Teaching and learning interaction in South Africa’s higher education: Some weak links

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Abstract: The quest to get many people into higher education often crowds out the need for quality teaching and learning achievement if not backed up by resources. Narratives of recurrent concerns in the higher education sector include maintaining access to and quality of higher education, achieving a better outcome and reduce the number of students dropping out of institution. Although successes have been achieved in terms of student access to higher education, the same cannot be said of success rate. What is the weak link? How can the misalignment in the educational sector be remedied? Using ordinary least square (OLS) estimation method, empirical analysis revealed that student success depends to a large extent on the quality of input. It was evident from the study that the quantity and quality of research output significantly depend on the quality of academic staff. In view of these, various quality-enhancing investments in facilities and teacher upgrading are needed. More experienced lecturers irrespective of their nationality need to be employed to continually support teaching and learning. The higher education sector needs to...
internalize the fact of underpreparedness of high school learning graduates and make a proper corrective mechanism to upgrade their skills to contend higher education learning.

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Keywords: Higher education; learners; quality; South Africa; teaching and learning; university

1. Introduction

The impact of the unfolding knowledge society is reshaping higher education system globally. This has led to a shift of economies across the world from a money-based to knowledge-based owing to the fact that knowledge supersedes physical capital as a source of national wealth (Abugre, 2018). The relevance of higher institutions to the community is hinged on the extent to which they embrace the knowledge base economy and networks (African Development Bank (ADB), 2008; Miño Puigcercós et al., 2019). This, in turn, helps in producing an increasingly diversified range of skills in response to development needs (Kaliisa & Picard, 2017). Higher education in South Africa is a force in national socioeconomic development against a backdrop of oppression, skill shortage, ignorance and perpetual dependence (Maharasoa & Hay, 2001). Accordingly, one of the objectives of the Department of Higher Education and Training (DHEt) is to “increase the rate at which the key skills necessary for economic growth and social development are delivered” (DHEt, 2019, p. 1). Efficient higher education plays an important role in bridging the skills shortage gap in South Africa by raising the level of skills; which are crucial not only for workforce productivity, but are also essential for the innovative capacity of the economy (Fisher & Scott, 2011). The National Qualifications Framework (NQF) also emphasized skills development over formal knowledge, in view of the socioeconomic needs of the South African society (National Commission on Higher Education, 1996).

Narratives of recurrent concerns in the higher education sector include: maintaining access to and quality of higher education, achieving a better outcome and reducing the number of students dropping out from educational institution (African Development Bank (ADB), 2008; López-pérez et al., 2011; RSA, 2013; Choka & Govender, 2017). However, a large number of students drop out at key transition points all along the education pipeline that runs from high school through to the university. On average, less than 15% of matriculants gain admission into higher education institution, out of which less than 50% eventually graduate from the university (Tewari, 2014). High drop-out rate which is as a result of high failure rate in the South African tertiary education institutions is a major concern for policy makers (Author, 2014; Department of Higher Education and Training (DHET), 2011; Letseka & Maile, 2008). It also constitutes an extra cost burden to government and other stakeholders in the education sector. This study aims to highlight some of the weak links with respect to access to and quality of teaching and learning in the South African higher education system with a view to providing policy recommendations to bridge the gap.

The post-1994 apartheid period in South Africa has witnessed several measures instituted by the state to transform tertiary education in the country (Machingambi, 2011; Mouton et al., 2012). One of such measures is to ensure equitable access to higher education irrespective of race or socioeconomic status. Great successes have been achieved in this respect (access) but the same cannot be said of the quality of graduates (Choka & Govender, 2017; Lewin & Mawoyo, 2014; Motala & Pampallis, 2005). The quest to get as many people into higher education often crowds out the need for quality teaching and learning achievement. Most of the first time entering lack the required knowledge and competences for University studies (Tewari, 2016). This is caused by the misalignment in teaching and learning between high schools and Universities. Some of the students take too long a time to graduate due to under-preparedness (RSA, 2012), more so the learning environment does not also assist them to achieve success. In summary, the South African higher education sector
is faced “articulation gap” which refers to the misalignment between the learning requirements of higher education programs and the actual knowledge and competencies of the first-time entering students (Author, 2016). Although increased access is a key component of the transformation agenda of higher education in South Africa, there is an undeniable need for these institutions not only to improve the participation rate, but also to ensure that these participation strategies culminate in a successful outcome (Akoojee & Nkomo, 2007).

Success rate\(^1\) (student’s performance) in South African universities is 74% compared to the desired national benchmark of 80% (RSA, 2013). This results in the graduation rate of 16% which is well below both national and international standards for students enrolled in a three-year degree program (Center for Higher Education Trust, 2016; RSA, 2013).

