

Makoya

Official Newsletter of Umalusi

September 2022

20 years of education
guardianship
Dr Mafu Rakometsi

Congratulations to Umalusi on
its 20th anniversary
Ms Angie Motshekga

Umalusi launches the “International
Benchmarking of the National Senior
Certificate (NSC)” report



UMALUSI



Quality Council for General and Further
Education and Training

CONTENTS

- 2 From the editor's pen - **Mr Biki Lepota**
- 3 20 years of education guardianship
Dr Mafu Rakometsi – CEO of Umalusi
- 5 Congratulations to Umalusi on its 20th anniversary
Ms Angie Motshekga – Minister of Basic Education
- 7 Umalusi launches the “International Benchmarking of the National Senior Certificate (NSC)” report
Mr Biki Lepota – Senior Manager: Statistical Information and Research
- 8 The alignment of qualifications on the General and Further Education and Training Qualifications Sub-framework
Ms Tsholofelo Madise – Assistant Researcher: Statistical Information and Research
- 10 Approaches deployed to ensure the validity of standardised examination marks
Mr Matome Sebola – Assistant Manager: Standardisation: Statistical Information and Research
- 12 Measures of central tendency: What are the mean, median and mode?
Mr Simon Mokganya – Junior Statistician: Statistical Information and Research

From the Editor's Pen

Mr Biki Lepota



Welcome to the September 2022 issue of Makoya. This edition, which is dedicated to the work of the Statistical Information and Research Unit, is framed by the 20th Anniversary festivities. The two main events reported on in this issue are the 20th Anniversary Celebration of Umalusi and the launch of the National Senior Certificate (NSC) benchmarking report.

The first article by the CEO of Umalusi is a reflection on the notable achievements over the last two decades: 2002 – 2022. The reflection is done within the context of evolution and change. This is followed by the Minister of Basic Education's congratulatory message at the heart of which is the challenge to Umalusi to continue offering research-based advice without fear or favour.

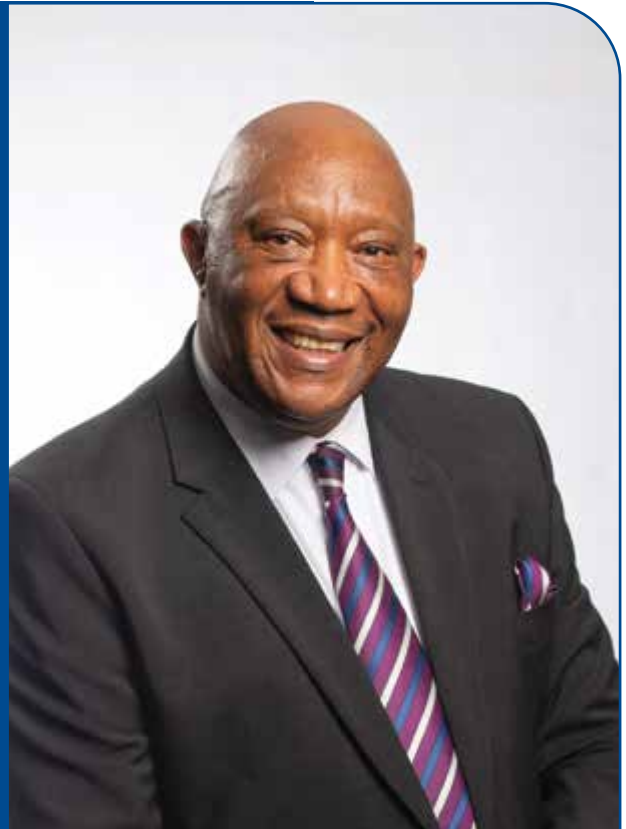
Biki Lepota reports on the research report the findings of which reassures the South African public that the NSC is an internationally comparable qualification. The remainder of the articles are contributions from colleagues from the Statistical Information and Research Unit dealing with different aspects of the work of Umalusi. The first one focusses particularly on the approaches used to ensure the credibility of marks that are standardised by Umalusi, the second looks at the degree of alignment of qualifications on Umalusi sub-framework of qualifications. The final contribution is an orientation into the commonly used indices to measure central tendency.

