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Impact of Replacing Supplementary Examinations with Second Opportunity Examinations in a South African University of Technology

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Abstract
Examinations are used to promote students. Promotions are in terms of moving to higher-level studies or graduations. Students who failed the main examinations were given a second chance. At this South African University of Technology (UoT), two types of second chance were given. From the beginning of the institution to 2009, the second chance examination used was called Supplementary Examination. Supplementary Examination (SE) was the examination written by students who obtained 45% to 49% in their main examination. From 2010 onwards, the institution decided to replace the SE with unconditional rewrite examination (URE). The URE-era students were granted unrestricted permission to write a second examination, even if they got zero in the main examination. The rationale was that their performance would improve. In this investigation, the main - examination marks of SE-era students were compared with those of URE-era students. What prompted the study was the question: "How does provision of second chance impact on the student's preparation of the main examination"? Does the stricter second chance conditions impact positively or negatively on the student's preparation for the main examination? The research design was quantitative. The sample used was the main examination results of 2009, the last SE year, and those of 2011, the URE second year. Data analysis indicated that the means (averages) of SE-era students were generally higher than those of URE-era students. With all things being the same, the conclusion is that if students know that they have an unrestricted chance to rewrite, they prepare less for the main examination.

Keywords: supplementary examinations, second opportunity examinations, University of Technology.

Introduction

In a certain South African University of Technology (UoT), second-chance examinations were a norm for students who failed the main examination.

Supplementary examinations (SEs) were written until 2009, then replaced by Unrestricted Rewrite Examinations (UREs) from 2010 at this UoT. There were no preconditions for UREs for students who failed their main examination. Even if you obtain 0% in the main examination, you qualified for the URE. On the other hand, the qualification for SE was a 45% - 49% mark in the main examination. There was a general feeling at this institution that to deprive a student of a right to try again if the student obtained less than 45% in the main examination amounted to limiting the potential number of students who could otherwise succeed in the URE.

The rationale was that a student could fail main examination horribly and still pass the URE. The arguments for or against the rationale centred on issues like stress management, time pressure and math anxiety associated with writing examinations. Those arguing in favour of URE mentioned issues like favourable time of writing the re-write, mentioning that the main examination was written at the time students were expected to write other subjects, while the URE was written after the completion of the normal examination period, allowing ample preparation time for the re-write. Allowing only the students who obtained 45% - 49% in the main examination to rewrite the examination, they argued, would be a disservice to those obtaining less than 45% as they could be deprived of benefitting from the favourable time of re-writing the examination. They also mentioned that there may be personal reasons for which a student could fail the main examination that may have dissipated by the time of the re-write.

Those arguing that 'failing the main examination implies potential to fail the URE pointed to issues like assistance – consulting lecturers – which was provided for before writing the main examination, but which could not be possible between the main examination and the re-write, as most lecturers mark the main examination at the time the students who feel they did not perform well start preparing for the re-write. The crux of their argument is that if students fail when helped, how can they succeed when help prospects are limited?

Research Questions

The focus of this paper is two-fold. Firstly, on how the provision of the URE influenced the student's effort in preparing for the main examination, as compared to the provision of SE. Would it not be a stress relief for the student to prepare for the URE, which comes later, instead of worrying about the burden of passing the main examination at the time of examination time-table congestion? Specifically, if a student knows that another unconditional opportunity will be available in case of failing the main examination, will this knowledge not impact on the student's desperation to succeed in the main examination? In other words, will the availability of the URE not be a distraction on the student's preparation for the main examination? If, for instance, a student does seven courses, and the student knows that access to re-write mathematics is unrestricted, will this not tempt the student to prepare for examinations of other courses at the expense of the mathematics main examination? If so, what will be the impact of lay-off (albeit short) from mathematics?