The challenge of “articulation gap” as highlighted earlier leads to low graduation rates and high costs (in terms of high drop-out rates extended completion times and other inefficiencies such as the big burden of remedial teaching) to the institution (Fisher and Scott, 2011). This article argues that teaching remains elusive, or cannot, be said to be complete or effective if it is not reflected in the rate and quality of graduate produced.

The rest of this study is structured as follows: Section 2 covers the problems faced by South African higher education. Section 3 highlights the missing ingredients in the South African higher education while the current effort to salvage the situation is discussed in Section 4. A model for achieving quality educational output is discussed in Section 5. The conclusions are discussed in Section 6.

2. The problem of numbers

Higher education in South Africa is at a crossroad. At national levels, the democratization and liberalization processes have put higher education institutions in a more vibrant and more transparent environment. In South Africa, higher education plays an important role in bridging the skill shortage gap by developing qualified graduates and postgraduates through the generation of research and innovation (Fisher & Scott, 2011). The central goal of the policy framework for the transformation of higher education system in South Africa as contained in the White Paper 3 is to promote equity of access and fair chance of success to all who seek to realize their potential through higher education (Council on Higher Education, 2013; Department of Education (DoE), 1997).

In an attempt to close the education access gap occasioned by the apartheid, issues of quality and learning outcome are often sacrificed for the desire to get as many students into higher institutions (Badat, 2010; Scott & Ivala, 2019). The goal of ensuring equity access is to get as many students from the disadvantaged background into higher institutions (Department of Higher Education and Training, (DHET), 2014). However, the goal of ensuring equity access cannot be said to have been achieved as many of the students especially those from disadvantaged background drop out in large numbers while others who remain in the system fail to achieve the expected grades as well as taking too long to graduate.

Increased access has not been accompanied by a commensurate increase in success. This results in the production of under-qualified graduates or graduates who are unattractive to the labour market due to the quality of education. Education quality is defined as maintaining and applying the academic and educational standards, both in the sense of specific expectations and requirements that should be aimed at and complied with (Ministry of Education, (MoE), 2001). The issue of quality is central to redress and equity. Higher education enrolments in South African institutions have witnessed substantial growth since the transition to democracy in 1994. The higher education enrollment has grown by over 80% since 1994 to a total of over 900 000 heads (Council on Higher Education, 2013). Graduation rate, on the other hand, has also grown only marginally from 15% in 1994 to 17% in 2010 (Council on Higher Education, 2013); thus, only a very limited success is achieved so far. A key strategic objective of producing an increasing number of
graduates with the required skills and competence to meet the human resource requirement and knowledge needs of the country remains elusive. The underlying factors that have been identified to explain the disparities between access especially to programs with specialized entry requirements and the success rate in qualification attainment can be attributed to the mismatch between demand for higher education and the level of preparedness of school-leavers for tertiary studies largely arising from the poor performance of the schooling system, consequently resulting in high drop-out rate and poor degree completion rate (Department of Higher Education and Training (DHET), 2011, p. 37; Council on Higher Education, 2013, p. 27).

Higher education institutions are expected to train graduates who will make a valuable contribution to nation-building in terms of applying the knowledge and skills acquired for the development of the society (Osman & Petersen, 2010; Scott & Ivala, 2019). The primary focus of higher education is to build human capital which can, in turn, contribute to the socioeconomic and political growth of the country. With the aim of resolving the inherent societal challenges such as inequalities and inefficiencies in the education system, the South African institutions were mandated to accomplish the following broad objectives: (1) to increase and broaden participation; (2) to be responsive to social interest and needs; (3) to cooperate and be a partner in governance; and (4) to generate funding to sustain the institutions (Department of Education (DoE), 2007).

The South African government has done very well in achieving nearly full access to basic education although the same cannot be said of it when it comes to meaningful education with quality outcomes (Department of Basic Education, 2010). In the South African context, despite government’s huge investment in the educational sector, students seem not to be performing adequately; graduation rate is very low especially at the undergraduate level (Table 1).

As shown in Table 1, the annual average graduation rate between 2009 and 2017 has been 16.43%. This is far below the national minimum target of 25%. The effects of articulation gap are felt on the postgraduate enrollment and post-graduate research output and quality. The poor graduation rate constitutes a huge waste of resources, both financial and human, as most of the students take a longer time to graduate or eventually drop out. For example, according to the National Plan for Higher Education in South Africa (NPEH) prepared by the MoE, a student drop-out rate of 20% implies that about R1.3 billion in government subsidies are spent each year on students who do not complete their study program (Ministry of Education, (MoE), 2001, p. 18). In 2005, the Department of Education reported that out of 120,000 students who enrolled in higher education in 2000, 60,000 (50%) dropped out within the space of 3 years (Letseka & Maile, 2008). Of the remaining 60, 000, only 22% graduated within the specified 3-year duration for generic bachelor degree thereby costing the National Treasury R4.5 billion in grants and subsidies without a commensurate return on investment (Letseka & Maile, 2008). These funds would have gone a long way in improving the quality and expansion of the higher education system and also in redressing past inequalities if the drop-out rate is much lower.