Hope this is a good read.

20 years of education guardianship

From the CEO's Desk

Dr Mafu Rakometsi



Umalusi succeeded the South African Certification Council (SAFCERT) in 2001 and started its work in earnest in 2002. That is why Umalusi celebrated its 20th anniversary at the CSIR International Convention Centre in Pretoria on 6 September 2022. Among the almost 180 delegates attending the event were Ms Angie Motshekga, Minister of Basic Education; Mr Tebogo Letsie, representing two Portfolio Committees: Basic Education, and Higher Education, Science and Innovation; Dr Casius Lubisi and Mr John Pampallis, the founding chairpersons of the Umalusi Council; and Prof Peliwe Lolwana, Umalusi's first CEO. The event attracted key stakeholders in the education sector, such as representatives from the Department of Basic Education, the Department of Higher Education and Training, the South African Qualifications Authority (SAQA), the Council on Higher Education (CHE), the Independent Examinations Boards (IEB), the South African Comprehensive Assessment Institute (SACAI), the Federation of Governing Bodies of South African Schools (FEDSAS), the National Association of School Governing Bodies (NASGB), the National Alliance of Independent Schools Associations (NAISA), and the South

African Council for Educators (SACE).

Several notable milestones have defined and re-defined Umalusi's existence over the past 20 years. Due to its expanded mandate, Umalusi experienced significant growth in its staff complement from seven employees in 2002 to about 140 in 2022. The introduction of the National Certificate (Vocational) (NC(V)) in 2007 and the National Senior Certificate (NSC) in 2008 resulted in Umalusi strengthening its standards-setting approaches to make them fit for purpose and internationally comparable. From an inclusivity point of view, Umalusi has, since 2012, made the content of the NSC accessible to visually impaired and blind learners in the form of braille transcripts.

In July 2022, Umalusi launched the Online Application System for Replacement Certificates, a service dedicated to applicants whose original certificates have been lost or damaged. The motivation for this is the need to reduce the costs and turnaround time for the provision of this service. Umalusi reviewed its accreditation policy and criteria to keep it in alignment with current developments locally

and internationally. Since 2014/15, Umalusi has accredited just under 1 000 institutions to offer and assess Umalusi quality-assured qualifications. As a research-informed organisation, Umalusi conducted numerous benchmarking studies to determine the standing of all its qualifications, as well as the standards of the curricula and examinations associated with its qualifications.

Over the years, Umalusi has forged strategic partnerships with multiple partners of repute, both nationally and internationally, such as universities, research institutions and educational assessment associations, to advance the research culture and strengthen its quality assurance approaches. This has resulted in Umalusi successfully hosting five national, regional and international conferences between 2003 and 2018, where approximately 350 academic papers were delivered to explore the notion of standards in different ways. Among the delegates attending and speaking at these conferences were university academics,

scholars, educationists and policy makers from countries with different histories, resources and populations, and of different sizes, such as Australia, the United Kingdom and the United States of America, as well as countries in Africa and Europe.

As a research-informed organisation, Umalusi has contributed to building educational scholarship by working with various universities. In this regard, special issues of four accredited journals have been produced: *Per Linguam* 28(2) in 2012, *Perspectives in Education* 32(1) in 2014, *Perspectives in Education* 34(4) in 2016 and *Journal of Education* 70 in 2017. Umalusi is currently finalising a fifth special issue of an accredited journal, *Southern African Linguistics and Applied Language Studies*, which is dedicated to language matters.



Ms Angie Motshekga
Minister of Basic Education

Congratulations to Umalusi on its 20th anniversary

I congratulate Umalusi, the caretaker of one of the nation's most treasured assets – the standards of general and further education and training – for its resilience over the past 20 years. A 20th anniversary is a significant moment in the history of any organisation. From humble beginnings, Umalusi has grown to become a recognised brand in the South African basic and post-school education sector.

