban University of

Technology. Furthermore, human resource practices such as talent management were reviewed to illustrate how strategic policies can guide an organisation toward excellence. The aspect of teamwork and individual participation was also reviewed to ascertain the benefits and downfalls of both approaches. After a critical review of the literature, a suitable study model was developed. The next chapter presents the research methodology used in this research.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

The study aimed to evaluate the effect of individual participation and teamwork on the pass rate of first-semester students within the Electrical Engineering department of Durban University Technology. To achieve the aim of this study, primary and secondary data were collected. Rajasekar (2013) indicates that research methodology provides the guide and specific work plan to a study, with the intent of acquiring some information. The following sections present the research methodology used to conduct this study. Various concepts that feed into the overall concept of the methodology used to conduct the study are highlighted in the respective sections that follow. Lapan and Quartaroli (2009) state that methodological reviews should focus on past and current methodologies to assess the effectiveness of the processes, procedures and approaches used by the researcher to conduct the research project.

3.2 RESEARCH METHODOLOGY

According to Debois (2016), research methodology is a series of well-structured steps to address the research problem. Yang and Miller (2008), as well as Singh (2012), conclude that research methodology should follow several steps to identify the research problem, literature review, formulate assumptions, measurement, data collection and analysis, interpreting data and conclusions. Research methodology is in this way composed of research strategies addressing the principles employed, with reasons for utilisation in a study. The study employed both quantitative and qualitative research methods in a mixed- method approach. This choice of methodology was based on the research questions formulated under the perspective of the research problem and aims.

According to Kothari (2004), there are two basic approaches to research, and these are quantitative and qualitative. Quantitative research involves the generation of data in quantitative form, which can be subjected to rigorous quantitative analysis in a formal and

rigid fashion. This approach can be subdivided into inferential and simulation approaches to research. The purpose of the inferential approach to research is to form a database from which to infer the characteristics or relationships of a population, where a sample of the population was studied. The experimental approach, according to Kothari (2004), is characterised by much greater control over the research environment and in this case, some variables are manipulated to observe their effect on other variables. The simulation approach involves the construction of an artificial environment within which relevant information and data can be generated. This permits observation of the dynamic behaviour of a system under controlled conditions. Struwig and Stead (2013) iterate that in the quantitative research process, individuals were the object of an empirical inquiry. Walliman (2017) describes quantitative research as a technique that uses numerical measurements and statistical examinations of measurements about social happenings. The survey could also be an effective design when studying a topic or when no one theory exists, or the researcher does not know which constructs are appropriate or how to measure important variables (Cooper and Schindler, 2013).

Cooper and Schindler (2003) assert that quantitative studies can be applied in a broader study, involving a greater number of subjects, thereby enhancing the generation of the results. Quantitative studies also allow for greater objectivity and accuracy of results. Generally, quantitative methods are designed to provide summaries of data that support generations about the phenomenon under study, and personal bias can be avoided by researchers keeping a distance from participating subjects and employing subjects unknown to them.

Data collection was carried out in the Engineering and Built Environment Faculty at the Durban University of Technology. This study was done in the Electrical Principles Laboratory, within the department of Electrical Power Engineering. A control group and an experimental group were randomly selected by the researcher. Four staff members from the Department assisted in the practical and tutorials of the experimental group for this research. This was done over 15 weeks in 2 x two hourly sessions weekly. Both groups were asked to perform the compulsory practical and complete a questionnaire. The practical tasks were also part of their course fulfilment requirements. This also ensured

that students would find the experience beneficial as it also contributed to their course marks. Permission to perform the study was obtained from the Department of Electrical Power Engineering. The two groups were treated equally despite the different modes of delivery. To ensure that no external factors influenced both the control and experimental groups, they received the same lecture notes and materials and were taught by the same person for the conventional lecture.

The department staff performed physical demonstrations as well using videos to show the experimental group how to do their experiments. The Control group used the lectures as the knowledge to perform the practical experiments.

3.3 RESEARCH DESIGN

The research design implemented for this study is the mixed methods approach. Data was collected utilising questionnaires and interviews. Creswell (2009) and Turner (2010) define the mixed methods approach as “combining both quantitative and qualitative research methods in a research study.” Being both a quantitative and qualitative study, a cross-sectional survey was an appropriate design to achieve the objectives of this study. Notably, a survey design has the potential to generalise to large populations if a justified sampling has been selected and executed for the empirical study. Mukul and Deepa (2011) confirm that the research design is a strategy used for collecting and coherently analysing data to achieve the objectives of a research towards addressing the research problem. Furthermore, Lewis and Thornhill (2009) indicate that the survey design is commonly used in business and management studies to answer research questions. In this perspective, a survey design allows a researcher to produce relevant models of relationships between variables.

Against the above backdrop, survey design was appropriate for this study as it is built on the understanding of possible relationships. For Kumar (2011), the survey design is used when a researcher first needs to explore a topic using qualitative and quantitative data to achieve the objectives of the study. This study sought to investigate the relationships between individual and teamwork participation of first-year Electrical Engineering students and pass rates. According to Cooper and Schindler (2011), in contrast to

quantitative methods, since they strive to develop understanding through a detailed description such as building theory without testing it, the approach uses subjective data in trying to achieve an insider's view through observation.

Having worked with tertiary students in their first course in electrical engineering, both in a traditional setting and an industrial environment, this researcher deduced that there was a need for further research. Many researchers have indicated that changes are necessary in the way in which engineering subjects are taught. Traditional methods do not fully relate to real-world situations and engineering subject concepts. Students need to be helped to think and solve problems – even those related to the real world. The practical component with full academic guidance, intervention and technology can offer support in re-enforcing the concepts taught in the lecture. A total of 350 students participated in this study and they were divided equally into the Control group and Experimental group. The table below outlines the difference between the teaching and learning modes of delivery of the control and the experimental groups.

Table 3. 1 Differences between the control group and the experiential group

CONTROL GROUP	EXPERENTIAL GROUP 1	EXPERENTIAL GROUP 2
Lectures, Practical and Practical Examination.	Lectures, Tutorials, Pre/Post Practical, Practical and Practical Examination.	Lectures, Tutorials. Pre/Post Practical, Practical and Practical Examination
The Practical experiment is not demonstrated by the departmental staff.	The Practical experiment is demonstrated by the departmental staff.	The Practical experiment is demonstrated by the departmental staff.
Pre/Post Practical is not ed for the Practical component.	Post Practical is conducted for the Practical component.	Pre/Post Practical is conducted for the Practical component.
Application/ Technical Skills are taught	Basic approach to problems. Practical tasks are taught step by steps	Basic Application/Technical Skills are taught.

3.3.1 Quantitative Approach

The quantitative analysis is limited to numerical descriptions rather than detailed narratives and generally provides less elaborate accounts of human perception. In addition, the research is often carried out in an unnatural, artificial environment so that a level of control can be applied to the exercise (Cooper and Schindler, 2003). This level of control might normally be in place in the real-world, yielding laboratory results as opposed to real-world results. Moreover, the issues are only measured if they are known prior to the beginning of the survey (and, therefore, have been incorporated into the questionnaire). Quantitative research is more appropriate when the issues to be tested are known, the language used by the participants to describe these issues is known and finally, it is essentially evaluative, not generative. The quantitative research process is reasonably well structured, and it is used to test for validity and reliability. In quantitative studies, data is collected based on a pre-determined population (Kumar, 2011). This study adopted quantitative research considering that the numbers in the population of the study were relatively high. The use of a quantitative approach allowed the researcher to elicit findings from the predetermined sample of the study. The list of students is known in advance. Findings that stem from the research are generalised to the wider population of the study.

3.3.2 Qualitative Approach

The second research approach is qualitative, whereby researchers, in contrast to the quantitative approach, assert that the world is socially constructed and assume the position of a subjective observer in the same world (Saunders, Lewis and Thornhill, 2009). The qualitative approach, as argued by Neil (2007), involves an in-depth understanding of human behaviour and the reasons that govern humans. Smaller focused samples, as opposed to large random samples in the quantitative approach, may be used. The study conducted interviews with lecturer stakeholders to obtain their perspectives based on the teaching and learning experience of the module. Qualitative analysis was not utilised as a stand-alone approach since a questionnaire was used for quantitative data collection. The study design adopted mixed methods based on the assumption that the conversation accompanying the completion of standardised measures within an interview setting would be specifically informative. According to

Lincoln and Guba (1985), qualitative research is natural as the researcher attempts to interpret the data and draw conclusions based on his observation. Qualitative research observes, interviews, summarises, describes, analyses, and interprets phenomena in their real dimension. Table 3.2 below distinguishes quantitative from qualitative approaches.

Table 3. 2 Differences between Quantitative from Qualitative approaches Source: Kumar (2011)

Quantitative Approach	**Qualitative Approach**
Experimental designs or quasi-experimental Non-experimental designs, such as surveys	Narratives, Phenomenologist Ethnographies, Grounded theory Case studies

In qualitative research, the researcher might be involved in the study as a research participant to provide more insight and strengthen the interpretative context of the study (Cooper and Schindler, 2013). The study capitalises on the strengths of both methods to avoid the effects of the limitations of each method.

3.4 RESEARCH PARADIGMS

According to Saunders (2009), a research paradigm incorporates the fundamental philosophical concepts and values about the nature of reality and the scientific pursuit of knowledge. The three research paradigms commonly employed by researchers include positivist (quantitative) research, which involves the use of numerical measurement and statistical analysis of measurements to examine social phenomena (Lewis and Thornhill, 2009). Phenomenological (qualitative) research and mixed research or the triangulation Paradigm" rejects the notion that a single, verifiable reality exists independent of one's senses (Rehman and Alharthi, 2016). According to Edirisingha (2012), the strengths and weakness of each paradigm need to be measured by the researcher, the population

involved and the availability of resources before decision-making. The Researcher used the questionnaires for the student's perceptions and interviewed the lecturers for their perceptions on improving the pass rate of first-year students in the department of Electrical Power Engineering.

3.5 SAMPLING METHOD

3.5.1 Target Population

A population is any group of individuals or objects that share common characteristics and represent the whole or total of cases involved in the study (Silverman, 2016). Saunders, Lewis, and Thornhill (2012) define a population as the full set of cases from which a sample is taken. The population for this study were all the first-year Electrical Power Engineering students registered within this department, at the Durban University of Technology and more specifically, those registered for the laboratory course. It also included three lecturers of the laboratory module.

3.5.2 Sampling and sample size

Patten and Newhart (2017) view sampling as the selection of research respondents from an entire population, making decisions about settings and behaviours to be observed. Cooper and Schindler (2012) assert that the size of the sample is a function of the variation in the population parameters under study and the estimating precision needed by the researcher. Some principles that influence sample size include the greater dispersion or variance within the population, the larger the sample must be to provide estimation precision; the greater the desired precision of the estimate, the larger the sample must be; the narrower the interval range, the larger the sample must be; the higher the confidence level in the estimate, the larger the sample must be; the greater the number of sub-groups of interest within a sample, the greater the sample size must be, as each sub-group must meet minimum sample size requirements; and if the calculated sample size exceeds five per cent of the population, the sample size must be reduced without sacrificing precision (Saunders, 2012).