Improvement in the quality of higher education is expected to drive research and innovation; stimulate the diversification of the economy; reverse the educational inequalities and poor educational performance; justify both private and public investment in the system as well as reposition the country among the comity of nations. A number of factors are responsible for the poor quality and inefficiency of higher education in the country, they include a large number of unprepared learners entering higher institution, large number of undergraduate classes, high student-staff ratio, poorly qualified lecturers, rapidly declining government funding. There is, therefore, need to re-examine teaching and learning environment to assess the missing link in order to suggest possible solution reverse the trend. In view of the foregoing discussion, there is a need not only to identify the weak link, but also to develop strategic steps to improve graduation rate coupled with a systemic focus on the production of high-quality graduates with a sound knowledge and skills that are relevant to the countries’ needs. This will help develop a new generation of academics and
| Year | Total undergraduate enrolment (UG) | Total undergraduate graduation (UG) | UG graduation rate (percent) | Total postgraduate enrolment (PG) | Total postgraduate graduation (PG) | PG graduation rate (percent) |
|------|-----------------------------------|------------------------------------|-----------------------------|---------------------------------|----------------------------------|-----------------------------|
| 2009 | 684,619                           | 108771                             | 15.89                       | 128747                          | 36083                            | 28.23                       |
| 2010 | 726882                            | 113183                             | 15.57                       | 138610                          | 40142                            | 28.96                       |
| 2011 | 766771                            | 117559                             | 15.33                       | 147893                          | 43066                            | 29.12                       |
| 2012 | 781710                            | 120396                             | 15.40                       | 149026                          | 45597                            | 30.60                       |
| 2013 | 800753                            | 130050                             | 16.24                       | 159750                          | 50773                            | 31.78                       |
| 2014 | 789110                            | 133371                             | 16.90                       | 156444                          | 52002                            | 33.24                       |
| 2015 | 799990                            | 139105                             | 17.39                       | 163661                          | 52419                            | 32.02                       |
| 2016 | 785351                            | 147204                             | 18.74                       | 170666                          | 55872                            | 32.74                       |
| 2017 | 832351                            | 151546                             | 18.21                       | 183175                          | 59385                            | 32.42                       |

Source: Center for Higher Education Trust (2016); DHET (2019).
researchers with the potentials to transform the knowledge base of the economy and put it on the path of sustained growth.

3. Weak links in higher education

The quality of higher education in South Africa is relatively dependent on the learner’s preparedness, student–staff ratio, availability of local resources or inputs, student support services, funds both by the government and private institutions, as well as by the number and quality of the lecturers in higher education institutions among others. However, meeting these criteria has been a major challenge for the South African higher education. Many universities do not see student support services as part of the core role, learners are underprepared, prevalence of large undergraduate classes and high student–staff ratio, staffs are less qualified compared to average in the university sector, weak management structure (RSA, 2012). The challenges of quality enhancement are reviewed below.

3.1. Large number of underprepared students entering higher institutions

One major problem affecting the quality of graduate output in South Africa is a large number of underprepared students entering higher institutions or better still a discontinuity or mismatch between prior learning and what higher education expects (Scott & Ivala, 2019). Many of these students are the first to pursue post-secondary education in their families; they also do not possess the basic requirement to succeed at a higher institution with little or no motivation to succeed (Fisher & Scott, 2011). This is reflected in their academic performance such as high repetition rate, drop-out rate and extended completion times among others (Fisher & Scott, 2011). This affects the graduation rate which in turn limits the capacity of the higher education sector to close the skills gap in the country (Fisher & Scott, 2011). Improvement in the quality of higher education through curriculum adjustment is therefore required to cater for the needs of these cohorts.

3.2. Superficial learning/grade inflation

The continuous rise in the NSC scores without a corresponding rise in the students’ ability/performance which is referred to as grade inflation has generated a lot of concerns among policymakers, researchers and other stakeholders in the education sector (Kizito et al., 2016). Internationally, the Grade 12 school results are good predictors of first-year academic success at university (Nel & Kistner, 2009). However, in the case of South Africa, there are concerns whether the National Senior Certificate (NSC) scores by learners are the best predictor of their academic success at tertiary level as a number of them perform poorly as against the impression created by their matric scores (Kizito et al., 2016). Grade inflation, which is as a result of pressure to deliver a better pass rate instead of better quality manifests in different forms, namely: generous marking to inflate standard grades, low pass requirement (for three subjects 40% and for another three 30%) and setting examinations to cater for students with low ability, especially previously disadvantaged students (Ramphele, 2009).