Since its establishment in 2001, seven years after the country's democratic changes in 1994, Umalusi has made a significant contribution to improving the quality of our education and training system. It has always provided advice on how to set, measure and/or assess and track educational standards within the context of a diverse and unequal society such as South Africa. Using its robust quality assurance approaches, Umalusi successfully managed, from a quality assurance point of view, the transition from the Senior Certificate (SC) to the National Senior Certificate (NSC) in 2008. As you are aware, the NSC ensures that every learner in the country writes the same examination, and is therefore assessed against a common yardstick.

Umalusi has distinguished itself as a principal vehicle for upholding common standards in South Africa's education and training system, differentiated along the lines of public and private provision. I agree with the assertion that a leader's tenacity is seen in how they respond to difficult situations. Given the high-stake nature of the NSC, debates ensue every year after the announcement of the NSC's results. Parents, learners, teachers, researchers, government officials, policy makers, universities and the general public get involved in the debate around the results, and the issues revolve around whether standards are falling or improving, and whether adjustments of Grade 12 results constitute an inflation of marks.

What I have always found missing in the debates is that the standardisation of examination results is an international practice that is used to mitigate the effect of factors other than a learner's knowledge and aptitude on their performance. What we know is that, to date, no research has been conducted to provide evidence that there is anything amiss about Umalusi's standardisation process.

We are truly indebted to the efforts of Umalusi's Assessment Standards Committee (ASC) of Council for putting so much effort in its work and sacrificing its members' valuable time to ensure that Umalusi remains a trusted authority in fostering high education standards in general and further education and training over the years. Although I have never attended any standardisation meetings, I have it on good authority that the meetings are quite robust, something that should be appreciated.

Over the years, we have witnessed Umalusi sailing through relatively uncharted waters and establishing a strong presence in the South African education and training landscape, and beyond its borders. Among its notable achievements are the following:

- a) The development of its sub-framework of qualifications,
- b) The development and implementation of accreditation approaches and systems for private providers of education and training, and assessment bodies,
- c) The development of policies to guide the quality assurance of the assessment function,
- d) The development of certification systems to support the qualifications for which Umalusi is responsible,
- e) The initiation of a robust research programme, and
- f) The hosting of regional and international conferences, as well as national and international webinars on its professional work.

This clearly shows that Umalusi has come a long way. Umalusi should not allow itself to become complacent, or to judge its own performance

uncritically. Indeed, as the organisation begins its journey of the next 20 years, it should actively seek out criticism, and well-founded judgements, on what it could have done – and can still do – better. The fact that Umalusi has been able to successfully execute its mandate is, in a large part, due to the excellent and professional manner in which members of the first to the fifth councils have executed their fiduciary duties. I wish to take this moment to thank the members and chairpersons of a past Umalusi Council. Among them are Dr Cassius Lubisi and Mr John Pampallis. Further, I thank the first CEO of Umalusi, Prof Peliwe Lolwana, and her team for setting things in motion for us to be where we are today.

Unarguably, there is a great deal more to be done. What is needed now is for Umalusi to ask itself the following question with a sober mind: "What more do we still need to do?" I sincerely believe that the next 20 years give you an invaluable opportunity to continue the discussion and debate about how much more must be done. The Council should continue in its pursuit of equity in the provision of quality education for all in the general and further education and training sub-sector, mindful of the fact that decisions taken today will lay the foundation for the third decade of excellence in the service of South Africa's pre-tertiary system.

Lastly, I wish to thank the CEO of Umalusi, Dr Mafu Rakometsi, as well as the executive and senior management of Umalusi, for the sterling work that they continue to do. Your efforts in giving effect to the strategic direction of the organisation are appreciated.

Umalusi launches the “International Benchmarking of the National Senior Certificate (NSC)” report

Mr Biki Lepota
Senior Manager: Statistical Information and Research

Umalusi launched its most recent research report, titled “International Benchmarking of the National Senior Certificate (NSC)” at the CSIR International Convention Centre in Pretoria on 23 September 2022. The event was attended by almost 120 delegates, representing 23 out of the 26 South African universities, private higher education institutions and the three bodies responsible for assessing the NSC – the Independent Examinations Board (IEB), the South African Comprehensive Assessment Institute (SACAI) and the Department of Basic Education (DBE), which is both the provider and assessor of the NSC. The other attendees comprised representatives of Umalusi’s sister quality councils – the South African Qualifications Authority (SAQA), the Council on Higher Education (CHE) and the Quality Council for Trades and Occupations (QCTO) – and representatives of other key stakeholders, such as the Education Labour Relations Council (ELRC) and the South African Council for Educators (SACE), as well as Umalusi staff members.