If, on the other hand, a student is aware that he/she would need to pass the main examination by at least 45% to qualify for the SE, would such a student not, as a preventative measure against the anxiety of the potential failure to meet this minimum requirement, be motivated to exert more pressure in preparing for the main examination?

The second focus of this paper is on whether URE will result in better overall performance as opposed to SE. If student main – examination preparation effort is influenced by the unconditional provision of the re-write, then the number of students succeeding at first attempt (in the main examination) may drop as opposed to when the provision was not available. The number of students succeeding in the unconditional re-write may be such that the overall pass rate may be less than, the same as, or even more than when the unconditional re-write was not provided. In other words, the provision of unconditional re-write may or may not impact on the overall pass rate. This rests on performance in the re-write.

The paper compares performance of two categories of students in the main examination, the SE-era students and the URE-era students. The research questions are described below. How do provisions URE and SE impact on preparation for the main examination? The following are the associated sub-questions:

a) How does the main examination performance of URE students compare to the main examination performance of the SE students?
b) How does performance in URE impact on overall performance as compared to performance in SE? This question translates into the following sub-question: What was the overall pass rate for URE students and how does it compare to the overall pass rate of the SE students?

Before answering these questions, we look at the literature survey that may have a bearing on the research questions.

Literature Survey

In the literature survey, focus will be on mathematics teaching and learning issues that may impact on the student's success in his/her summative assessment. One of issues being considered is student belief about their ability to learn.

Student belief about their ability to learn.

Belief about a student's ability to learn has the potential to impact on the student's grasp of mathematical ideas. According to Masters (2011), students believe differently about how they learn. Some view the ability to learn as 'fixed', something they cannot do anything about. Those who believe their fixed ability to learn is 'low' subscribe to a belief that no amount of effort in their studies will make difference in their performance. Those who believe their fixed ability is 'high' tend, out of complacency, to underestimate the importance of effort in their studies.

If students are aware of unconditional provision of re-write opportunities, their belief about their abilities to learn may influence their reaction. Those who view ability as fixed may not see the difference between preparing for main examination and

preparing for the unconditional re-write. They may focus on preparing for the main examination, or they may be vulnerable to possible examination time-table congestion associated with writing the main examination. In the latter case they may attend the main examination unprepared, with the knowledge that their lack of effort in preparing for the main examination will be compensated by their full focus on preparing for the unconditional re-write. In that case their knowledge about provision of unconditional re-write opportunities will cause the students not to prepare for the main examination.

On the other hand, students who are aware of supplementary re-write opportunities, may, out fear of possible failure of not meeting the minimum 45% in the main examination, be motivated to prepare suitably for the main examination as a preventative measure. In that case the provision of supplementary re-write opportunities will ensure better preparation for the main examination.

The 'low fixed' ability students, on the other hand, may, because of lack of confidence as a result of believing in their low ability to learn, prepare misgiving for the main examination and, if not successful, second – opportunity examinations (irrespective of whether it is the unconditional re-write or supplementary re-write). For them, the provision of the second opportunity will provide some hope in case of failure in the main examination.

Institutions of learning should vigilantly ensure that their educational practices do not institutionalise or communicate 'low-ability' expectations by over-emphasising excellence as a scarce resource – that excellence is meant only for a few. This can act as a source of discouragement for those who consider themselves not to be excellent.
Students with high-ability expectations may also not be influenced by the rewrite provisions by focusing on the main examination. They are unlikely to consider the re-write as their mindset is already geared towards succeeding in the main examination. When they are surprised by their failure of main examination as a result of their complacent preparation for the examination, they may then prepare for the re-write. In this case the re-write provision may not impact on their preparation for the main examination.
The other factors that may impact on the re-write as an influential factor in main-examination preparation effort are barriers to effective time management. We now describe these issues.