For example, while the average grade 12 performances for the period 2001 to 2005 had gradually increased, the first-year students’ performance had declined over the same period with the gap increasing from 22.2% to 26.6% over the same period (Nel & Kistner, 2009). Evidence of grade inflation (especially on the results of the lower performance group) was found in a study conducted by Nel and Kistner (2009) at the University of Stellenbosch to examine the new Grade 12 National Senior Certificate results for entry into higher education (Nel & Kistner, 2009). This, according to Nel and Kistner could give the students an unrealistic perception of their abilities. The course contents are also not designed in a way to cater for these cohorts. Universities are hereby encouraged to set entry qualifying examinations for first-year learners in order to be sure of their abilities.

3.3. Large classes at undergraduate/high student–staff ratio

Following South Africa’s democratization in 1994, the higher education landscape changed, paramount among them was the massification of higher education which is basically to redress the
previously segregated educational system. This usually leads to large classes in most introductory modules. The student–staff ratios are very high across universities in South Africa, although the average ratio for the country looks reasonable. At the University of South Africa, the staff–student ratios are unreasonably high, reaching a peak of 87 students per staff in 2008 and 2011 (Table 2). In the Faculties of Commerce and Humanities, the staff–student ratios are unreasonably high, sometimes as high in up to 100 students per staff. Large class size and students with diverse educational and linguistic backgrounds are part of undergraduate education (Fisher & Scott, 2011, p. 28). This further adds to consequent poor student performance.

3.4. Resource availability

Availability of resource is another factor that constrains access to and performance of students in higher institutions. Lack of adequate funding for higher education would imply higher fees thereby shutting out the poor and reducing the ability of universities contributing to socioeconomic, political and cultural development (Letseka & Maile, 2008). For example, in the UK, a study by HEFCE indicates that 20% of disadvantaged students were 6 times less likely to participate in Higher education compared to 20% of more advantaged students (Scott & Ivala, 2019). In the USA, it is believed that a student’s success depends almost entirely on the income earned by the parents with 90% of the graduating students coming from the top income quartile while 25% come from the lower half (Scott & Ivala, 2019). In the case of South Africa, 70% of the families of higher education drop-outs were categorised as “low-income status” with some of their parents earning less than R1, 600 per month (Letseka & Maile, 2008). This makes it practically impossible for an average South African student to access university education. This

| University | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|------------|------|------|------|------|------|------|------|
| UNISA      | 80   | 87   | 85   | 83   | 87   | 82   | 78   |
| UNIZULU    | 31   | 32   | 36   | 38   | 38   | 40   | 36   |
| MAN        | 42   | 46   | 43   | 44   | 39   | 40   | 36   |
| UFH        | 24   | 25   | 27   | 29   | 30   | 31   | 28   |
| DUT        | 28   | 27   | 30   | 31   | 29   | 28   | 30   |
| TUT        | 36   | 34   | 35   | 31   | 30   | 30   | 30   |
| UJ         | 14   | 18   | 19   | 20   | 19   | 19   | 29   |
| WSU        | 31   | 33   | 30   | 31   | 29   | 27   | 28   |
| NMMU       | 27   | 26   | 27   | 28   | 30   | 28   | 28   |
| VUT        | 31   | 33   | 37   | 36   | 34   | 30   | 27   |
| CUT        | 28   | 28   | 29   | 28   | 27   | 26   | 26   |
| UNIVE      | 39   | 36   | 34   | 29   | 24   | 23   | 26   |
| UWC        | 19   | 17   | 19   | 22   | 20   | 22   | 22   |
| NWU        | 36   | 30   | 26   | 29   | 29   | 22   | 22   |
| UKZN       | 17   | 17   | 19   | 20   | 19   | 19   | 21   |
| UFS        | 17   | 18   | 18   | 19   | 21   | 21   | 20   |
| UP         | 19   | 19   | 20   | 20   | 21   | 21   | 20   |
| ULP        | 18   | 15   | 15   | 18   | 20   | 20   | 20   |
| SUN        | 18   | 19   | 19   | 18   | 18   | 18   | 17   |
| RHODES     | 16   | 15   | 16   | 16   | 11   | 13   | 14   |
| UCT        | 15   | 15   | 16   | 15   | 13   | 13   | 12   |
| UWITS      | 10   | 11   | 11   | 11   | 10   | 11   | 11   |
| Average    | 25   | 26   | 27   | 27   | 27   | 26   | 27   |
| National target | 20 | 20 | 20 | 20 | 20 | 20 | 20 |

Source: Council on Higher Education and Training (Center for Higher Education Trust, 2016).
was evident in the series of student protests that engulfed campuses in South Africa. Improving the level of funds to universities (especially previously disadvantaged ones) will go a long way in increasing the success rate in South African higher institutions.