Dr Mafu Rakometsi, Umalusi’s CEO, provided the historical context to the current study by sharing with the audience the benchmarking studies conducted by Umalusi since 2006. His presentation emphasised three important points. Firstly, the previous studies had highlighted debates and complexities about what was meant by standards, what standards should be in the education system relative to other systems, and how they should be measured. Secondly, the studies provided a nuanced understanding of the differences and similarities between the substance of South African qualifications and underpinning curricula, and those of other jurisdictions. Finally, Dr Rakometsi argued that international comparisons by any nature should not be read to imply that there is a single best curriculum, or that there is only one

way in education.

Umalusi commissioned the study to Ecctis, formerly known as the UK NARIC. Ecctis is an internationally trusted and respected reference point for qualifications and skills standards. For that reason, the research was conducted by “a gold-standard provider of solutions and services in international education, training and skills, and in the development and recognition of globally portable qualifications”.

In the study, Umalusi benchmarked the NSC against five qualifications and/or programmes: the International Baccalaureate Diploma Programme, the Kenyan Certificate of Secondary Education, the New South Wales Higher School Certificate, the Zimbabwean Forms 5–6 Advanced Level and the Cambridge Assessment International Education AS and A Levels. The benchmarking took curriculum design, assessment frameworks and approaches, content, learning outcomes, knowledge and skills into account.

The findings and recommendations were presented by Dr Thomas Colville and Ms Abigail Jones, senior officials at Ecctis. The overarching findings were that the NSC has demonstrable lines of comparability with upper-secondary qualifications in each of the benchmarked systems. The NSC is an effectively designed upper-secondary education qualification that aims to develop higher-order thinking skills, and desirable and future-focused outcomes for students, which should prepare them for higher or further education and the world of work. Overall, the report makes the argument that the NSC provides its holders with an internationally comparable level of education. The full report is available on the Umalusi website (www.umalusi.org.za).



The alignment of qualifications on the General and Further Education and Training Qualifications Sub-framework

Ms Tsholofelo Madise

Assistant Researcher: Statistical Information and Research



Umalusi is mandated to develop and manage the General and Further Education and Training Qualifications Sub-framework (GFETQSF). Umalusi also monitors the suitability and adequacy of standards and qualifications. The Minister of Higher Education, Science and Innovation has issued a Ministerial Determination of the sub-frameworks that comprise the National Qualifications Framework (NQF) through Government Gazette 44031 of 24 December 2020.

The Ministerial Determination seeks to reconfigure the three sub-frameworks of the NQF according to the types and levels of qualifications that can be offered by individual quality councils and to ensure that all qualifications registered on the NQF are current and aligned to their sub-framework policies.

The Ministerial Determination comes at a time when Umalusi celebrates 20 years of its existence under the theme: "Two decades of education guardianship: 2002–2022". This is the perfect time to audit its qualifications and set the tone for coming years and new qualifications. With that being said, Umalusi has audited its qualifications to determine their standing, as well as the standards of the curricula and assessments. The alignment of qualifications within the GFETQSF ensures that they are aligned with the criteria set by Umalusi and the South African Qualifications Authority (SAQA)'s policy for the registration of qualifications and part-qualifications. This, in

turn, ensures articulation with other qualifications on the GFETQSF and qualifications on other sub-frameworks.

Umalusi certifies the following qualifications:

Senior Certificate amended (SC(a))

The amended Senior Certificate (SC(a)) is a qualification at Level 4 on the NQF. It enables adults and youth who did not complete their high school education, or failed their Grade 12 examination, to obtain a school-leaving certificate and thus further their education if they so choose. Additionally, this qualification was adapted to suit out-of-school learners who still needed to write subjects to obtain a matric qualification. The qualification is offered in tandem with the NSC and will be phased out with the introduction of the National Senior Certificate for Adults (NASCA). It is for this reason that the SC(a) was not subjected to the qualification alignment. However, due to implementation challenges, the Minister responsible for higher education and training has given a concession to allow the SC(a) to be offered pending the finalisation of the implementation plan.