Barriers to Effective Time Management
Time management issues do have a bearing on how provision of unconditional versus supplementary re-write conditions can impact on student preparation for the main examination. Strang (2015) conducted a survey about barriers to effective time management among college students. Among others, Strang (2015) found procrastination, distractions by friends, poor planning to be some of the barriers. Procrastination, and poor planning can distract students from full preparedness for the main examination and consequently push students to target second – opportunity

examination. In addition, they can cause stress, time pressure and anxiety in their preparation for the examination. We now focus on these factors.

Stress, time pressure, anxiety and strategic behaviour

Success in mathematical tasks can be negatively impacted by stress (Ashcraft and Kirk, 2001; Maloney and Beilock, 2012; Vukovic et al., 2013). This investigation recognises that there is time pressure associated with solving the mathematical tasks. If the frequency of solving the tasks is minimal, a problem of competency backlog can result (less practice, less competence). If the tasks are done within the framework of a confined time, like during an examination, it can impact on the student's preparedness for the examination, forcing the student to go for a re-write. The student can opt for unrestricted re-write as a way of reducing the stress level associated with solving the mathematical tasks in the main examination.

Strategic behaviour (i.e. choosing your best of available options) is utilised widely in problem solving domains, including education (Olthof et al., 2011). Strategic behaviour can relate to choosing a certain strategy to solve a mathematical task. This paper argues that strategic choice can ultimately impact on the timing of preparedness of the learner for summative assessment.

Research in mathematical domain indicates mathematics as built on a number of cognitive abilities (Passolunghi et al., 2008; Krajewski and Schneider, 2009; Geary, 2011). Extended neural network of the brain implements the cognitive abilities (Goswami and Szűcs, 2011; Fias et al., 2013; Szűcs et al., 2014). This investigation contends that the flexibility and adaptability of the strategic behaviour may be time-dependent – time having the potential to impact on the building of these mathematical cognitive abilities and their associated testing.

Different factors can impact on the switching between, adaptative selection and application of most efficient mathematical strategies. Some of these relate to personal features of the solver like mathematical expertise, attitudes and emotions toward math (Baroody and Dowker, 2003) and domain-general aspects, i.e., broader cognitive and emotional factors (Devine et al., 2012; Mammarella et al., 2015). Attitudes and/or emotions towards math, broader cognitive and emotional factors could generate pressure that can impact on the student's preparedness to be assessed summatively.

Working memory (WM) is a process, embedded among cognitive factors, that is strongly associated with successful solution of mathematical tasks (WM; for review see Raghubar et al., 2010; Bull and Lee, 2014; see also Passolunghi et al., 2008; Friso-Van Den Bos et al., 2013; Szűcs, 2016). WM has been found to predict explanations of mathematics outcomes. The number of studies investigating this predictive role has increased in recent years (Bull et al., 2008; Li and Geary, 2013; Caviola et al., 2017; Cragg and Gilmore, 2014; Szűcs et al., 2014). Inevitably, WM influences mathematics achievement differently: it helps to track relevant information (e.g., by storing and retrieving partial results) during problem-solving, as well as involvement in successfully selecting and implementing procedures (Barrouillet and Lépine, 2005;

Swanson, 2006; Wu et al., 2008). It is the contention of this paper that the keeping track of relevant information, and the successful selection and implementation of procedures are influenced by the student's confidence (or lack of it) emanating from frequency of the mathematical problem-solving activities. Ultimately the confidence impacts on the readiness or otherwise of the students to be assessed.

What this investigation further accepts is that performance in mathematics tasks is affected by psychological, social, personal and environmental factors. This also specifically applies to performance in university examinations (Rasul, Saima & Bukhsh, Qadir, 2011). Rasul, Bukhsh's (2011) study was designed to measure the factors affecting student's performance in examination at university level. It was found that psychological, physical, socio-economic and educational factors and lack of proper guidance affected performance in examination.

The paper contends that the above factors not only affect performance in the examination, but also that they may also impact on the readiness or otherwise of the students to be assessed. As mentioned earlier, students who target re-write because of not having adequately prepared for the main examination will forfeit the right to proper guidance as a result of unavailability of lecturers for consultations.