### 3.5. Less qualified staff

One of the major factors that influence students’ performance includes qualification of teachers (Omolar, 2008). Barber and Mourshed (2007) assert that the quality of an education system cannot exceed the quality of its teachers. The quality of teachers/lecturers is a major factor that shapes the learning and growth of students (Chong, 2009). Developing a highly educated workforce is a major priority for the goal of building a knowledge base economy in South Africa, to provide education and training to a larger number of citizens than in the past (Kruss*, 2004). Building a knowledge-based economy in South Africa hinges on the development of a highly educated and motivated workforce (teachers/instructors) which is the traditional role of universities.

High level of unqualified and under-qualified teachers in South African schools is a major constraint to the academic performance of learners. Teacher quality has been a major concern of the South African education system authorities, and the South African public at large, in ensuring quality education. Several changes have taken place in the South African education system since 1994. The changes were as a result of the segregated educational system along racial lines under the apartheid era. Despite governments’ effort to redress the imbalances of the apartheid system in the field of education, and teacher education, in particular, the quality of teachers and teaching in the historically disadvantaged communities are still an area of concern (Department of Education, 2005). For example, Table 3 shows only 41% of the permanent academic staff of public universities in RSA had doctoral qualification and only 34% of the permanent staff of the public universities had master’s qualification (Center for Higher Education Trust, 2016). This is not good enough for the growth of higher education sector and by implication the economy at large.

Hence, there is a need for quality teachers as they make a difference in learner achievement and improved graduation rate. In point of fact, there is a greater need for professionalizing the teaching at the universities; doctoral qualification is hence an important mechanism toward professionalization.

Despite significant improvement in the number of doctoral graduates, with an average of 26 doctorates per million of the country’s total population in 2013, South Africa still lags far behind countries like Portugal (569 PhDs per million), the United Kingdom (288 per million), Australia (264 per million), the United States of America (201 per million), Korea (187 per million), and Brazil (48 per million).

### 3.6. Poor reading and communication skills

According to Bharuthram (2012), there is a strong relationship between reading and educational outcome. Poor reading and communication (in the language of instruction) skills are major factors that negatively affect students’ academic performance in higher institutions (Howie, 2003). In the study of Laitin and Ramachandran (2016) for 11 African countries, including South Africa, it was revealed that the language of instruction (particularly English) is a significant factor that determines student performance. Improving the quality of schooling creates an enabling environment

| Table 3. Percentage of permanent academic staff of public universities by qualification |
|-----------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| PhD                                           | 29     | 33     | 34     | 35     | 36     | 37     | 39     | 41     |
| Masters                                      | 32     | 32     | 33     | 34     | 35     | 34     | 34     | 34     |
| Others                                       | 39     | 35     | 33     | 31     | 29     | 29     | 27     | 25     |

Source: Fisher and Scott (2011); Center for Higher Education Trust (2016).
for poor students to exit the vicious circle of poverty that has plagued the society. But according to Taylor (2006) many South African students perform significantly lower on cross-country assessment than many of their neighbours. Results from two international assessments, Progress in International Reading Literacy Study (PIRLS) 2011, reveals that South African students remain at rock bottom of the study rankings although there is a slight improvement from the 2006 study (Kelly et al., 2014). A good command of English language ensures success in academic (Masasi, 2012). However, many South African students are deficient when it comes to reading and communication in English. The English language is not their mother tongue and they find it difficult coping with other subjects as they are taught in English, this impact negatively on the students’ academic performance.

3.7. Poor mathematical skills
Students’ performance in key subjects, such as Mathematics is a good predictor of success in the university education (Bokana & Tewari, 2014). For example, a pass in Mathematics is a minimum requirement for many sciences, engineering and technology (SET), business and management (BM) programmes. However, access to and success in major SET and BM programmes are severely limited by poor student performance in Mathematics and Mathematics-based subjects (Fisher & Scott, 2011). In the National School Certificate (NSC) examination of 2010, Mathematics had the lowest pass rate of 47.4%—this problem was further compounded with a large proportion of passes below 40% (Fisher & Scott, 2011). The result of the Trends in International Mathematics and Science Study (TIMSS) in 2011 also revealed the low level of South African students’ performance (Kelly et al., 2014). This deficiency in mathematical skills is a major factor that negatively affects students’ academic performance in higher institutions (Howie, 2003).