National Senior Certificate (NSC)

The National Senior Certificate is an NQF Level 4 qualification. It is awarded to learners who achieve the exit-level outcomes stipulated in the National Curriculum Statement for Grades 10 to 12. The NSC policy has recently been

updated to be aligned with the National Policy Pertaining to the Programme and Promotion Requirements (NPPPPR), the SAQA Policy and Criteria for the Registration of Qualifications and Part-Qualifications on the National Qualifications Framework (as amended in 2020) and Umalusi's policies. This means that the NSC meets the requirements of qualifications on the GFETQSF. A recently commissioned research study titled "International Benchmarking of the National Senior Certificate (NSC)" (see article on page 7) benchmarked the NSC with five similar qualifications. Overall, the study found the NSC to be of an internationally comparable education standard.

Report 190/191 Engineering Studies N1–N3 Programmes (NATED)

The Report 190/191: Engineering Studies N2 to N3 programmes (NATED) were implemented in 1995. Umalusi has been quality assuring the exit points of the NATED assessments since 2003. The NATED programmes were meant to be phased out in 2007 when the National Certificate (Vocational) (NC(V)) was implemented. Since the implementation of this qualification in 1995, the instructional offerings have not been revised, hence its outdated and/or underspecified curricula. This has had a detrimental effect on the quality assurance of assessment. The audit found that the programmes did not meet the requirements of qualifications on the GFETQSF. The Minister of Higher Education, Science and Innovation approved the phasing out of the remaining NATED programmes in 2021. This phasing out was meant to begin in 2022. A task team to oversee the phasing out of NATED has been established, and progress is being made in this regard.

National Certificate (Vocational) (NC(V))

The National Certificate (Vocational) (NC(V)) is an NQF Level 4 qualification of the GFETQSF, offered at public technical and vocational education and training (TVET) colleges and private colleges, as well as other institutions that have been offering further education and training programmes since 2007. The NC(V) has

three exit points: at levels 2, 3 and 4. It is suitable for all learners who decide to follow a vocational pathway after Grade 9. The attainment of the NC(V) Level 4 is equivalent to Grade 12. Currently, discussions are taking place regarding the internalisation of summative assessment for NC(V) levels 2 and 3. The discussions are looking to move the qualification from three exit points to one exit point at Level 4, with levels 2 and 3 being examined internally.

General Education and Training Certificate (GETC)

The General Education and Training Certificate (GETC): Adult Basic Education and Training (ABET) Level 4 is an adult qualification registered at Level 1 of the NQF. This qualification is at the same level as Grade 9 at secondary school. This qualification consists of fundamental, core and elective unit standards. The GETC, a unit standards-based qualification, no longer meets the requirements of qualifications on the GFETQSF. The qualification will be phased out and will be replaced by the General Education and Training Certificate for Adults (GETCA) going forward. However, similar to the SC(a), due to implementation challenges, the Minister responsible for higher education and training has given a concession to allow the GETC to be offered pending the finalisation of the implementation plan.

Conclusion

Following the qualifications alignment investigation, Umalusi has been assisting assessment bodies to update and align their qualifications to meet the SAQA requirements for the re-registration of qualifications on the NQF. This is because all GFETQSF qualifications must meet the requirements of the Ministerial Determination and re-registration on the NQF by June 2023. Additionally, Umalusi has provided guidance in the development of the associated assessment criteria and updating of the exit-level outcomes for the GETCA and NASCA qualifications to align them to the SAQA requirements as new qualifications entering the system.