Kochhar (2000) says proper guidance is necessary to help students with problems like lack of correlation between talent and achievement, faulty study practice, and imperfect methods of learning. Studies have been done to establish how peer influence impacted on student performance. Gonzales et. al., (1996); Goethals, (2001); Hanushek et. al, (2002) found that peer influence was more impactful than family. This paper contends that negative peer influence may cause delay in student progress of solving mathematical tasks. On the other hand, Giuliodori, Lujan and DiCarlo (2006) found that peer interactions might increase student skills on solving qualitative problems.

Abdulkadir (2018) investigated factors affecting student academic performance. He found that learning techniques correlated positively with student academic performance ($r = 0.964$, $p > 0.01$), that home-related issues impacted on academic performance ($r = 0.79$, $p > 0.01$), that study habits impacted on performance ($r = 0.819$, $p > 0.01$), and that availability of physical resources correlated positively with academic performance ($r = 0.819$, $p > 0.01$).

Summarising the above, it is evident that learning technique, home related aspects, study habits and physical resource have positive relationship with academic performance. Similarly, students with good academic performance have better learning techniques, home related aspects, study habits and physical resource. This paper argues that it requires dedicated students to learn the different techniques and to develop the good study habits. Such students are most likely to be ready at the earliest time of summative assessment as opposed to those with less dedication.
Research has shown that class attendance can improve a student's performance. A study conducted by Collett et al., 2007; Stanca, 2006; Chow, 2003, conducted studies

that showed that attendance had small, but statistically significant, effect on student performance.

Marburger (2001) concluded that missing classes contributed significantly to incorrect response to questions covering the material done during the absenteeism. Moore (2006) indicated that on average, better-attending students achieved highest grades. On the other hand, Martins and Walker (2006) did not find class attendance to have any impact on performance. Park and Kerr (1990), and Schmidt (1993) supported this view. Jennjou Chen (2006), in his study "Class attendance and exam performance: A randomised experiment", found a positive correlation between the two, concluding that on average, attending lecture corresponds to a 7.66% improvement in exam performance.

Most universities have adopted a policy of barring the student from examination when the percentage of the attendance is less than 80%. At this UoT there were expectations that students could not obtain their Diploma qualifications without first having completed their work experience. Since the unit at the UoT dealing with placement of the students in different companies could not place all the students, some of the students kept on trying to look for placements by themselves when they were supposed to be focusing on their studies. They would attend interviews, sometimes succeeding in obtaining the work experience opportunity. This means losing a lot of class time. Some of the companies were too far from the institution for normal classes to be attended. This obviously impacted on the students' readiness to be assessed, and consequently on their choice of assessment.

The research questions this paper is trying to address focus on the impact of the re-writes on students' performance in main examination, as well as their impacts on the overall performance. These factors cannot be dissociated from how teaching and learning are done at this UoT. If, because of teaching style, the students consistently do not understand the lecturer, their level of readiness for the summative assessment will be different from if they consistently understood the lecturer. That is why the teaching philosophy of the institutions becomes an important factor in addressing the research questions. The teaching philosophy of the UoT under discussion is the one underpinned by the principle that knowledge cannot be passively transmitted from lecturer to the student, that the students need to be given an opportunity to actively construct their knowledge subject to socially accepted norms. A socio-constructivist approach to teaching and learning was adopted at this UoT. However, there are obstacles to the successful implementation of the approach. There is no provision for seating arrangements that can facilitate the formation of group work. Lecture rooms are characterised by non-removable chairs in fixed rows. Class sizes are quite big – averaging about 60 students per class. As a result, lecture method is used, though each lecturer is aware of the university teaching philosophy.