4. Current effort to salvage the situation
Since the advent of democratic rule, the issue of access and success has gained adequate attention in terms of policy formulation starting with the 1997 White Paper on Higher Education Transformation through the Green Paper for Post-school Education and Training as well as the National Development Plan (NDP) among others. According to the 1997 White Paper, “The principle of equity requires fair opportunities both to enter higher education programs and to succeed in them” (Department of Education (DoE), 1997, p. 11). The White paper is not just aimed at ensuring equity access, but also to ensure quality learning outcomes. High-quality learning must be deep, meaningful, transformative and metacognitive in term, ensuring that learning is achieved (Åhlberg et al., 2005; Teise & le Roux, 2016). It also includes mastery of content, understanding concepts and developing strategies for exploring new ideas (Killen, 2012). It is unacceptable for graduates in general and those from previously disadvantaged communities in particular, to be short-changed in terms of the quality of program provision as it would not only impact on their ability to improve their own life chances, but it would also adversely impact on the broader agenda for social and economic development. According to UNESCO (2002), regardless of gender, wealth, location, language or ethnic origin, quality education requires the following:

- healthy, well-nourished and motivated students;
- well-trained teachers and active learning techniques;
- adequate facilities and learning materials;
- a relevant curriculum that can be taught and learned in a local language and builds upon the knowledge and experience of teachers and learners;
- respect for and engagement with local communities and cultures.
- clear definition and accurate assessment of learning outcomes, including knowledge, skills, attitudes and values;
- participatory governance and management; and
- an environment that not only encourages learning but is welcoming, healthy, safe and gender sensitive.
In order to achieve the twin goals of access and success and also in line with the National Plan for Higher Education (NPHE), current strategies are geared towards funding institutional Academic Development programmes, improving the quality of schooling as well as providing several financial aid schemes (Akoojee & Nkomo, 2007). The major focus of the Academic development programmes is to improve the efficiency of higher education system in terms of the number and quality of graduate output (Department of Higher Education and Training, (DHET), 2012). This goal is being pursued through various mentorship programs for students as well as training workshops for staffs.

Due to increased social pressure, the national government is faced with a challenge on how to improve educational quality and as well increase graduate output with relatively limited or inadequate financial resources (Teferra, 2015). High-quality education requires expertise, expensive equipment and infrastructure coupled with other logistics (Teferra, 2015). Education authorities are therefore optimising various financial support channels such as national Research Funds (NRF), National Student Financial Aids Schemes (NSFAS), Teaching Development Grant (TDG) e.t.c. and other donor agencies both at the national and international spheres. Other strategies aimed at achieving the twin goals of access and success include but not limited to early risk profiling for all first-year students, tracking and monitoring of students’ academic progress, mentorship and tutorship programmes, academic staff development as well as the optimal application of e-learning and support platforms.

5. Achieving quality educational output: knowledge option

5.1. The growth model

It must be noted that the efficiency of higher education is directly linked to quality measures (Council on Higher Education (CHE), 2000, p. 21). The quality is a product of a number of variables; the more important being is the size and quality of academic staff in the universities and the staff–student ratios. According to Spaull (2013), economic and social development is not possible without increased access and improvement in the quality of education. The ability to grow the economy by increasing knowledge rather than labour or capital creates opportunities for limitless growth (Cortright, 2001; Organisation for Economic Co-operation and Development (OECD), 2008). The main aim of teaching is to develop a deep understanding of important knowledge which is able to create opportunities for growth and development of the economy. According to the “new growth theory”, output/productivity growth is as a result/cause by the accumulation of human capital such as knowledge, skills and training as well as technological innovation. While labour and capital are subject to diminishing returns, knowledge is not. Knowledge generates increasing returns and drive economic growth. This is illustrated using a simple growth model given below.

\[ Q = f(l, c, k) \]

where \( Q \) is the output (quality graduate),

- \( I \) is the labour (man power),
- \( C \) is the capital and
- \( K \) is the knowledge and innovation.

In order to improve the quality of graduate who possess sound knowledge and skills that are relevant to meet the developmental nation’s needs and as well to raise a new generation of academics and researcher, stakeholders must make efforts to engage of skilled personnel who will be able to train other people irrespective of their race, color or nationality.