There are two major classes of sampling methods mostly used in research, namely non-

probability, and probability methods. Probability methods are based on the principles of randomness and probability theory, while non-probability methods are not. Consequently, probability samples satisfy the requirements for the use of probability theory to accurately generalise to the population, while this is not the case with non-probability samples (Kobus, 2012). This does not however necessarily mean that the samples from non-probability techniques are not representative. At least with a probabilistic sample, researchers know the odds or probability that they have represented the population well. Trochim (2006) asserts that researchers can estimate confidence intervals for the statistic; here, researchers consider a wide range of non-probabilistic alternatives.

The total population in this study was 350 students. The sample size for each group was 175 each, that is, Control and Experiential Groups.

Convenience Sampling

This method refers to a situation when population elements are selected because they are easily and conveniently available. In this study, the total population was 350 students, the Control Group and the Experiential Group were equally divided.

3.6 DATA COLLECTION

To evaluate the effect of individual participation and teamwork on the pass rate of first- semester students within the Electrical Power Engineering department of the Durban University Technology, the primary data collected through questionnaires were used for quantitative analysis to generate different results, such as correlations between variables and regression. Furthermore, the qualitative data collection methods included interviews and observations (Bhattacharyya, 2013). Secondary data was also considered by analysing existing literature from journal articles, papers, and books on education and educational management. Research instruments, according to Edekin (2018), are designed to facilitate the process of collecting data to be analysed by the study to arrive at findings.

3.6.1 Research Instrument

According to Babbie (2007), a research instrument is a tool employed for gathering data from the research participants. The questionnaire and the interview schedule are the frequently used research instruments. In the current study, the researcher also used questionnaires and interviews as the research instruments. These research instruments used are further explained in the following sections.

3.6.2 Questionnaires

Babbie (2007) defines a questionnaire as a document containing questions or other types of items designed to solicit information appropriate for analysis. Data for this study was collected using a questionnaire. A 5-point Likert scale questionnaire was administered to the sample of the population during lecture hours, Maree (2010) states that a Likert scale is suitable when measuring a construct and it gives different choices to the participants to state their information for comparison of responses. The students were required to reflect on their results for the laboratory component of their coursework. Students provide information on how well they appreciate the methods used by the lecturers to deliver the module in reference to individual and teamwork participation, as well as how well they understand the lectures given the methods of delivery used by individuals or teams of staff. Findings gathered from the above-mentioned exercise assist the study to gain perspective on how effective individual or team efforts are in securing a pass rate for all students, and thus achieving service excellence for the department as well as the organisation.

According to Debois (2016), the advantages of a questionnaire include being less expensive, participants being treated equally by the researcher and participants getting enough opportunity to answer the questions within a short space of time. Questionnaires can gather vast amounts of data which can be quantified, and errors minimised which in turn allows the easy analysis and visualisation of results because questions are standardised (Flick, 2015). The researcher was able to analyse and quantify the data gathered from the questionnaire in this research. The disadvantage of using a questionnaire is that participants do not always return them, and in some instances, the

questionnaires are not completed (Flick, 2015). In this study, only 341 students returned the questionnaires, and 9 students did not return the questionnaires.

Moreover, a lack of understanding and interpretation of the questionnaire item disrupts the completion of the questionnaire. Lastly, questionnaire completion does not allow participants to convey feelings and emotions (Debois, 2016). A self-administered questionnaire allowed the respondents, in this case, students enrolled for the laboratory component of the first year. Electrical Power Engineering students participated in completing the questionnaire at their leisure according to the degree of agreement or disagreement with the statements on the questionnaire. The disadvantage encountered in this research was the fact that some students felt intimate and did not answer the questions honestly.

3.6.3 Interview

According to Welman (2007), the structured interview could be used if the interviewer puts together a collection of questions from a previously compiled questionnaire or interview schedule. The researcher used a structured interview and recorded the interview with the lecturers; a set of three questions were compiled by the researcher.

The following questions allowed the researcher to collect data from lecturers:

- **Teaching Approach Question 1**.
  How do you appreciate your teaching/lecturing approach in response to students' understanding of the laboratory module? Follow-up question: Is there anything that you may change to improve the teaching/lecturing of the laboratory module?

- **Perception of the results Question 2.**
  What is your opinion about the students' results for the laboratory module?

- **Perception of the Support Question 3**.
  In your view, do you get any necessary support from the department, other lecturers, and students to teach the laboratory module?

The following questions allowed the researcher to gather data from the students:

- **Teaching Approach Question 1**.
  Did you understand the method the lecturer used to teach the laboratory module?
  Follow-up question: Is there anything you would like the lecturer to change to improve the understanding of the laboratory module?

- **Perception of the results Question 2.**
  What is your opinion regarding your results for the laboratory module?

- **Perception of the Support Question 3**.
  In your view, do you get any necessary support from the department, other lecturers, and students to teach the laboratory module?

3.7 RESEARCH FRAMEWORK

This study's framework is based on the perceptions of both students and lecturers, reflecting on the support they receive. Students expect delivery from the individual lecturers or team and general support from the department regarding the laboratory module. From lecturers' and students' participation in teaching and learning, all reflect teaching-learning activities and the outcome of the process.

The students were sent the questionnaire and asked different questions about:

- Module content Assimilation
- Assessment Readiness
- Perception of the support from their lecturers individually or as a team
- Both, lecturers, and students were interviewed using structured questions that addressed the following:
- Teaching Approach
- Perception of the students' results
- Perception of the Support from the department and colleagues

The study builds on O'Leary and Cui's (2018) model, which states that students and staff were likely to be active in their role in critically reflecting on their practices. The study is also informed by the literature review as well as the Cycle of Collaboration Observation model developed by O'Leary and Cui (2018) and the Classroom Innovation framework which emphasises effective teaching principles, focused on the teaching staff delivery of the module, with emphasis on the importance of good practice and a supportive environment to make the difference in the learning outcomes of students (Latorre- Medina and Blanco-Encomienda, 2014). Action research is critical in education as both teachers and students benefit in teaching and learning, in addressing the need for an education process to achieve its objectives. In this context, the aim to evaluate the effect of individual participation and teamwork on the pass rate within the Electrical Engineering department of the Durban University of Technology is likely to reflect learning and teaching efforts. As critically discussed in the literature, the research framework is represented in Figure 2.2.

3.8 DATA ANALYSIS

Krishnaswamy, Swakumar and Mathirajan (2006) define data analysis as a conversion of collected data into information statements descriptively covering means, percentages, classifications, or distributions, or making assertions about relationships or providing estimates for prediction. This study used descriptive and inferential statistics to present and analyze findings. The Cronbach's Alpha, KMO and Chi-square tests were conducted as part of the inferential statistical analysis. The data generated from the data collection process was analysed using the software, Statistical Package for the Social Sciences (SPSS). This software allows data to be presented in graphical and statistical format, hence making it easier to comprehend the results and findings of the study. Walliman (2017) asserts that the main merit of presenting data using graphs is the distributional features that can be observed without any hindrances. The responses to each of the points in the scale were placed against the various points of the Five-point Likert-scale. The total frequencies from each section were then fed to the spreadsheets to generate pie charts.

3.9 VALIDITY AND RELIABILITY

According to Sapsford and Jupp (2006), validity refers to the extent to which observations accurately record the behaviour in which the researcher is interested. The authors also note that one part of validity is reliability. This refers to the consistency of the observations, usually where two or more observers, or the same observer on a separate occasion, studying the same behaviour comes away with the same data. If the observational techniques are unreliable, they are highly likely to produce invalid data. For Kobus (2012) validity refers to the extent to which the instrument measured what it was supposed to measure. It is indicated that there are different types of validity, namely face validity, content validity, construct validity and criterion validity.

Kobus (2012) presents the different types of validity as follows:

Face validity refers to the extent to which an instrument seems or looks valid.

Content validity refers to the extent to which the instrument covers the complete content of the construct that it sets out to measure.

Construct validity is needed for standardisation and has to do with how well the construct covered by the instrument is measured by different groups of related items; and *Criterion validity* is probably the

ultimate test as to whether an instrument measures what it is supposed to measure.

For this study, the researcher ensured that the research is accurately performed and that the results of the study were recorded, analysed and communicated in a precise manner. Reliability can be determined by utilising test-retest, internal consistency, and alternative form (Saunders, 2003). To determine whether the study is reliable or not, one needs to consider the different threats to reliability including participant error, participant bias, observer error and observer bias. Kobus (2012) describes reliability as when the same instrument is used at different times or administered to different subjects from the same population, and the findings remain the same, then the instrument ensures consistency. There are different types of reliability as indicated by Kobus (2012), namely:

- Test-retest reliability is determined by administering the instrument to the same subjects on two or more accessions. The first scores are then compared with the second set by calculating a correlation coefficient. Such a coefficient will take on a value close to zero if the instrument has low reliability, and close to one if it has high reliability. Equivalent form reliability is obtained by administering the instrument and then on a second occasion, administering an equivalent instrument measuring the same construct to the same subject. Comparing the two sets of scores using a correlation coefficient gives the degree of this type of reliability of the instrument.

- Split-half reliability: to obtain this type of reliability, the items that make up the instrument are divided into two, forming separate instruments. It is divided into three methods, namely even-numbered items, randomly assigned items and the

first half of the items form one instrument and the second half form the other.

Internal reliability is when several items are formulated to measure a certain construct and there should be a high degree of similarity amongst them since they are supposed to measure one common construct.

The researcher did not tamper with the research process by pre-empting the study, or the findings of the study. Further to this, the researcher requested that all participants in the study be honest about the information that they provide as responses to the prompts by the researcher. The researcher did follow procedures properly and correctly to get relevant information from valid questions, which relate to the phenomenon under study to ensure that quality, rigour, and trustworthiness are observed during the process of data collection and interpretation.

3.10 CONCLUSION

This chapter presented the research methods employed to conduct this explanatory study. The research philosophies and strategies were presented. In addition, the data collection tools were identified and explained. The population and sampling techniques were also provided, together with data collection and analysis procedures. The next chapter presents the results and discussions of the findings.

CHAPTER FOUR: PRESENTATION AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

This chapter presents the results and discusses the findings obtained from the questionnaires in this study. The questionnaire was the primary tool used to collect data and was distributed to 350 first-year students. The data collected from the responses were analysed with SPSS version 26.0. The chapter also presents and discusses the results from interviews conducted with the three lecturers who were participants in the study. The results present the descriptive statistics in the form of graphs, cross- tabulations and other figures for the quantitative data collected. Inferential techniques include the use of correlations and chi-square test values, which are interpreted using p- values. The traditional approach to reporting a result requires a statement of statistical significance. A **p-value** is generated from a **test statistic.** A significant result is indicated with $p < 0.05$. Sample representation, validity and reliability tests are discussed.

- Descriptive statistics are used to present the characteristics of data.
- Perceptions of first-semester laboratory students and lecturers regarding the success of the laboratory module within the Electrical Engineering department at the Durban University of Technology are tested. Further discussions will focus on the interpretation of the qualitative findings according to the lecturers' reflection on the teaching and learning, students' results, and support.

4.1.1 The Sample

In total, 350 self-administered questionnaires were sent to students and 341 were returned, which gave a 97.4% response rate.

4.1.2 The Research Instrument

The research instrument consisted of 23 items, with a level of measurement at a nominal or an ordinal level. The questionnaire was divided into two sections, which measured various constructs and themes as illustrated below:

A Biographical data

B Evaluation of the Instructional Method used in the laboratory

4.2 RELIABILITY STATISTICS

The two most important aspects of precision are **reliability** and **validity**. Reliability is computed by taking several measurements on the same subject. A reliability coefficient of 0.60 or higher is considered “acceptable” for a newly developed construct. Figure 4.1 below reflects Cronbach’s alpha score for all the items that constituted the questionnaire. Section B was constituted of 4 components as illustrated below.