The UoT changed from SE to URE. It was hoped that this measure would result in improved overall performance. If it can be shown that replacing supplementary re-writes with unconditional re-writes resulted in improved overall performance in

mathematics, then the investigation will have confirmed that the replacement was a good move. If the replacement resulted in deterioration of overall performance, then it was a bad move. The significance of this study is mostly in establishing the impact of this replacement.

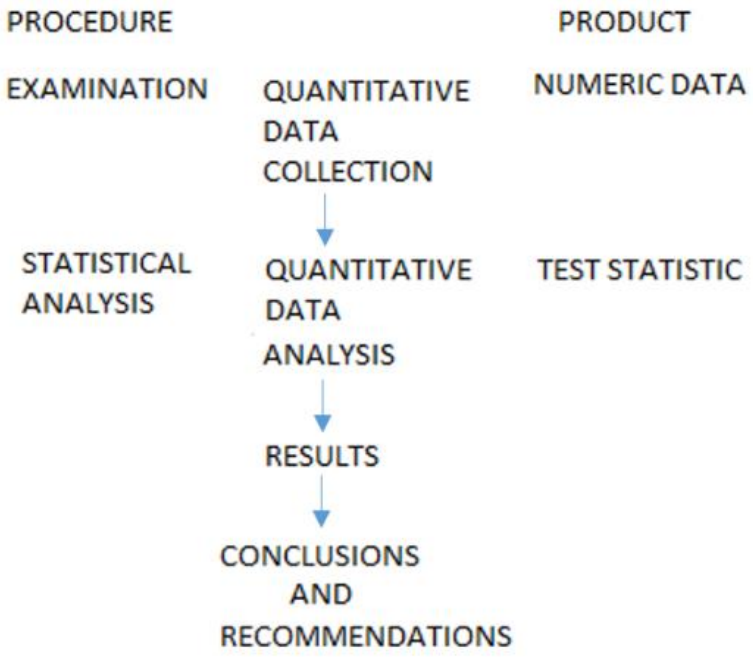
Method

Participants

The sample was a purposeful sample. The examination results of 2009, the last year of using the SE, were used and compared with those of 2011, the second year of using URE. Because the 2009 supplementary examinations were written in 2010, the author felt it better to use 2009 and 2011 results instead of 2009 and 2010 ones, for comparison purpose.

Design

The research design was quantitative. The following picture gives a summary of the design.



What the above picture briefly shows is that quantitative data (examination results) were analysed and their means (test statistics) compared. Conclusions and recommendations were then drawn from the comparison.

Material and Procedure

Data consisted of marks of both groups in the main examination. The main examination marks were targeted by this paper because of their relative objectivity as assessment tools, as compared to the composite main examination mark, since the latter has a subjective element of lecturer-influenced year mark (class tests are set by the class lecturers). Reliability is the degree to which an assessment tool produces stable and consistent results. Reliability is consistency across time (test-retest reliability), across items (internal consistency) and across researchers (inter-rater

reliability). A ruler is always reliable, as the results of ruler measurement could be replicated time after time.

Validity implies the extent to which the research instrument measures what it is intended to measure. If the results of the personality test show a shy person to be outgoing, then it is not valid. Validity is all about genuineness of the research, whereas reliability is nothing but repeatability of outcomes. A valid instrument is always reliable, but a reliable instrument is not necessarily valid. For instance, a weight-scale whose readings start at 5kg instead of 0kg may be reliable in measuring items (in the sense that measurement will be replicated for the measured item), but not valid (in the sense that weight of items will be 5kg less than the readings on the scale).