5.2. Methodology and data

To achieve this objective, a variant of the above model is formulated with labour, knowledge and innovation being merged together and using the percentage of PhD lecturer as a proxy to measure the quality of staff. Output was measured by students’ success rate. Students’ success rate was used...
because it is broader than the graduation rate. It is seen as a better measure of quality output because it includes student retention rate, graduation rate, holistic development and their employability. These student success statistics reflect the quality of student learning and intellectual development (Voigt & Hundrieser, 2008). Capital was proxied by education expenditure, that is, the resources spent on education, while the student–staff ratio is added to measure the impact of large classes on the quality of graduates in South African higher education institutions using the ordinary least square estimation tool for the analysis. For other factors identified, there are no readily available data for them and probable in further study, proxies would be identified to represent them. The theoretical functional form of the educational output function is as follows:

\[ SUCRT = f(LWPHD, PUEXP, STSFR) \]

where \( SUCRT \) is the output (Quality graduate proxied by success rate),

- \( LWPHD \) is the human resources (lecturers with PhD),
- \( PUEXP \) is the capital (Education expenditure) and
- \( STSFR \) is the student–staff ratio.

Total public spending on education (PUEXP) as a percentage of total government spending was used as a proxy for education expenditure and obtained from World Bank development indicator (WDI, 2015). Data on student–staff ratio (STSFR), the percentage of lecturer with a PhD (LWPHD), weighted research output (WROUT) and success rate (SUCRT) were obtained from Center for Higher Education Transformation (Center for Higher Education Trust, 2016). Due to data limitation, the period covered in this study is from 2000 to 2014.

5.3. Empirical analysis

Empirical analysis of the study and discussion is presented in this section.

5.3.1. Impact of quality input on student success

The multiple OLS regression model which was estimated to show the impact of quality input (LWPHD, PUEXP, STSFR) student success rate (Quality output) is given below.

\[ SUCRT_i = \alpha + \beta LWPHD_i + \delta PUEXP_i + \gamma STSFR_i + \epsilon_i \]

where \( \beta, \delta \) and \( \gamma \) are the parameter coefficients while \( \epsilon \) is the error term. All data are in percentage. The results are presented in Table 4.

Regression results are presented in Table 4. The correlation coefficient is represented by the \( R \) value, which is 0.956. This indicates that there is a high degree of correlation between the dependent variable (SUCRT) and independent variables (PUEXP, LWPHD and STSFR). The adjusted \( R^2 \) value indicates the percentage of the total variation in the dependent variable (SUCRT) that can be explained by the independent variables (PUEXP, LWPHD and STSFR). In this case, 91.3% can be explained, which is very large. This indicates that the success rate of students in South African higher institutions to a very large extent depends on the quality of inputs such as staff.

### Table 4. Impact of quality input on student success

| Variables | Coefficient (t) | R       | R²      | F     |
|-----------|----------------|---------|---------|-------|
| Constant  | 38.176(3.230)**| 0.956   | 0.913   | 38.593|
| LWPHD     | 0.381 (7.501)**|         |         |       |
| STSFR     | 0.699 (3.339)**|         |         |       |
| PUEXP     | 0.381 (0.964)  |         |         |       |

Dependent Variable: SUCRT; Predictors: (Constant), PUEXP, LWPHD, STSFR. T statistics in (); ** means significant at the 5% level of significance.
Table 4 also shows the analysis of variance (ANOVA, “F”) results. The F statistics report how well the regression equation predicts the dependent variable. The test statistic is the F value of 38.59. Using an α of 0.05, we have $F_{0.05;3,11} = 3.59$. Since the test statistic is much larger than the critical value (that is $38.50 > 3.59$), we reject the null hypothesis of equal population means and conclude that there is (statistically) significant difference in the population means. Also, the p-value for 38.59 is 0.000, so the test statistic is significant at that level, which means that the null hypothesis that quality inputs (PUEXP, LWPHD, STSFR) do not predict students’ success is rejected. This study, therefore, concludes that student success depends to a large extent on the quality of input.

Furthermore, the result as presented in Table 4 revealed that the coefficient of LWPHD (0.38) is positive and statistically significant at the 5% level of significance. This implies that a unit increase in the quality of staff will lead to a 0.4 unit rise in the success rate of students. The t-statistic and p-value are also significant at the 5% level of significance, thereby, supporting the fact that the quality of academic staff is a significant predictor of student success. The result further shows that there is a positive relationship between education expenditure (PUEXP) and success rate. This implies that a unit increase in PUEXP will lead to a 0.4 unit increase in student success. However, it is not statistically significant at the 5% level of significance.

The student–staff ratio also exhibited a positive and significant relationship with a success rate (SUCRT). This is basically against theoretical expectation as high student–staff ratio tends to lower students’ success. However, it may be said that the result reflects the current state of things in the South African higher education system. The average student–staff ratio in the South African higher institution has been between 25 and 27 (Table 2) although it does not reflect what really happens in the various institutions as well as across different faculties.

### 5.3.2. Impact of quality staff on research output

To test for the impact of quality input on research output, the quality of staff (lecturer with PhD) was regressed on the weighted research output and the result is presented in Table 5.

$$WROUT_i = \alpha + \gamma LWPHD_i + \epsilon_i$$

where $WROUT_i$ is the weighted research output, $LWPHD$ represents the percentage of lecturers with a minimum of PhD qualification, $\gamma$ is the parameter coefficient to be estimated and $\epsilon$ is the error term.