4.2.1 Cronbach’s alpha Coefficient

To measure the internal consistency of the measurement used in the study and to ensure that generalisation of the findings was possible, Cronbach’s alpha coefficient is depicted in Table 4.1 below.

Table 4. 1 The Cronbach’s alpha coefficient

	Section	**Number of Items**	**Cronbach's Alpha**
B1	Relationship between Theory and Practical	8	0.848
B2	Assessments	5	0.712
B3	Teamwork	4	0.769
B4	Additional Support	2	0.566

The reliability scores for all sections exceed or approximate the recommended Cronbach's alpha value. This indicates a degree of acceptable, consistent scoring for these sections of the research. The additional support construct has a slightly lower score in comparison with other constructs because it was composed of the minimum number of items for reliability testing. The factor analysis follows.

4.2 Factor Analysis

Why is factor analysis important?

According to Yong and Pearce (2013), factor analysis emphasises summarizing data for possible relationships and patterns identified in the data to be interpreted and understood. Factor analysis is a statistical technique whose main goal is data reduction (Orcan, 2018). A typical use of factor analysis is in survey research, where a researcher wishes to represent several questions with a small number of hypothetical factors. For example, as part of a national survey on political opinions, participants may answer three separate questions regarding environmental policy, reflecting issues at the local, state, and national levels. Each question, by itself, would be an inadequate measure of attitude towards environmental policy, but together they may provide a better measure of the attitude. Factor analysis can be used to establish whether the three measures do, in fact, measure the same thing. If so, they can then be combined to create a new variable, a factor score variable that contains a score for each respondent on the factor. Factor techniques apply to a variety of situations. A researcher may want to know if the skills required to be a decathlete are as varied as the ten events, or if a small number of core skills are needed to be successful in a decathlon.

The matrix table is preceded by a summarised table that reflects the results of KMO and Bartlett's Test. The requirement is that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be greater than 0.50 and Bartlett's Test of Sphericity less than 0.05. In all instances, the conditions are satisfied, which allows for the factor analysis procedure. Factor analysis is done only for the Likert scale items. Certain components are divided into finer components. This is explained below in the rotated component matrix.

Table 4. 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.841
Bartlett's Test of Sphericity	Approx. Chi-Square	2289.880
	Df	171
	Sig.	0.000

All the conditions are satisfied for factor analysis; that is, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value should be greater than 0.500 and Bartlett's Test of Sphericity sig. value should be less than 0.05.

Table 4. 3 Rotated Component Matrix

	Relationship between Theory and Practical	**Assessments**	**Teamwork**	**Additional Support**
B1	**0.695**	**0.150**	**-0.038**	**0.012**
B2	**0.784**	**0.010**	**0.067**	**0.012**
B8	**0.786**	**0.143**	**0.125**	**-0.008**
B9	**0.838**	**0.113**	**0.083**	**-0.096**
B10	**0.754**	**0.204**	**0.058**	**-0.028**
B11	**0.644**	**0.211**	**0.083**	**-0.135**
B17	**0.479**	**0.267**	**-0.162**	**0.264**
B18	**0.519**	**0.263**	**0.063**	**-0.179**
B3	**0.352**	**0.540**	**0.064**	**0.030**

B4	**0.449**	**0.674**	**-0.065**	**-0.066**
B5	**0.256**	**0.775**	**0.111**	**-0.103**
B6	**0.283**	**0.710**	**0.002**	**-0.113**

B19	**-0.133**	**0.559**	**0.016**	**0.289**
B13	**-0.120**	**0.119**	**0.565**	**0.446**
B14	**0.068**	**0.082**	**0.838**	**0.212**
B15	**0.132**	**-0.007**	**0.811**	**0.117**
B16	**0.100**	**-0.020**	**0.773**	**0.007**
B7	**0.070**	**-0.133**	**0.172**	**0.791**
B12	**-0.181**	**0.067**	**0.255**	**0.721**

Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalisation.

a. Rotation converged in 6 iterations:

Factor analysis is a statistical technique whose main goal is data reduction. A typical use of factor analysis is in survey research, where a researcher wishes to represent several questions with a small number of hypothetical factors.

Regarding Table 4.3:

- The principal component analysis was used as the extraction method, and the rotation method was Varimax with Kaiser Normalisation. This is an orthogonal rotation method that minimises the number of variables that have high loadings on each factor. It thus simplifies the interpretation of the factors.

- Factor analysis/loading shows inter-correlations between variables.
- Items of questions that loaded similarly imply measurement along a similar factor. An examination of the content of items loading at or above 0.5 (and using the higher or highest loading in instances where items cross-loaded at greater than this value) effectively measured along the various components.

The statements that constituted each of the sub-themes (components) loaded perfectly along a single component. This implies that the statements that constituted these sections perfectly measured what they set out to measure.

4.3 PRESENTATION OF DEMOGRAPHIC RESULTS

The following sections present the findings from the survey. Responses from Section A are presented and later, the responses and discussion based on responses from Section B are presented.

Table 4. 4 Age Analysis Table 4.3: Age Analysis

Age		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16 - 20	274	80,4	80,4	80,4
	21 – 30	66	19,4	19,4	99,7
	31 – 40	1	0,3	0,3	100,0
	Total	341	100,0	100,0	

The above findings illustrate that the participants' age distribution was scattered mainly around the age category of 16-21 years by a total of 80.4%, whilst 19.4% is attributed to the age category of 21-30 and 0.3% is attributed to the age group 31-40 years. The findings show that most of the participants in the survey were generally below the age of twenty-one. This finding is synonymous with the sample of the study as the study focused on first-semester students and their learning support within the laboratories of the institution. It is an accepted norm that first-semester students are those that have just completed high school and are joining a higher learning institution for the first time. In this case, however, it is also revealed that there are some much older than this group category that has just completed high school tuition. These subsequent groups may belong to those that have been failing to progress to the next level of study, or who may

be continuing their studies from other previous qualifications already attained, or they may be upgrading their skills and have been accumulating work experience in previous years. The varied years in response indicate diversity, which the study appreciates as it may show different patterns with maturity levels in needing support, and perceptions of the support granted in the laboratories.

4.3.1 Gender Analysis

Table 4. 5 Gender Analysis

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	264	77,4	77,6	77,6
Female		76	22,3	22,4	100,0
Total		340	99,7	100,0	
Missing	System	1	0,3		
Total		341	100,0		

The table above demonstrates that a total of 77.6% of the sample, and by the majority, were male; whilst 22.4% were female. There were more male participants than there were female participants in the study.

Department Analysis Table

4.6 Department Analysis

Department		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Electronic	201	58,9	58,9	58,9
	Industrial	40	11,7	11,7	70,7
	Mechanical	56	16,4	16,4	87,1
	Power	44	12,9	12,9	100,0
	Total	341	100,0	100,0	

There were four departments from which the study drew responses in terms of the students that attend the laboratory lectures. A total of 58.9% were from the Electronic Department, 11.7% from the Industrial department, 16.4% from the Mechanical department, whilst 12.9% were from the Power department.

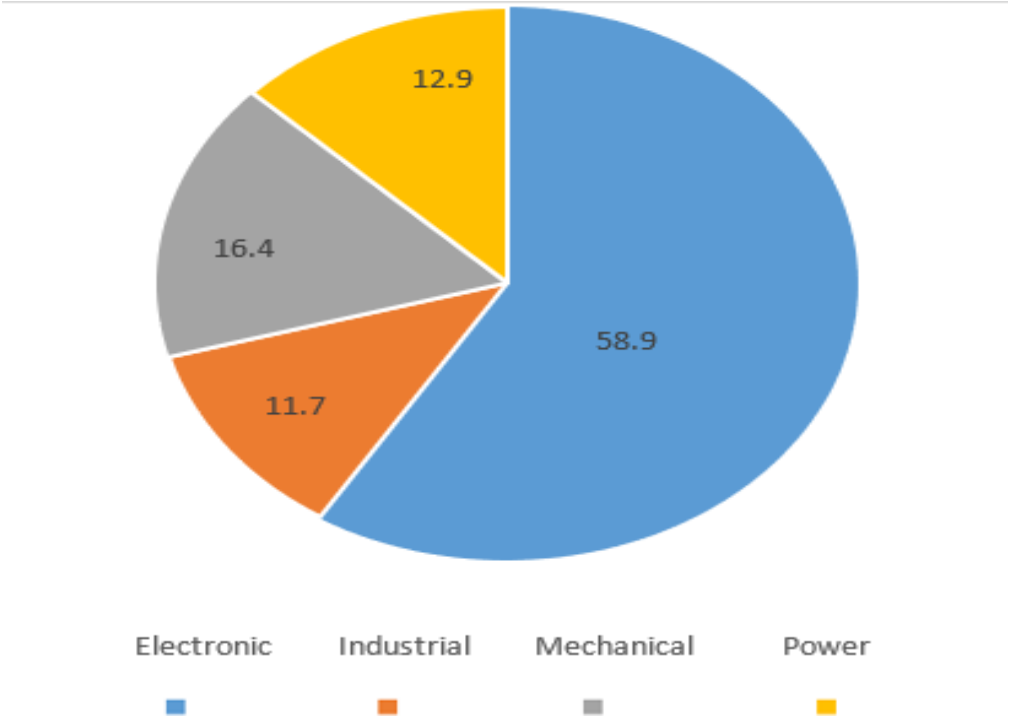

Figure 4. 1 The Department Analysis.

4.4 DESCRIPTIVE STATISTICAL ANALYSIS

The following sections present findings pertaining to the section of the research instrument on Assessments:

4.4.1 I understand the coursework taught in the laboratory component of my course

Table 4. 6 I understand the coursework taught in the Laboratory component of my course

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	0,9	0,9	0,9
	Disagree	3	0,9	0,9	1,8
	Slightly disagree	7	2,1	2,1	3,8
	Neutral	17	5,0	5,0	8,8
	Slightly agree	39	11,4	11,5	20,3
	Agree	166	48,7	48,8	69,1
	Strongly agree	105	30,8	30,9	100,0
	Total	340	99,7	100,0	
Missing	System	1	0,3		
Total		341	100,0		

Table 4.7 above illustrates that 0.9% of the participants strongly disagreed and disagreed respectively that they understand the laboratory coursework, 5.0% remained neutral and 48.8% agreed, whilst 30.9% strongly agreed. The findings are encouraging as many of the participants indicate that they understand what they are being taught during the time they spend in the laboratory. There have been increasing concerns about the pass rate that seems to be dropping each semester for the laboratory component in the Electrical Engineering department. A drop-in pass rate suggests that the students are not prepared

enough to undergo tests and/or exams for the module. The research problem that prompted the study has revealed that the past concerns may be alleviated as 79.7% agree that they understand what is being taught in the laboratories. This finding is in line with Heathfield (2014), who states that not many people in an organisation want to hear that they were less than effective in the previous year that they were appraised. In this way, the students, hearing from previous reports and cautions asking them to be vigilant in their studies, may have worked extra hard to ensure that they pay attention to understand what is being taught. On the other hand, the lecturers themselves may have also put in extra effort to ensure that the students get the maximum benefit from the lectures they present.