We now describe the main examination mark as an assessment tool within the framework of the above-mentioned concepts of reliability and validity. The following steps were taken to ensure the reliability and validity of the main examination, supplementary and unconditional re-writes:

a) A study guide given to each student at the beginning of the term specifies not only the topics that will be covered during the term but also clearly defined goals and objectives of each topic to be covered. Lecturers are guided by the goals and objectives when teaching.

b) Assessment of each topic is informed by the goals and objectives specified in the learner guide.

c) The main examination, supplementary or unconditional re-write are set by the examiner, and then moderated either internally (mathematics 1 and 2) or externally (mathematics 3). The purposes of moderation are to ensure adherence to goals and objectives specified in the guide, adherence to the syllabus and consistent marking.

d) The main examination is written by all students. Scripts are distributed among different lecturers for marking (numerous lecturers at this institution teach the same level mathematics, for instance, 8 lecturers may teach Mathematics 1, 10 lecturers may teach Mathematics 2 etc.), resulting in a lecturer not necessarily marking the scripts of his/her students. Student numbers rather than names are written on examination scripts, making it difficult for the marker to know whose script it is. The statistic used in the data analysis was the mean

Results

The UoT under consideration followed a semester system. By Mathematics 1 we refer to the content of mathematics that was done in one semester. Similarly for Mathematics 2 and 3. Two categories of results were compared. The first category was SE-era main examination results versus URE-era main examination results. The second category was overall SE-era pass rate versus overall URE pass rate.

Descriptive statistics
Main examination results Mathematics 1: 1st Semester 2009 versus 1st Semester 2011

Table 1 – Mathematics 1 2009-01 versus 2011-01

	2009-01 Mathematics 1 SE	2011-01 Mathematics 1 URE
Mean	46.125	43.3002681
Variance	314.7097031	270.7966935
Observations	944	373
Hypothesized Mean Difference	0	
df	731	
t Stat	2.744430828	
P(T<=t) one-tail	0.003105156	
t Critical one-tail	1.646940787	
P(T<=t) two-tail	0.006210312	
t Critical two-tail	1.963214514	

The results show a slightly better main-examination performance (mean 46.125) of the supplementary group as opposed to that of the unconditional re-write group (mean 43.3). The difference is of statistical significance ($p = 0.0062 < 0.05$). This is supported by the percentage of students who got at least 50% in the main examination as the following table shows:

Table 2 – 2009-01 SE vs 2011-01 URE results (Mathematics 1)

Class limits	2009-01 Mathematics 1 SE Main Examination Frequency	2011-01 Mathematics 1 URE Main Examination Frequency
0-9	0	0
10-19	57	24
20-29	118	51
30-39	147	69
40-49	252	104
50-59	170	72
60-69	104	28
70-79	53	13
80-89	34	10
90-99	9	2
Total	944	373
Number of passes	370	125
Pass %	39.2	33.5

The frequency table shows that 39.2% of supplementary group got 50% or more in the main examination as opposed to 33.5% of unrestricted group.

Main Examination Results Mathematics 2: 2009-02 SE versus 2011-02 URE

Table 3 – Mathematics 2 2nd Semester: 2009 SE versus 2nd Semester 2011 URE results

	2009-02 Mathematics 2 SE	2011-02 Mathematics 2 URE
Mean	51.2034632	46.5621118
Variance	208.4183828	255.4347053
Observations	462	644
Hypothesized Mean Difference	0	
df	1047	
t Stat	5.040899579	
P(T<=t) one-tail	2.72836E-07	
t Critical one-tail	1.64631029	
P(T<=t) two-tail	5.45672E-07	
t Critical two-tail	1.962232341	

The table shows a substantial difference in the means of the Supplementary group and Unconditional Group – 51.2 for the former and 46.56 for the latter. The difference is statistically significant ($p = 5.4567 \times 10^{-7} < 0.05$).