The estimation results are presented in Table 5. The correlation coefficient is represented by the $R$ value, which is 0.956. This indicates that there is a high degree of correlation between the dependent variable research output (WROUT) and independent variable (LWPHD). This is in line with the assertion of Manamela² (2018) who opined that there is a positive correlation between research output of universities and the percentage of academics that hold a doctoral degree. The adjusted $R^2$ value indicates the percentage of the total variation in the dependent variable (WROUT) that can be explained by the independent variables (LWPHD). In this case, 94.1% can be explained, which is very large. This indicates that the number and quality of research output in South African higher institutions to a very large extent depend on the quality of inputs such as staff with a minimum qualification of PhD.

| Table 5. Impact of quality staff on research output |
|-----------------------------------------|--------|--------|--------|--------|
| Variables           | Coefficient (t) | $R$   | $R^2$  | $F$    |
| Constant            | −0.839(−6.801)** | 0.970 | 0.941  | 207.926|
| LWPHD               | 0.056 (14.420)** |       |        |        |

Dependent Variable: WROUT; Predictors: (Constant), LWPHD. T statistics in (); ** means significant at the 5% level of significance.
Table 5 also shows the analysis of variance (ANOVA, “F”) results. The F statistics report how well the regression equation predicts the dependent variable. The test statistic is the F value of 207.93. Using an α of 0.05, we have $F_{0.05;1,13} = 4.67$. Since the test statistic is much larger than the critical value (that is $38.50 > 3.59$), we reject the null hypothesis of equal population means and conclude that there is a (statistically) significant difference in the population means. Also, the p-value for 207.93 is 0.000, so the test statistic is significant at that level, which means that the null hypothesis that quality inputs (LWPHD) do not predict research output is rejected. This study, therefore, concludes that research output depends to a large extent on the quality of input (academic staff with PhD).

The result, as presented in Table 5 further revealed that the coefficient of LWPHD (0.56) is positive and statistically significant at the 5% level of significance. This implies that a unit increase in the quality of staff will lead to a 0.06 unit rise in the research output. The t-statistic and p-value are also significant at the 5% level of significance, thereby, supporting the fact that the quality of academic staff is a significant predictor of research output. It is, therefore, imperative for policymakers to make concerted effort to improve the quality of academic staffs by increasing the percentage of academics with a doctoral degree.

6. Conclusions

In a bid to ensure that many of the previously disadvantaged groups get access to education, the quality of input is being sacrificed for quantity thereby creating an “articulation gap”. Students’ under-preparedness is another major constraint to success rate, which often leads to a large number of students dropping out while others take a longer period to complete their degree. Recurrent concerns in the higher education sector have been training students for the emerging economy, maintain access to and quality of higher education, achieve a better outcome and also to reduce the number of students dropping out of school. This study argues that teaching remains elusive, or cannot, be said to be complete or effective if it is not reflected in the rate and quality of graduate produced.

Empirical analysis revealed that student success depends to a large extent on the quality of input. For example, a unit increase in academic staff with a minimum qualification of PhD will lead to an increase in the students’ success rate by 0.4% ditto education expenditure. It was also evident from the study that the quantity and quality of research output significantly depend on the quality of academic staff as a unit increase in academic staff with a minimum qualification of PhD tends to increase research output by 0.06%.

Therefore, for higher education to achieve its main goal of turning out quality graduate and as well meeting the socioeconomic, political and cultural goals, a revised curricular which will ensure that all students take compulsory English modules is suggested. Various quality-enhancing investments in facilities and teacher upgrading are proposed. In point of fact, there is a greater need for professionalizing the teaching at the universities; the doctoral qualification is hence an important mechanism toward professionalization. More qualified and experienced lecturers need to be employed irrespective of their race, gender or nationality alongside increased funding for public universities to continually support teaching and learning as well as quality schooling. Also, a public–private partnership with multinational companies and corporate organization is important not just to provide grants to students and researchers, but to build infrastructure which will create the required enabling environment for quality teaching and learning activities. Universities are also encouraged to set entry qualifying exams for first-year learners in order to be sure of their abilities. Other performance measurement techniques should be employed to identify students within the lower performance group with high hidden potential due to lack of quality schooling and enabling environment for optimal performance. The challenge of students’ under-preparedness can be effectively addressed through improved collaboration by all stakeholders in the education industry.
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Notes
1. This entails the quality of programmes, skills that have been acquired by the students which determine their employability as well as personal growth.
2. Deputy Minister of the South African higher education and training.

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