4.4.2 My lecturers assist me fully with the laboratory coursework

Table 4. 7 My lecturers assist me fully with the laboratory course work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	6	1,8	1,8	1,8
Disagree		6	1,8	1,8	3,5
Slightly disagree		7	2,1	2,1	5,6
Neutral		15	4,4	4,4	10,0
Slightly agree		48	14,1	14,1	24,1
Agree		131	38,4	38,5	62,6
Strongly agree		127	37,2	37,4	100,0
Total		340	99,7	100,0	
Missing	System	1	0,3		
Total		341	100,0		

Table 4.8 above illustrates that many of the participants agree that the lecturers assist them fully with their coursework. A total of 38.5% agree with this, whilst 37.4% strongly agree. Some disagreed, meaning that they do not share the same sentiment: for example, 1.8% strongly disagreed, whilst 1.8% disagreed that they received full assistance from their lecturers in the laboratory. A total of 4.4% remained neutral. The segment that disagreed (3.6%) is significant for the study as they indicate the reality as the students perceived it. The study investigated how individual participation and teamwork affect the pass rate of first-semester students. Whilst a higher percentage feel that they receive adequate support, it is still important to highlight that there is a group that feels ignored. The results may be due to individual capacity, which may perhaps be improved with teamwork efforts. Organisations must work with brevity and variety (Shekar, 2010). In this regard, the department needs to note the varied needs of students and formulate a strategy that will cater to the needs of these students to ensure that they reach their maximum potential.

4.4.3 My lecturers provide me with sufficient training and education in the laboratory

Table 4. 8 My lecturers provide me with sufficient training and education in the laboratory

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	1,2	1,2	1,2
	Disagree	4	1,2	1,2	2,4
	Slightly disagree	5	1,5	1,5	3,8
	Neutral	25	7,3	7,4	11,2
	Slightly agree	35	10,3	10,4	21,6
	Agree	147	43,1	43,5	65,1
	Strongly agree	118	34,6	34,9	100,0
	Total	338	99,1	100,0	
Missing	System	3	0,9		
Total		341	100,0		

The participants were asked to respond to whether the training and education provided to them in the laboratory is sufficient. The findings reveal that many of the participants feel that they do. For example, 43.5% of the participants agree whilst 34.9% strongly agree and are adamant that the training and education they receive are sufficient. However, 1.2% disagree and strongly disagree respectively and 7.4% remained neutral. The group that has remained neutral may have done so because they were not sure how to feel about the question posed to them. The majority in this instance indicated satisfaction with the level of training and education they receive, which is synonymous with the groups that asserted that lecturers assist them fully and the group that said they understand the work being taught to them in the laboratory coursework. According to Nilsson and Ellstrom

(2012), the world of work has undergone changes in both the nature of work and the emergence of new forms of work, which result from innovation, the development of new knowledge, increased competition, and other factors (Brown et al., 2003; Sennett, 2006 cited in Nilsson and Ellstrom, 2012). Against this backdrop, it is significant to note that the lecturers are agile and innovative enough to be abreast, ensuring that they provide quality education and training in a manner that satisfies the end-user.

4.4.4 I am satisfied with the level of attention I receive from the lecturers in the laboratory

Table 4. 9 I am satisfied with the level of attention I receive from the lecturers in the laboratory

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	6	1,8	1,8	1,8
	Disagree	4	1,2	1,2	3,0
	Slightly disagree	8	2,3	2,4	5,3
	Neutral	26	7,6	7,7	13,1
	Slightly agree	42	12,3	12,5	25,5
	Agree	134	39,3	39,8	65,3
	Strongly agree	117	34,3	34,7	100,0
	Total	337	98,8	100,0	
Missing	System	4	1,2		
Total		341	100,0		

The above findings illustrate that many of the participants are of the view that their lecturers provide them with adequate attention when they are in the laboratory. This is indicated by the 39.8% that agreed and the 34.7% that strongly agreed. Only 1% strongly disagreed, whilst 1.2% disagreed. The remaining 7.7% remained neutral to the statement.

The results reveal that a high percentage of participants, 74.5%, agree that they receive enough attention from their lecturers during the time of their tuition spent in the laboratory. This is a significant finding for the study as it illustrates that the participants in their individual capacity are satisfied with the level of engagement between themselves and the lecturers. Those who have negated the statement are consistent with the group that indicated that they do not understand what is being taught in the laboratory coursework in the above findings. These findings are synonymous with the findings in the literature. For example, Nilsson and Ellstrom (2012) assert that the demand and competition for highly skilled labour are intensifying on a global level. It has become clear that the most important organisational asset, especially in knowledge-intensive organisations, is the people, as the future competitiveness and prosperity of an organisation depend on its employees.

The satisfaction that participants feel with the way they are given attention during lectures is consistent with the above views of how employees should be: highly skilled and competitive to prosper. In this way, the lecturers are prospering in their work of delivering service to the end-users and in turn, the students themselves benefit through that delivery.

4.4.5 The lecturers can provide each student with required the attention

Table 4. 10 The lecturers can provide each student with the required attention

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	1,5	1,5	1,5
	Disagree	6	1,8	1,8	3,3
	Slightly disagree	15	4,4	4,5	7,7
	Neutral	28	8,2	8,3	16,0
	Slightly agree	49	14,4	14,5	30,6
	Agree	125	36,7	37,1	67,7
	Strongly agree	109	32,0	32,3	100,0
	Total	337	98,8	100,0	
Missing	System	4	1,2		
Total		341	100,0		

Table 4.11 above indicates that lecturers can provide each student with the required attention. This is illustrated by most participants agreeing with this statement. A total of 37.1% of the participants agreed, a further 32.3% strongly agreed, 1.8% disagreed, another 1.5% strongly disagreed and 8.3% remained neutral. It is encouraging to see that the students are being provided with quality service, as indicated through the responses of the participants in the survey.

Their claims that the lecturers can provide all students with the individual attention they need are validated by the high score that this statement received. These students may have had a specific need attended to by their lecturers in a helpful way, hence the feeling

that the lecturers can assist at an individual level. Those who disagreed with the statement are perhaps those that have not approached the lecturers at an individual level nor received any help during the time that they may perhaps have. The group remaining neutral in this instance may be unsure of how to respond to the statement. Coyle-Shapiro, (2017) asserts that the effective management of an organisation's employees (that is, its human resources) is arguably the single most difficult, most complex, most ambiguous, yet most important task that managers face. It is in this instance encouraging to see that the management of human resources at the DUT is yielding fruitful results. This is shown by the number of students who feel that they understand what they are being taught, are given satisfactory attention and are provided with adequate attention per student by their lecturers. This is a positive finding for the study as it illustrates that students are satisfied with individual participation in laboratory coursework.

4.4.6 The lecturers in the department seem to be handling the workload efficiently

Table 4. 11 The lecturers in the department seem to be handling the workload efficiently

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	1,5	1,5	1,5
	Disagree	6	1,8	1,8	3,2
	Slightly disagree	6	1,8	1,8	5,0
	Neutral	46	13,5	13,6	18,6
	Slightly agree	53	15,5	15,6	34,2
	Agree	117	34,3	34,5	68,7
	Strongly agree	106	31,1	31,3	100,0
	Total	339	99,4	100,0	
Missing	System	2	0,6		
Total		341	100,0		

The above findings illustrate that 34.5% of the participants in the survey agree that lecturers seem to be handling their workload efficiently; 31.3% strongly agree; 1.8% disagree; 1.5% strongly disagree, whilst 13.6% remained neutral. There is a notable rise in the level of participants that remained neutral to the statements posed in the survey. This may be because this question pertains to the workload of lecturers, which some students may have felt out of depth to talk about. Those that disagreed with the statement are synonymous with those that have indicated that they do not receive individual attention from the lecturers. The group that agreed is consistent with the group indicating that they receive adequate training and education in the laboratory.

4.4.7 I feel that one lecturer is more than helpful in helping students pass the laboratory coursework

Table 4. 12: I feel one lecturer is more helpful in helping students pass the laboratory coursework assessments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	38	11,1	11,7	11,7
	Disagree	19	5,6	5,8	17,5
	Slightly disagree	29	8,5	8,9	26,4
	Neutral	68	19,9	20,9	47,2
	Slightly agree	44	12,9	13,5	60,7
	Agree	83	24,3	25,5	86,2
	Strongly agree	45	13,2	13,8	100,0
	Total	326	95,6	100,0	
Missing	System	15	4,4		
Total		341	100,0		

Table 4.13 above illustrates that many of the participants are of the view that one lecturer in the laboratory is more than enough in meeting the students' needs. This is demonstrated by the 24.3% that agreed to this and the 13.2% that strongly agreed. Some disagreed, insinuating that more lecturers are required in the laboratory. For example, 5.6% disagreed, whilst 11.1% strongly disagreed. The remainder of the participants, 20.9%, opted to remain neutral as they may not want to comment on this issue. This finding is significant as it indicates that the individual participation of students is sufficient for excellence. This is indicative of many of the participants who have supported this proposition. The group that has not agreed to this is synonymous with the group that has maintained that inadequate training and teaching is occurring in the laboratory and that they are not receiving adequate individual attention.

4.4.8 The instruction method of the laboratory coursework must not be changed

Table 4. 13: The instruction method of the laboratory coursework must not be changed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	15	4,4	4,6	4,6
	Disagree	12	3,5	3,7	8,3
	Slightly disagree	13	3,8	4,0	12,3
	Neutral	54	15,8	16,6	28,8
	Slightly agree	53	15,5	16,3	45,1
	Agree	90	26,4	27,6	72,7
	Strongly agree	89	26,1	27,3	100,0
	Total	326	95,6	100,0	
Missing	System	15	4,4		
Total		341	100,0		

A statement was posed to the respondents, testing their perception of the method currently being used to deliver the laboratory coursework. Many indicate satisfaction with the current mode of instruction. The results reveal that 27.6% of participants agree that the method of instruction should not change; 27.3% strongly agree; 3.7% disagree; 4.6% strongly disagree, whilst 16.6% remained neutral. The rise in the level of the participants that opted to remain neutral for this question is worrisome as it is significantly higher than the other responses. This choice of the answer may be because the respondents do not know how to answer, as they have in previous questions demonstrated that they do not understand the coursework and that the lecturers do not have time to offer individual attention to them. They might not know what may be good or bad as a method of instruction. The group that has agreed to no changes in the method

of instruction, 54.9%, have done so because they understand the coursework and feel that adequate attention is being given to them. The few participants that have not agreed with this statement are those who have indicated that they do not understand and that the lecturers are inundated with work. The findings are encouraging as they demonstrate that most participants in the survey are happy with the method that is being used. This indicates that the current method is a winning formula as the majority of first-year students are adamant that no changes to it are required. It seems that they are not faulting the current system in any way.

4.4.9 I am always prepared for my assessments for the laboratory coursework

Table 4. 14: I am always prepared for my assessments for the laboratory coursework

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	1,2	1,2	1,2
	Slightly Disagree	2	0,6	0,6	1,8
	Neutral	26	7,6	7,7	9,5
	Slightly agree	30	8,8	8,9	18,4
	Agree	143	41,9	42,4	60,8
	Strongly agree	132	38,7	39,2	100,0
	Total	337	98,8	100,0	
Missing	System	4	1,2		
	Total	341	100,0		

The above table 4.15 shows that many of the participants are always prepared for their assessments. This is indicated by the 42.4% that agreed and 39.2% that strongly agreed.