The following table shows the mark distribution:

Table 4 – Mathematics 2 marks distribution

Class limits	2009-02 Mathematics 2 SE	2011-02 Mathematics 2 URE
0-9	0	0
10-19	6	30
20-29	16	58
30-39	64	109
40-49	142	191
50-59	109	133
60-69	75	79
70-79	36	23
80-89	10	17
90-99	4	2
More	0	2
Total	462	644
Number of passes	234	256
Pass %	50.65	39.75

Main Examination Results Mathematics 3: 2009-02 SE versus 2011-02 URE

Table 5 – 2009-02 Mathematics 3: SE versus 2011-02 URE Main Exams results

	2009-02 Mathematics 3 SE	2011-02 Mathematics 3 URE
Mean	55.90497738	44.65615142
Variance	241.3136569	179.131394
Observations	221	317

Hypothesized Mean Difference	0	
df	427	
t Stat	8.73868146	
P(T<=t) one-tail	2.71556E-17	
t Critical one-tail	1.648429975	
P(T<=t) two-tail	5.43112E-17	
t Critical two-tail	1.965535168	

The table above shows a substantial difference in performance between the SE group (mean 55.9) and URE group (mean 44.66). The difference is statistically significant ($p = 5.43 \times 10^{-17} < 0.05$).

The following table summarises the mark distribution:

Table 6 – Mathematics 3 marks distribution

Class limits	**Frequency: 2009-02 Mathematics 3 SE**	**Frequency: 2011-02 Mathematics 3 URE**
0-9	0	0
10-19	1	6
20-29	5	39
30-39	28	68
40-49	45	97
50-59	55	63
60-69	47	32
70-79	23	9
80-89	11	3
90-99	5	0
100	1	
Total	221	317
Number of passes	142	107
Pass %	64.25	33.75

Once again, 64% from the supplementary group obtained 50 or above in the main examination as opposed to 33.75% from the unconditional re-write group.

Overall Results: SE versus URE

Above are the results of student performance in the main examination only. However, the final performance of the students was calculated as the average of the pre-main examination year mark and the main examination on a 50-50 basis. We call the 50-50 results 'overall results'. The focus here is how SE impacted on the overall performance of the students as opposed to the URE. Again, we look at different mathematics levels.

Overall: Mathematics 1: 2009-01 SE 1 versus 2011-01 URE 1 results

Here, the first-semester 2009 (2009-01) results are compared with first-semester 2011 (2011-01).

Table 7 – Overall results for Mathematics 1

	2009-01 Mathematics 1 overall SE	2011-01 Mathematics 1 overall URE
Mean	44.75216638	42.43686007
Variance	303.8812832	233.6207929
Observations	1154	586
Hypothesized Mean Difference	0	
df	1321	
t Stat	2.845638976	
P(T<=t) one-tail	0.002250343	
t Critical one-tail	1.646007938	
P(T<=t) two-tail	0.004500686	
t Critical two-tail	1.961761418	

The table shows a slightly better performance by the supplementary group (mean 44.75) as opposed to the unconditional re-write group (mean 42.44). The difference, although small, is of statistical significance ($p = 0.0045 < 0.05$). Table 8 below shows distribution of marks.

Table 8 – Mathematics 1 marks distribution

	2009-01 Mathematics 1 SE	2011-01 Mathematics1 URE
9	0	
0-9	74	33
10-19	154	79
20-29	211	123
30-39	296	175
40-49	204	111
50-59	115	35
60-69	57	18
70-79	34	10
80-89	9	2
90-99	0	0
100	1154	586
Number of passes	419	176
Pass %	36.31	30

Again, more from the supplementary group (36.3%) obtained 50% or higher, as compared to the unconditional re-write group (30%).

Overall: Mathematics 2: 2009-02 SE versus 2011-02 URE

Table 9 – Overall results for Mathematics 2

	2009-02 Mathematics 2 SE	2011-02 Mathematics 2 URE
Mean	51.2034632	46.5621118
Variance	208.4183828	255.4347053
Observations	462	644
Hypothesized Mean Difference	0	

df	1047	
t Stat	5.040899579	
P(T<=t) one-tail	2.72836E-07	
t Critical one-tail	1.64631029	
P(T<=t) two-tail	5.45672E-07	
t Critical two-tail	1.962232341	

The difference in the means of the supplementary group (51.2) and the unconditional Group (46.6) is of statistical significance ($p = 5.456 \times 10^{-7} < 0.05$). The break-down of the marks are indicated in Table 10 below.