The other groups, 7.7%, remained neutral, whilst 1.2% disagreed. The data showing that most of the participants are prepared for their assessments is reassuring as it indicates that the students are committed to their studies and that they do indeed understand what is being taught to them. This is evidenced by the fact they can identify positively that they are prepared for all the assessments they undergo in the laboratory for this component of their studies. The groups that are always prepared are consistent with the group that understands their coursework and wishes for no change in the method of instruction. This finding points to the individual capacity for effort being put into the studies.

Accordingly, Gagne (2000) cited in Tansley (2011) points out that talent exists in the few individuals who have the necessary capabilities to make a difference in each field of human endeavour, whether it is academia, arts, leisure, sport, social action, technology, or business.

4.4.10. I am always confident when I undergo laboratory coursework assessments

Table 4. 15: I am always confident when I undergo laboratory coursework assessments.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	1,5	1,5	1,5
	Disagree	4	1,2	1,2	2,7
	Slightly disagree	8	2,3	2,4	5,0
	Neutral	36	10,6	10,7	15,7
	Slightly agree	47	13,8	13,9	29,6
	Agree	139	40,8	41,1	70,7
	Strongly agree	99	29,0	29,3	100,0
	Total	338	99,1	100,0	
Missing	System	3	0,9		
	Total	341	100,0		

The level of students' confidence to be assessed is indicated in the above table 4.16 to be on a positive slope. Many participants agreed that they are always confident when being assessed. That is, 41.1% agreed, whilst 29.3% strongly agreed. This group is consistent with the group from above which indicated that they are always well prepared for the assessments given as part of the laboratory segment of their learning.

The group that has not agreed to the confidence is consistent with the group that stated they do not understand the coursework and hence cannot be confident during assessment time. The findings demonstrate that on an individual basis, most of the participants are confident about what they are learning and being assessed on.

4.4.11 I always pass my assessments

Table 4. 16: I always pass my assessments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	2,1	2,1	2,1
	Disagree	4	1,2	1,2	3,2
	Slightly disagree	13	3,8	3,8	7,1
	Neutral	66	19,4	19,4	26,5
	Slightly agree	63	18,5	18,5	45,0
	Agree	125	36,7	36,8	81,8
	Strongly agree	62	18,2	18,2	100,0
	Total	340	99,7	100,0	
Missing	System	1	0,3		
	Total	341	100,0		

On the issue of assessments, the participants were further interrogated to present evidence on their

pass rate. It was pleasing to note that the majority do pass their assessments. This was indicated by the 36.7% who agreed to always passing and a further 18.2% who strongly agreed to this.

The other groups, 2.1%, strongly disagreed, whilst 1.2% disagreed, indicating they do not always pass their assessments. These groups are consistent with the group that indicated above that they are not confident when undergoing assessments. The remaining 19.4% opted to be neutral on the statement, indicating they are not sure how to respond. This may be because they sometimes do well whilst at other times they perhaps do not do so well. It is however encouraging to see that the majority are excelling in their assessments, proving on an individual scale that they understand what is being taught and as such do well during assessments on the current method of instruction in the laboratory segment. Notably on this, Gagne (2000) cited in Tansley (2011), argues that talent emerges from ability because of an individual's learning experience.

4.4.12 I am happy with my pass rate.

Table 4. 17: I am happy with my pass rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	34	10,0	10,1	10,1
	Disagree	27	7,9	8,0	18,0
	Slightly disagree	22	6,5	6,5	24,6
	Neutral	61	17,9	18,0	42,6
	Slightly agree	68	19,9	20,1	62,7
	Agree	76	22,3	22,5	85,2
	Strongly agree	50	14,7	14,8	100,0
	Total	338	99,1	100,0	
Missing	System	3	0,9		
	Total	341	100,0		

Most participants indicated that they are happy with their pass rate. That is, 22.3% agreed, whilst 14.7% strongly agreed. A total of 17.9% remained neutral on this statement. This may be because the participants are not consistent with their pass rate and as a result could not select a direct answer to the statement. The remaining group of 10% strongly disagreed to being happy with their pass rate, whilst 7.9% disagreed. The later groups are consistent with the group that lacks confidence during assessments and are never fully prepared for such. However, it is encouraging to note that the majority are happy with their pass rate. This means that on an individual benchmark, the students see excellence in their performance standards. The service that they receive from their lecturers in the laboratory seems to be of a good standard if they understand it, are well prepared and do well during assessments.

4.4.13 My pass rate is affected by the staff performance in the department

Table 4. 18 : My pass rate is affected by the staff performance in the department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	30	8,8	9,2	9,2
	Disagree	19	5,6	5,8	15,1
	Slightly disagree	21	6,2	6,5	21,5
	Neutral	85	24,9	26,2	47,7
	Slightly agree	38	11,1	11,7	59,4
	Agree	67	19,6	20,6	80,0
	Strongly agree	65	19,1	20,0	100,0
	Total	325	95,3	100,0	
Missing	System	16	4,7		
Total		341	100,0		

A statement was posed to the participants in relation to their pass rate being affected by the performance of lecturers in the department and the majority indicated that the pass rate is indeed influenced by the performance of staff in the department. This finding is significant as it is synonymous with the finding that the students are happy with the level of engagement they receive from their lecturers and that the method of instruction should not be changed. In the above responses, the majority have indicated good preparedness and a positive pass rate. This points to the students revealing a positive relationship between their performance and that of the lecturers in the department. In this regard, 19.1% of the participants strongly agreed, whilst 19.6% agreed that their pass rate is affected by the performance of staff in the department. A total of 8.8% strongly disagreed, 5.6% disagreed, whilst 24.9% remained neutral. The group disagreeing is consistent with the underperforming group, whilst the ones that remained neutral may not know the course of their results considering that they may be inconsistent in their pass rate. As such, Bakar, et al. (2010) highlight that performance measurement is the process of quantifying action, where measurement is the process of quantification of an action which leads to performance. The students in this regard may be failing to hold themselves accountable for their pass rate, considering that some of the above findings indicate that other students are happy with the performance of lecturers in the laboratory and that they understand their work.

4.4.14 Teamwork is required in the laboratory to assist students better

Table 4. 19: Teamwork is required in the laboratory to assist students better

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Disagree	6	1,8	1,8	1,8
Disagree	4	1,2	1,2	3,0
Slightly disagree	5	1,5	1,5	4,5
Neutral	38	11,1	11,4	16,0
Slightly agree	47	13,8	14,2	30,1
Agree	94	27,6	28,3	58,4

	Strongly agree	138	40,5	41,6	100,0
	Total	332	97,4	100,0	
Missing	System	9	2,6		
	Total	341	100,0		

The participants were asked to voice their perceptions regarding the teamwork approach being used to assist students in the laboratory and 40.5% strongly agreed that teamwork should be used to assist students more efficiently, whilst 27.6% agreed with this. The other 1.8% strongly disagreed, whilst 1.2% disagreed. The group that agreed on the point that teamwork has the potential to better assist students is the one performing well and that feels no threats in being grouped as they feel they have positive contributions to offer. The group that has disagreed is synonymous with the group that indicated that they do not know what is being taught and hence do not know what may be of further assistance to them.

Those that have remained neutral, 11.4%, may have done so as they do not know which answer to select. This is a significant finding as it demonstrates that the students do not have any problems with group work, and they are not threatened by this suggestion. Whilst in the above responses it was revealed that many of the participants are certain that they are happy with the method of instruction not being changed, the introduction of teamwork effort for enhancing the learning experience is not rejected. The students indicate that the method of instruction can be changed to introduce a team of lecturers instead of just one, which in the above instance is shown to be sufficient, as per the above findings.

4.4.15 A team of laboratory lecturers will help maintain good instruction in the coursework in the laboratory

Table 4. 20: Teams of laboratory lecturers will help maintain good instruction of the coursework in the laboratory

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	0,3	0,3	0,3
	Slightly disagree	1	0,3	0,3	0,6

	Neutral	36	10,6	10,6	11,2
	Slightly agree	48	14,1	14,2	25,4
	Agree	115	33,7	33,9	59,3
	Strongly agree	138	40,5	40,7	100,0
	Total	339	99,4	100,0	
Missing	System	2	0,6		
Total		341	100,0		

The above table depicts that most participants agree that having a team of lecturers in the laboratory will assist in maintaining good instruction for the laboratory coursework. A total of 40.5% strongly agreed with this whilst 33.7% agreed. Furthermore, 0.3% disagreed, 0.3% slightly disagreed and 14.1% remained neutral.

The percentage that agreed to this statement is synonymous with the group that has agreed to teamwork having good prospects for the learning outcomes in the laboratory in the above findings. The group that has not agreed to this is synonymous with the group that has maintained that they do not understand the coursework in the laboratory. The group that has remained neutral may not have known how to respond directly to the statement and opted to abstain. This again is a significant finding as it shows that the participants are open to diversity when it comes to the instruction provided to them by the department, even if it is in the form of teamwork from the lecturers. This is fitting as Nilsson and Ellstrom (2012) assert that the world of work has undergone changes in both the nature of work and the emergence of new forms of work, which result from innovation, the development of new knowledge, increased competition, and other factors. In this regard, therefore, it is not surprising that the participants do not regret the notion of change as it is geared towards achieving more excellence for their benefit.

4.4.16 A team of laboratory lecturers will help with more interaction between the staff and students in the laboratory

Table 4. 21: A team of laboratory lecturers will help with more interaction between the staff and students in the laboratory

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	0,6	0,6	0,6
	Slightly disagree	1	0,3	0,3	0,9
	Neutral	37	10,9	10,9	11,8
	Slightly agree	39	11,4	11,5	23,3
	Agree	122	35,8	36,0	59,3
	Strongly agree	138	40,5	40,7	100,0
	Total	339	99,4	100,0	
Missing	System	2	0,6		
	Total	341	100,0		

Table 4.22 above depicts that 40.5% of the participants strongly agree and feel that a team of lecturers will help with more interaction between students and staff in the laboratory, 35.8% agree, 0.6% strongly agree and 10.9% remained neutral. The findings above demonstrate that the majority were happy with the level of engagement they have between themselves and their lecturer in the laboratory. Participants asserted that they receive sufficient attention in the laboratory. The current finding demonstrates that whilst this may be so, the participants do not reject the notion of a team of lecturers as in this question, as they reveal this may increase the levels of interaction. The students who disagreed are synonymous with the students that have indicated they do not understand what is happening in the laboratory concerning the coursework. Those that remained neutral did not know how to answer. According to Anaurd and Wasielesk

(2014), managerial discretion refers to the latitude of options managers garner when making strategic choices. This is perhaps the latitude that can be exercised by the management of the department as they make decisions to enhance the effectiveness of the mode of instruction for the students in the laboratory to continuously improve their service delivery.

4.4.17 I feel that a team is more helpful in helping students pass the laboratory coursework assessments

Table 4. 22: I feel that a team is more helpful in helping students pass the laboratory coursework assessments

	Frequency		Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	0,6	0,6	0,6
	Disagree	2	0,6	0,6	1,2
	Slightly disagree	4	1,2	1,2	2,4
	Neutral	29	8,5	8,9	11,3
	Slightly agree	28	8,2	8,6	19,9
	Agree	114	33,4	34,9	54,7
	Strongly agree	148	43,4	45,3	100,0
	Total	327	95,9	100,0	
Missing	System	14	4,1		
	Total	341	100,0		

Many participants are of the view that having a team of lecturers in the laboratory would enhance the pass rate of students in the laboratory; 43.4% strongly agree with this statement and 33.4% agree. A further 0.6% strongly disagree and disagree respectively and the remaining 8.5% remained neutral. The current findings are consistent with other findings above, where the participants have voiced their opinions showing a positive reaction to teams of lecturers in the laboratory for increased engagement and enhanced results academically. Additionally, the participants feel that it would be in

the best interest of the students to have teamwork in the form of more than one lecturer in the laboratory assisting students with the laboratory coursework. In this regard, Huys (2002) argues that considering its prominent place in the prevailing organisational discourse, team-based work has proven to be a favourite formula for organisational re-design.

4.4.18 My lecturers can do better to assist me to get a better pass rate Table

Table 4. 23 : My lecturers can do better to assist me to get a better pass rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	8	2,3	2,4	2,4
	Disagree	9	2,6	2,7	5,0
	Slightly disagree	4	1,2	1,2	6,2
	Neutral	53	15,5	15,6	21,8
	Slightly agree	31	9,1	9,1	31,0
	Agree	110	32,3	32,4	63,4
	Strongly agree	124	36,4	36,6	100,0
	Total	339	99,4	100,0	
Missing	System	2	0,6		
Total		341	100,0		

The participants feel that they can do better in their academic studies with the help of their lecturers. That is, 36.4% strongly agree with the above statement, 32.3% agreed, 2.3% strongly disagreed, 2.6% disagreed and 15.5% remained neutral. The group that has remained neutral may be those that believe that their individual effort results in them achieving expected assessment results, whilst the group that disagrees is synonymous with those who have consistently disagreed with the point of receiving any help from lecturers because they do not understand the coursework. Lastly, the

group that has agreed is optimistic about the help they receive from their lecturers. As previously indicated, their lecturers provide them with adequate academic support. This finding emphasises the faith that students have in their lecturers' ability to assist them with their academic studies.

4.4.19 More staff need to be present to deliver the laboratory coursework Table

Table 4. 24: More staff need to be present to deliver the laboratory coursework

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	16	4,7	4,8	4,8
	Disagree	10	2,9	3,0	7,8
	Slightly disagree	13	3,8	3,9	11,6
	Neutral	73	21,4	21,8	33,4
	Slightly agree	54	15,8	16,1	49,6
	Agree	82	24,0	24,5	74,0
	Strongly agree	87	25,5	26,0	100,0
	Total	335	98,2	100,0	
Missing	System	6	1,8		
	Total	341	100,0		

The participants in this question reiterate their perception that the laboratory can have more staff members to assist students, as 25.5% strongly agree to this, whilst 24.0% agree to it. A total of 4.7% have strongly disagreed, whilst 2.9% have disagreed. A total of 21.4% have remained neutral, meaning that they did not want to give a direct answer. The group agreeing with this statement is synonymous with the group that agreed to teamwork having positive outcomes in line with the pass rate of students in the laboratory coursework assessments.

4.5 SUMMARY OF THE FINDINGS

This section summarises the biographical characteristics of the respondents.

4.5.1 Age Analysis

Table 4. 25: Age Analysis

Age (years)		Gender		Total
		Male	Female	
16 – 20	Count	206	67	273
	% Within Age	75.5%	24.5%	100.0%
	% Within Gender	78.0%	88.2%	80.3%
	% Of Total	60.6%	19.7%	80.3%
21 – 30	Count	57	9	66
	% Within Age	86.4%	13.6%	100.0%
	% Within Gender	21.6%	11.8%	19.4%
	% Of Total	16.8%	2.6%	19.4%
31 – 40	Count	1	0	1
	% Within Age	100.0%	0.0%	100.0%
	% Within Gender	0.4%	0.0%	0.3%
	% Of Total	0.3%	0.0%	0.3%

Total	Count	264	76	340
	% Within Age	77.6%	22.4%	100.0%
	% Within Gender	100.0%	100.0%	100.0%
	% Of Total	77.6%	22.4%	100.0%

Overall, the ratio of males to females is approximately 3:1 (77.6%:22.4%) ($p<0.001$). Within the age category of 21 to 30 years, 86.4% were male. Within the category of males (only), 21.6% were between the ages of 21 to 30 years. This category of males between the ages of 21 to 30 years formed 16.8% of the total sample. The age distributions are not similar as there are more respondents younger than 20 years old ($p < 0.001$). There were nearly identical numbers of respondents ($p = 0.705$) by year and group ($p = 0.997$).

Table 4. 26: 2018-2019 Registration for the module

Year	Frequency	Percent	**Group**	Frequency	Percent
2018	167	49	Group 1	114	33.4
2019	174	51	Group 2	114	33.4
Total	341	100	Group 3	113	33.1
			Total	341	100.0

4.5.2 Department Analysis

Figure 4.28 below shows the departments to which the respondents belonged.

Nearly 60% of the respondents were in the Department of Electronic Engineering, with similar and smaller numbers belonging to the remaining listed departments ($p<0.001$). All the respondents were first-year students.

The section that follows analyses the scoring patterns of the respondents per variable per section. The results are first presented using summarised percentages for the variables that constitute each section. Results are then further analysed according to the importance of the statements.

4.6 RELATIONSHIP BETWEEN THEORY AND PRACTICAL

This section deals with the relationship between theory and practical. The table below summarises the scoring patterns, and the results show that about 90% of students agreed that they understand the coursework taught in the Laboratory component of the course. The scores in Table 4.28 prove that the relationship between theory and practical indicates that they are satisfied with the attention they receive from lecturers to ensure they assimilate the practical component of the course.

Lecturers and students for the laboratory course expressed their views on how they appreciate their teaching/lecturing approach in terms of understanding the laboratory module content, as depicted in Table 4.28. There is an alignment between the theoretical part of the course and the work that students complete in the laboratory as their practical assignments. Furthermore, Table 4.28 shows that lecturers expressed their satisfaction with the teaching approaches they use to emphasise both theory and practical. The understanding of theory helped the students to understand the results of the practical.

Table 4. 27 : Relationship between Theory and Practical

		Strongly disagree		**Disagree**		**Slightly disagree**		**Neutral**		**Slightly agree**		**Agree**		**Strongly agree**		**Chi Square**
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	p-value
I understand the coursework taught in the Laboratory component of my course	B1_B	3	0.9 %	3	0.9 %	7	2.1 %	17	5.0 %	39	11.5%	166	48.8%	105	30.9%	< 0.001
My lectures assist me fully with the laboratory course work	B2_B	6	1.8 %	6	1.8 %	7	2.1 %	15	4.4 %	48	14.1%	131	38.5%	127	37.4%	< 0.001
My lecturers provide me with sufficient training and education in the	B8_B	4	1.2	4	1.2	5	1.5	25	7.4	35	10.	14	43.	11	34.	< 0.001

laboratory			%		%		%		%		4%	7	5%	8	9%	
I am satisfied with the level of attention I receive from the lecturers in the laboratory	B9_B	6	1.8 %	4	1.2 %	8	2.4 %	26	7.7 %	42	12. 5%	13 4	39. 8%	11 7	34. 7%	< 0.001
The lecturers are able to provide each student with required attention	B10_B	5	1.5 %	6	1.8 %	15	4.5 %	28	8.3 %	49	14. 5%	12 5	37. 1%	10 9	32. 3%	< 0.001
The lecturers in the department seem to be handling the workload Efficiently	B11_B	5	1.5 %	6	1.8 %	6	1.8 %	46	13. 6%	53	15. 6%	11 7	34. 5%	10 6	31. 3%	< 0.001

I feel one lecturer is more helpful students pass the laboratory coursework assessments	B17_B	38	11.7%	19	5.8%	29	8.9%	68	20.9%	44	13.5%	83	25.5%	45	13.8%	< 0.001
The instruction method of the laboratory coursework must not be changed	B18_B	15	4.6%	12	3.7%	13	4.0%	54	16.6%	53	16.3%	90	27.6%	89	27.3%	< 0.001

Most statements show (significantly) high levels of agreement, whilst other levels of agreement are lower (but still greater than levels of disagreement):

- There are no statements with higher levels of disagreement
- B17 and B18 indicate higher levels of neutral scores
- The significance of the differences is tested and shown in the table.

To determine whether the scoring patterns per statement were significantly different per option, a chi-square test was done. The null hypothesis claims that similar numbers of respondents scored across each option for each statement (one statement at a time). The alternate states that there is a significant difference between the levels of agreement and disagreement. The results are shown in the table.

The highlighted sig. values (p-values) are less than 0.05 (the level of significance), implying that the distributions were not similar. That is, the differences between the way respondents scored (agree, neutral, disagree) were significant.

4.7 ASSESSMENTS

In all instances, there are significantly higher levels of agreement than disagreement. Levels are lower for B6 and B19. The results in Table 4.29 show that approximately 80% of students agreed that they are always prepared and confident to write the practical assessment. Although 55% of students agreed that they passed their assessment, 45% of them express dissatisfaction or remain

neutral about their pass rate. It is observed that about 50% of the students believe that the pass rate is affected by staff performance in the department. Based on the results in Table 4.29, the lecturers and department should continuously re-visit staff performance for the laboratory course and identify areas that need improvements.

Table 4. 28: Assessments

		Strongly disagree		**Disagree**		**Slightly disagree**		**Neutral**		**Slightly agree**		**Agree**		**Strongly agree**		**Chi Square**
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	p- value
I am always prepared for my assessments for the laboratory. coursework	B3 C	0	0.0 %	4	1.2 %	2	0.6 %	26	7.7 %	30	8.9 %	143	42.4 %	132	39.2 %	<0.001
I am always confident when I undergo laboratory coursework. assessments	B4 C	5	1.5 %	4	1.2 %	8	2.4 %	36	10.7 %	47	13.9 %	139	41.1 %	99	29.3 %	<0.001

I always pass my assessments	B5 C	7	2.1 %	4	1.2 %	13	3.8 %	66	19.4 %	63	18.5 %	125	36.8 %	62	18.2 %	<0.001
I am happy with my pass rate	B6 C	34	10.1 %	27	8.0 %	22	6.5 %	61	18.0 %	68	20.1 %	76	22.5 %	50	14.8 %	<0.001
My pass rate is affected by the staff performance in the department	B19 C	30	9.2 %	19	5.8 %	21	6.5 %	85	26.2 %	38	11.7 %	67	20.6 %	65	20.0 %	<0.001

Regarding how lecturers view the students' result for the laboratory module, lecturers were interviewed to reflect on the students' results of the level of understanding and comprehension. Lecturers perceive the result as good or very good, but weak results are identified for possible interventions even though students respond positively to the theoretical and practical components of the module.

4.8 TEAMWORK

The results in Table 4.30 show that more than 70% of the students agreed that teamwork is required in the laboratory to assist students better, and laboratory lecturers are likely to maintain good instruction of the coursework in the laboratory through teamwork. More students confirmed that teamwork facilitates interaction between the staff and students in the laboratory and is helpful towards passing the laboratory coursework assessments.