Table 10 – Mathematics 2 marks distribution

	2009-02 Mathematics 2 SE	**2011-02 Mathematics 2 URE**
0-9	0	0
10-19	6	30
20-29	16	58
30-39	64	109
40-49	142	191
50-59	109	133
60-69	75	79
70-79	36	23
80-89	10	17
90-99	4	2
100	0	2
Total	462	644
No passed	234	256
Pass %	50.65	39.75

The mark break-down confirms that the supplementary group (50.65%) gave a better overall performance as opposed to the other group (39.75%).

Overall: Mathematics 3: 2009-02 SE versus 2011-02 URE

Table 11 – Overall results for Mathematics 3

	2009-02 SE overall	**2011-02 URE overall**
Mean	54.80334728	42.30582524
Variance	254.780493	179.3125694
Observations	239	412
Hypothesized Mean Difference	0	
df	430	
t Stat	10.19992864	
P(T<=t) one-tail	2.52732E-22	
t Critical one-tail	1.648404969	
P(T<=t) two-tail	5.05464E-22	
t Critical two-tail	1.965496192	

Once again, there is a substantial difference in performance between the SE-era group (mean 54.8) and the URE-era group (mean 42.3). The difference is of statistical significance ($p = 5.055 \times 10^{-22} < 0.05$). This is confirmed by the following mark distribution in Table 12:

Table 12 – Mathematics 3 marks distribution

	2009-02 Mathematics 3 SE	**2011-02 Mathematics 3 URE**
0-9	0	0
10-19	1	6
20-29	5	39
30-39	28	68
40-49	45	97
50-59	55	63
60-69	47	32
70-79	23	9
80-89	11	3
90-99	5	0
100	1	0
Total	221	317
Number of passes	142	107
Pass %	64.253	33.754

64.253% of the supplementary group obtained at least 50% while only 33.754% of the unrestricted group obtained the 50% and above.

All of the above results confirm that student performance in the main examination was better in the era of supplementary examinations as opposed to the era of unrestricted re-write examinations. They also show that overall student performance was better in the era of supplementary examinations as opposed to the era of unrestricted re-write examinations.

Conclusion

It is clear from the results that student performance was better when provision was made for SE than URE. The fact that, for Mathematics1 results, students were admitted to the UoT under similar conditions (same UoT admission pre-requisites), that there was no curriculum change in 2009 and 2011 for Mathematics 1 to Mathematics 3, that the same lecturers were teaching during the 2009-2011 period, means the conclusion about the better performance of the supplementary group is reasonably justified. Most of the South African grade 12 learners apply for admission to and are absorbed by traditional universities. The remaining come to UoTs upon not qualifying for the traditional university programmes. The understandable reason is that in South Africa traditional universities offer mainly degree programmes while UoTs mostly offer the lesser diploma programmes. This somehow brings credence to assumption that the UoT students are a relatively homogeneous cohort. This means that the first-year intake of 2009 was relatively like that of 2011. This somehow weakens the possible assumption of one UoT Mathematics 1 intake in a particular year as potentially being

better than the intake of the other year. The first-semester or second-semester comparison in this paper (2009-01 versus 2011-01 or 2009-02 versus 2011-02) was deliberate to avoid variables associated with comparing first-semester marks with those of second semester. One of those variables is that the first semester in a particular year is relatively longer than the second semester. With all these arguments in mind, one can with a certain measure of justification, attribute the difference in performance to whether supplementary or unconditional re-write is provided for. In other words, the up-front knowledge of provision of supplementary re-write versus unconditional re-write impacted on the student's preparation for the main examination. Furthermore, the provision of the supplementary re-write resulted in the improvement in the overall performance of the students in the examination. It is therefore recommended that the supplementary option be re-implemented.

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