Table 4. 29: Teamwork

		Strongly disagree		Disagree		Slightly disagree		Neutral		Slightly agree		Agree		Strongly agree		Chi Square
		Count	Row N %	Count	Row N %		Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	p- value
Teamwork is required in the laboratory to assist students better	B13_D	6	1.8 %	4	1.2 %	5	1.5 %	38	11.4%	47	14.2%	94	28.3%	138	41.6%	<0.001
Teams of laboratory lecturers will help maintain a good instruction of the coursework in the laboratory	B14_D	1	0.3 %	0	0.0 %	1	0.3 %	36	10.6%	48	14.2%	115	33.9%	138	40.7%	<0.001
A team of laboratory lecturers will help with more interaction between the staff and students in the laboratory	B15_D	2	0.6 %	0	0.0 %	1	0.3 %	37	10.9%	39	11.5%	122	36.0%	138	40.7%	<0.001

I feel that a team is more helpful in helping students pass the laboratory coursework assessments	B16_D	2	0.6 %	2	0.6 %	4	1.2 %	29	8.9 %	28	8.6 %	11 4	34. 9%	14 8	45. 3%	<0.001

The findings reveal significantly higher levels of agreement for all statements. Teamwork plays an important role in teaching as lecturers can align the theory and practical components of the course. In this context, all stakeholders such as lecturers, the department and students working together facilitate the delivery of the module content in theoretical and practical terms. On the question of whether lecturers receive the necessary support from the department, other lecturers, and students to teach laboratory modules, lecturers indicated that the workload model and timetable put them in a position where they must rely on themselves. Lecturers expressed the necessity of a support system that reinforces the current tutors who provide some support to assist both the lecturers and students. Lecturers position supports the quantitative results in Table 4.30 where results agreed that teamwork was important for students to grasp both theoretical and practical components of the module. These findings are also supported by Schreiber and Yu (2016) on the aspect of collaboration with others when dealing with difficult material, such as explaining materials to others, preparing students for exams, working on group projects, and asking for help

4.9 ADDITIONAL SUPPORT

As shown in Table 4.31 below, most students agree that lecturers can do more to assist them to improve their results. The results also show that students agree that an increase in staff capacity is likely to improve the delivery of laboratory coursework.

Table 4. 30: Additional support

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree	Chi Square

		Count	Row N %		Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %		Row N %	p-value
My lecturers can do better to assist me to get a better pass rate	B7_E	8	2.4 %	9	2.7 %	4	1.2 %	53	15.6%	31	9.1 %	110	32.4%	124	36.6%	< 0.001
More staff need to be present to deliver the laboratory coursework	B12_E	16	4.8 %	10	3.0 %	13	3.9 %	73	21.8%	54	16.1%	82	24.5%	87	26.0%	< 0.001

More of 80% of students indicated that lecturers could do better to assist them in understanding the course and thus improve the pass rate. Furthermore, 60% of students believe that an increase in capacity (in terms of the number of staff to deliver the laboratory course) will likely contribute to the performance of students.

Lecturers were interviewed about the necessity of additional support, and their view is that a small class size could improve the pass rate since lecturers could be able to provide individual attention to students. Furthermore, lecturers recommend an increase in the number of tutorials as part of a support system for students to further assist the students to master the practical aspects of the course.

All lecturers confirm that students seem happy with the service they receive from the facilitators to influence their pass of the module. Lecturers are however open to the idea additional resource in terms of the introduction more technicians in the laboratory. This is to enhance their performance, even though they are happy with their current pass rate. Lecturers indicated that technical modules require a special attention in order to support students and enhance the pass rate.

4.10 CROSS-TABULATIONS

A second Chi-square test was performed to determine whether there was a statistically significant relationship between the variables (rows vs columns). The null hypothesis states that there is no association between the two. The alternate hypothesis indicates that there is an association. The table summarises the results of the chi-square tests.

For example, the p-value between My lecturers assist me fully with the laboratory course work and Department is 0.026. This means that there is a significant relationship between the variables highlighted in yellow. That is, the department of the respondent did play a significant role in terms of how respondents viewed how lecturers assisted respondents with the laboratory coursework. It is observed that more respondents from Electrical and Industrial departments agreed compared to respondents from Mechanical and Power departments. All p-values more than 0.05 do not have a significant relationship. The Kruskal Wallis test with an ANOVA measure identified the following significant differences (highlighted) between the groups for each of the following statements: Teamwork is required in the laboratory to assist students in passing their practical component.

Table 4.31: Kruskal Wallis test with an ANOVA

Table 4. 31: Kruskal Wallis test with an ANOVA

Pairwise Comparisons of Group

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Group 2-Group 1	12.618	12.315	1.025	0.306	0.917
Group 2-Group 3	-32.236	12.176	-2.647	0.008	0.024
Group 1-Group 3	-19.618	12.261	-1.600	0.110	0.329

Teams of laboratory lecturers will help maintain good instruction of the coursework in the laboratory

Table 4. 32: Kruskal Wallis test with an ANOVA

Pairwise Comparisons of Group

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Group 2-Group 1	28.486	12.297	2.316	0.021	0.062
Group 2-Group 3	-40.898	12.270	-3.333	0.001	0.003
Group 1-Group 3	-12.412	12.324	-1.007	0.314	0.942

My lecturers can do better to assist me to get a better pass rate

Table 4. 33: Kruskal Wallis test with an ANOVA

Pairwise Comparisons of Group

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Group 2-Group 1	23.796	12.454	1.911	0.056	0.168
Group 2-Group 3	-57.875	12.426	-4.658	0.000	0.000
Group 1-Group 3	-34.078	12.481	-2.730	0.006	0.019

More staff need to be present to deliver the laboratory coursework

Table 4. 34: Kruskal Wallis test with an ANOVA Pairwise Comparisons of Group

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Group 2-Group 1	55.592	12.663	4.390	0.000	0.000
Group 2-Group 3	-60.996	12.635	-4.827	0.000	0.000
Group 1-Group 3	-5.404	12.663	-0.427	0.670	1.000

4.11 CORRELATIONS

A bivariate correlation was also performed on the (ordinal) data. The results indicate the following patterns:

Positive values indicate a directly proportional relationship between the variables and a negative value indicates an inverse relationship. All significant relationships are indicated by a * or **.

For example, the correlation value between I understand the coursework taught in the Laboratory component of my course and I am happy with my pass rate is 0.290. This is a directly related proportionality. Respondents indicate that the greater the level of understanding of coursework relating to Practicals, the more satisfied respondents were with their pass rates and vice versa. Negative values imply an inverse relationship. That is, the variables have an opposite effect on each other. That is, as one increases, the other decreases.

For example, the correlation value between “I am satisfied with the level of attention I receive from the lecturers in the laboratory” and “more staff need to be present to deliver the laboratory coursework” is -0.136. That is, the more staff present in the laboratory, the less the need for individual attention.

The findings were in line with Heathfield (2014), who stated that not many people in an organisation wanted to hear that they were less than effective in the previous year that they were appraised. The pass rate reflects the individual capacity through engagement between lecturers and students. Scott (2018) asserts that an effective approach to prioritising student success lies in focusing on an analysis of the current inadequacy of students’ output and ways of enhancing improvement. Although the question of the workload of lecturers has been linked to pass rate, some students might have felt out of depth to talk about it. In the same context, students recognise that receiving adequate training and education in the laboratory was positive to their passing results. Each lecturer in the system has the power to make a difference, but the system needs to provide support to ensure that enough time is put into their teaching.

4.12 CONCLUSION

This chapter has presented the findings of the study. The collected data was presented and analysed in this chapter. A discussion of the findings was made in line with the literature presented in the study. The patterns that emerged from the findings were discussed and linked to the objectives of the research. The relationship between the Electrical Engineering students’ pass rate and the service provided by the staff has been explored. The perspectives of the lecturers in terms of support, results, and areas where improvements are needed were also discussed. The following chapter presents the conclusions and recommendations of the study.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The following sections provide an overview of the preceding chapters, to present the key findings and conclusions in line with the objectives of the study. The study evaluated how individual performance and teamwork affect the pass rate of first-semester students within the Electrical Engineering Department of DUT. This was done to assist the department to take note of the challenges that were likely to result in students' high rate of failure.

The challenges were highlighted and the opportunities that could be exploited to enhance the performance of staff members in a manner that is best suited to the increase of the pass rate of first-semester students are proffered. A quantitative methodology was used with a cross-sectional survey design, through which a questionnaire was administered to all students registered for the course to establish the relationship between the pass rate and the services offered to students. The findings of the study were linked to the literature, as well as to the objectives of the research. From this, a discussion of the findings ensues. The research probed the question of whether there is a relationship between the Electrical Power Engineering students' pass rate and the service provided by the staff. It also attempted to assess the perceptions of first-semester Electrical Power Engineering students on the service from the Electrical Power Engineering staff. Lastly, based on the findings, necessary recommendations are provided to improve individual participation/teamwork to meet student needs. The findings and conclusions in line with the research objectives are presented next.

5.1.1 Findings from Research Objective One: To identify the relationship between the Electrical Power Engineering students' pass rate and the service provided by the laboratory technicians through the application of individual participation and a teamwork system to meet student needs.

The study found that there is a relationship between the students' pass rate and the service provided through teamwork and individual participation. In this context, students are likely to be vigilant in their studies, to show commitment and to pay attention and understand what is lectured, when there is a collective effort of staff. On the other hand, the lecturers themselves may have also put in extra effort to ensure that the students get the maximum benefit from the lectures they give. Whilst a higher percentage agreed that they received adequate support, it is important to note that a group of students felt that they still needed more support. The findings proved that involvement and participation are critical to solving the problem of failure rate also there is evidence that teamwork boosts efficiency using teamwork to get tasks accomplished. Individual capacity and ability to participate also be improved with teamwork efforts, leading to improved student performance. The institution and particularly the department must work with brevity and a variety of members to improve. In this regard, the department needs to note the varied needs of students and formulate a strategy that will cater to the needs of the students to ensure that they reach their maximum potential.

The pass rate reflects the individual capacity through engagement between lecturers and the students. The researcher asserts that an effective approach to prioritising student success is to focus on the analysis of the current inadequacy of students' output and to devise ways of enhancing improvement. Although the question of the workload of lecturers has been linked to pass rate, some students might have felt uncomfortable asking questions. In the same context, students recognise that receiving adequate training and education in the laboratory was positive to their passing results.

It is evident that students express concern over the coursework in terms of lecturers not offering individual attention to students. The students were unsure of the best practice in teaching and learning. Although they understand the coursework and feel that adequate attention is being given to them, students believe that lecturers are inundated with work. The findings are encouraging as they demonstrate that many of the students are satisfied with the method that is being used. This indicates that the current method is a winning formula as many of the first-year students are adamant that no changes to it are required. Students seem confident during assessments and are prepared for such. However, it is encouraging to note that many students are happy with their pass rate. This means that on an individual basis, the students see excellence in their performance standards. The service that they receive from their lecturers in the laboratory seems to be of a good standard if they understand it, are well prepared and do well during assessments.

Teamwork seems to be a better practice for assisting students and ensuring that they perform well. Better service to students and an improved pass rate is a result of collective efforts. Although students may require further assistance to improve, it is demonstrated that the students do not have any problems with group work, and they are not threatened by this suggestion. Another contributing factor is the level of engagement they have amongst and between students and their lecturers in the laboratory. The researcher proved that student engagement appears to be a crucial factor in the success of students in higher education. Students asserted that they receive sufficient attention in the laboratory as it is found that lecturers may still increase the levels of interaction with their students.

Based on the findings, the researcher confirms that the objective of this study has been achieved. There is a positive reaction to teams of lecturers in the laboratory for increased engagement and enhanced results academically. To this end, it is in the best interests of students to have teamwork in the form of more than one lecturer in the laboratory assisting students with the laboratory coursework.

5.1.2 Findings from Research Objective Two: To assess the perceptions of first-semester Electrical Power Engineering students regarding the service they receive from the Electrical Engineering laboratory technicians.

Research objective two focuses on the perceptions of first-semester students of the Electrical Engineering department regarding the issue of the support and service they receive from the staff. This objective has been achieved as students in their individual capacity are satisfied with the level of engagement between them and the staff. However, other students expressed doubt about their understanding of what is being taught in the laboratory coursework.

It is encouraging to see that the students are being provided with quality service, which is indicated through the students' positive responses. Students iterate that lecturers should be able to provide all students with the individual attention they need, especially as students may have a specific need that requires attention from their lecturers. In the same context, the findings prove that students value assistance at an individual level, for instance, approaching the lecturers at an Individual level for specific help. The research proved that students' collaboration with staff and other students in teaching and learning activities improve the mastery of the learning content, especially for a practical module.

Students responded that they receive adequate training and education in the laboratory. The concern is the substantial number of students who are not sure about the effectiveness of the training approach used for the laboratory course. This further demonstrates that they do not understand the coursework and that the lecturers do not have time to offer individual attention to them. This also indicates that the current method is a winning formula as many of the first-year students are adamant that no changes to it are required. It seems that they are not faulting the current system in any way. Students believe that their individual effort contributed to the understanding of the coursework, which results in them achieving expected assessment results. Lastly, the students are optimistic about their results because of the support they receive from their lecturers. In the same context, lecturers emphasise that they have confidence in the approach used and their ability to assist students to understand the module content and pass, especially the practical section of the module. Furthermore, students perceive that the teamwork in the department results in positive outcomes in line with the pass rate of students in the laboratory coursework assessments.

Generally, the study objective was achieved as the students were satisfied with the overall performance and service of the technicians. The results show that the students have a positive

outlook on the service they receive from the technicians. They feel they get the required and necessary attention, helping them with their module. The majority were of the view that the overall service provided to them is adequate to assist them to pass the module as they understand what is being taught and it helps them prepare well for their assessments. They can pass this module with the help they receive. The students indicate, however, that despite their satisfaction, it would be good to make changes within the department in how they offer their service and delivery mode of the module.

5.2 CONCLUSIONS OF THE STUDY

Following the findings presented above emanating from the previous chapter, the study has arrived at the conclusions. Listed below are the conclusions of the study regarding the research question and the objectives of the study.

5.2.1 Conclusions from Objective One: To identify the relationship between the Electrical Power Engineering students' pass rate and the service provided by the laboratory technicians through the application of individual participation and teamwork systems to meet student needs.

Concerning the above objective, the study concludes that:

- There is a positive relationship between the pass rate of students and individual participation in delivering the module to students.
- There is a positive relationship between the pass rate of students and teamwork participation in delivering the module to students.

5.2.2 Conclusions from Objective Two: To assess the perceptions of the first-semester Electrical Engineering students regarding the service they receive from the Electrical Engineering laboratory technicians.

Concerning the above objective, the study concludes that:

- Electrical Engineering/Principles 1 students in the Electrical Engineering department are satisfied with the service they receive from the technicians in the laboratory.
- Students are given adequate attention and support within the laboratory and the level of

support and service quality offered to the student allows them to pass their module".

5.2.3 Lecturer Perceptions

Based on the qualitative findings, lecturers portray a positive reflection about students' performance for the module, although they recognise the importance of support to enhance performance. This is supported by participants who confirmed that students and staff were likely to be active in their role in critically reflecting on their practices. The nature of practical modules requires the department to address both human and physical resources.

5.3 RECOMMENDATIONS FROM THE STUDY

The following are some recommendations that emanate from the conclusions of the study.

- The study recommends that the Department of Electrical Engineering explores the possibility of introducing more than one technician in the laboratory to deliver the laboratory module component. Most students have indicated satisfaction with the level of engagement they receive from the technicians, but some students indicated they struggled with the course and do not understand nor pass the module. This recommendation would assist to identify the students who need more individual-specific attention to enhance their studies and marks. Students must be considered partners in the pedagogical approaches used by the lecturers. In turn, the pass rate would be increased, assisting the department to attain success.

- Furthermore, the study recommends that the department set clear team objectives to consolidate team efforts and participation. This may be achieved through increased capacity and the improved quality of tutorials to support laboratory technicians to respond to the needs of students. Academic and support staffs' involvement consists of critical factors such as information sharing, training, decision-making and motivation or incentives.

5.4 LIMITATIONS

The study aligned the findings and conclusions to the objectives of the study, thus ensuring that the aim of the study is met. Under each objective, conclusions have been further resolved and subsequently, recommendations presented. The study focused on a University of Technology and

a traditional university may provide different findings. Furthermore, the study did not consider the resources and capability aspects of the institution. To this end, further research can be conducted following the recommendations that emanated from the study to further probe the research area and subject of the study. For instance, further study is suggested to assess the influence of laboratory equipment on students' participation. It is also important to investigate whether students' participation in the laboratory may be influenced by technology literacy. Finally, a study on the factors that improve teamwork in the department may provide another insight.

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Appendix A

LETTER OF INFORMATION

Title of the Research Study: An evaluation of how students' and staff participation affect the pass rate for the laboratory component of an Electrical Engineering course, within the Faculty of Engineering and Built Environment.

Principal Investigator/s/researcher: Sunthrasagren Moodlier, MTECH.Management

Co-Investigator/s/supervisor/s: PhD/ R. Haripersad; MTech: Education/ Prof. P. Ramrathan;

Brief Introduction and Purpose of the Study:

The Durban University of Technology is an institution of higher learning located in the Durban area. There have been increasing concerns about the pass rate that seems to be dropping each semester for the laboratory component in the Electrical Engineering department. The purpose of this study will evaluate the contribution that the staff, individual performance, and team efforts have on the pass rate concerning the laboratory module.

Outline of the Procedures:

is study will adopt a quantitative and qualitative research approach; a mixed method of enquiry will be used to gather findings for the study. The use of a mixed method to gather findings for the study will enhance the study as the findings from both the data collection tools used respectively will be triangulated and compared in analysis to draw findings. Findings that stem from the research will then be generalised to the wider population of the study. The purpose of this research, the structured interviews will be employed as a form data collection in which respondents are to answer at their leisure. A simple random technique will be used. This research is limited to the DUT in the Durban Campus. Only lecturers and students within the Faculty of Engineering and Built Environment may participate. The venue is the Electrical Engineering 1 laboratories.

Risks or Discomforts to the Participant:
There is no risks or discomfort to the participants in this study. Reason/s why the Participant May Be Withdrawn from the Study:

There will be no adverse consequences for the participant should they choose to withdraw.

Remuneration: The participant will not receive any monetary or other types of remuneration.

Costs of the Study: The participant will not be expected to cover any costs towards the study

Confidentiality: All information will be used for this study purpose and will not be shared.

Research-related Injury: N/A

Persons to Contact in the Event of Any Problems or Queries:

Supervisor: R. Haripersad. Please contact the researcher (0834171732), my supervisor (0846261242) or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

General:

Potential participants must be assured that participation is voluntary and the approximate number of participants to be included should be disclosed. A copy of the information letter should be issued to participants. The information letter and consent form must be translated and provided in the primary spoken language of the research population e.g., isiZulu.

Appendix B: Letter to Participate

Faculty of Management Sciences Department of Public Management & Economics Date

Dear Participant

I am Sunthrasagren Moodlier student registered with the Durban University of Technology. I am conducting research as part of my studies to attain the MTECH degree. The title of the study: An evaluation of how student and staff participation affect the pass rate of first-semester students registered for the laboratory component within the Electrical Engineering Department of DUT.

I am required to collect data from lecturers within the Electrical Engineering Department - DUT. Please sign this letter to indicate approval to participate in this study.

All information collected by the study will be used for the research purposes only and will be treated with utmost confidentiality. Respondents can withdraw from the study at any point should they feel uncomfortable.

Should you have any queries concerning the study, please do not hesitate to contact me on the number provided below.

Yours Sincerely,

_____

Student
+27834171732

_____

Supervisor / Promoter

Appendi C

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, S. Moodlier, about the nature, conduct, benefits, and risks of this study - Research Ethics Clearance Number: _,
- I have also received, read, and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, S.Moodlier herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Sunthrasagren Moodlier	_____	- _____
Full Name of Researcher	**Date**	**Signature**

_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

Appendix D: Questionnaire

All questions in this section are compulsory!!!!

Please use a cross (x) to mark the answer that best applies to you.

Section A: Biographical information

1. What is your age?

Age	Answer
18-21	
21 – 30	
31- 40	
41- 50	
51- 60	
Above 60	

2. What is your gender?

Gender	Answer
Male	
Female	

3. State the department you are registered in

_____

4. State the level of study you are in

_____

Section B: Evaluation of the Instruction method of the Laboratory Component of the Electrical Engineering department

The Likert Scale:

Scale	3	2	1	0	-1	-2	-3
	Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree

Please fill-in the values provided above in the block provided below.

Scale

1. I understand the coursework taught in the Laboratory component of my course.

Scale

2. My lectures assist me fully with the laboratory course work.

Scale

3. I am always prepared for my assessments for the laboratory coursework.

Scale

4. I am always confident when I undergo laboratory coursework assessments.

Scale

5. I always pass my assessments.

Scale

6. I am happy with my pass rate.

Scale

7. My lecturers can do better to assist me to get a better pass rate.

Scale

8. My lecturers provide me with sufficient training and education in the laboratory.

Scale

9. I am satisfied with the level of attention I receive from the lecturers in the laboratory.

Scale

10. The lecturers are able to provide each student with required attention.

Scale

11. The lecturers in the department seem to be handling the workload efficiently.

Scale

12. More staff need to be present to deliver the laboratory coursework.

Scale

13. Team work is required in the laboratory to assist students better.

Scale

14. Teams of laboratory lecturers will help maintain a good instruction of the coursework in the laboratory.

Scale

15. A team of laboratory lecturers will help with more interaction between the staff and students in the laboratory.

Scale

16. I feel that a team is more helpful in helping students pass the laboratory coursework assessments.

Scale

17. I feel one lecturer is more helpful students pass the laboratory coursework assessments.

Scale

18. The instruction method of the laboratory coursework must not be changed.

Scale

19. My pass rate is affected by the staff performance in the department.

Scale

Thank you for your time. All information will be treated with strict confidentiality

O

Appendix E: Interview schedule for the lecturers/students in the Department of Electrical Engineering

Please state the department you are employed in.

1. Please state your designation.
2. How long have you been an occupant of this position?
3. What has been your experience in the past three years regarding the pass rate of first-semester students registered for the laboratory module?
4. Is there a connection between the students' pass rate and the staff structure and task allocation in the laboratory? Please explain further.
5. How has the structure of staff that delivers the laboratory module affected the pass rate of students? Please explain further.
6. What is your view on individual performance and its relationship to the pass rate of first-semester students in the electrical engineering department?
7. What is your view on team-based performance and its relationship to the pass rate of first- semester students in the electrical engineering department?
8. In terms of staff structures in the laboratory, what changes can you suggest to enhance the performance of first-semester students in the laboratory coursework?
9. Is the current staff structure able to provide excellent service to the first-semester students in the laboratory? Please explain further.
10. Is the current staff structure able to meet all the requirements of the performance goals set by the department is instructing students in the laboratory?
11. Is management satisfied that the current staff structure is able to provide good quality service to the first-semester students in the laboratory?
12. Are there any additional comments you would like to make regarding the issues raised in this interview?