Approaches deployed to ensure the validity of standardised examination marks

Mr Matome Sebola
Assistant Manager: Standardisation: Statistical Information and Research



Umalusi's role as a quality assurer of assessment is to ensure the maintenance of standards set across the qualifications on its sub-framework, the General and Further Education and Training Qualifications Sub-framework (GENFETQA). This includes the quality assurance of both the external and internal components of assessment by hosting standardisation meetings and using statistical moderations, respectively. The assessment bodies are responsible for administering the examinations, marking scripts and capturing candidates' marks, which must be prepared to be submitted for standardisation. All the assessment bodies are required to reach a capture rate of at least 95% per subject at national level for the external examination component of the subject to qualify for standardisation. However, the statistical moderations of the school-based assessment (SBA) require at least an 80% capture rate of the candidates' marks at school or centre level per subject. The underpinning mandate, as stipulated in section 17A(5) of the GENFETQA Act, assigns the function of standardising results to Umalusi as "the Council may adjust raw marks during the standardisation process".

Why standardisation?

The standardisation of examination marks is a common practice that is used all over the world to achieve several goals, such as mitigating the impact of factors other than the learners' subject knowledge, abilities and aptitude on their performance, addressing any variations in the standard of the question papers that may occur despite careful moderation, and any variations in the standard of marking that may occur from year to year, to ensure comparability and consistency in learner performance across the various subjects within a given year and across years. The standardisation of candidates' marks at Umalusi is subjected to qualitative inputs from external moderations and monitors on the conduct, administration and management of examinations, complemented by qualitative data that considers historical averages, pairs analysis and standardisation principles.

What processes take place before the standardisation meetings?

The four assessment bodies – the Department of Basic Education (DBE), the Department of Higher Education and Training (DHET), the Independent Examination Board (IEB) and the South African

Comprehensive Assessment Institute (SACAI) – offer tuition on the qualifications on the Umalusi Sub-framework NQF Level 1–4, and manage the administration of the summative assessments and examination processes.

All the assessment bodies are required to manage the following processes:

- a) Development of management plans on the administration of academic activities,
- b) Management plans on the administration of assessment of both the SBA and examination mark components.

Further, the assessment bodies develop standardisation data and submit it to Umalusi for verification purposes before standardisation.

To ensure that the submitted data is credible for standardisation purposes, Umalusi subjects the data to a process called the verification of mark capturing.

How is mark capturing verified?

The verification of the capturing of marks is a quality assurance process that ensures that examination marks are captured accurately. The process involves, firstly, recording the marks at marking centres (i.e. recording the candidates' marks as reflected on their scripts) and, secondly, recording the candidates' marks as recorded on the mark sheets at capturing centres. This is done to ensure that the marks observed at the marking centres or capturing centres remain the same as the marks that are submitted for standardisation.

This mitigates against possible human error, in which incorrect marks are submitted due to the intense pressure associated with running huge examination sessions and having to work

extended hours to meet the tight release dates of the examination results. Thus, the verification of mark capturing is done to ensure that the marks that are awarded to candidates during the marking process are the same marks that are submitted for standardisation purposes.

Four phases are involved in the verification of mark capturing:

- a) Phase 1: *Planning phase*: This process involves the submission of the self-evaluation tools on planning and preparation for the capture of both the SBA and examination marks.
- b) Phase 2: *Deployment of Umalusi officials to the marking centres*: Umalusi officials visit the marking assessment bodies where sampled scripts from different subjects and marks are captured. The entire process of the capturing of marks is observed for the identification of possible gaps to mitigate the loss of scripts or mark sheets due to multiple processes taking place at the same time.
- c) Phase 3: *Deployment of Umalusi officials to the capturing centres*: The monitors focus on the control of the mark sheets and the capturing of marks in the examination systems.
- d) Phase 4: *Verification of recorded marks against standardisation and resulting data*: The last phase involves the verification of the recorded marks against the standardisation and resulting data.

Conclusion

The verification of mark capturing is an added quality assurance layer that helps Umalusi answer whether the marks submitted for standardisation purposes warrant sufficient certainty to the level that standardisation decisions are made.

Measures of central tendency: What are the mean, median and mode?

Mr Simon Mokganya
Junior Statistician: Statistical Information and Research



The purpose of this article is to provide information on the uses of the mean, median and mode as summary statistics in research or general data presentation. This article is aimed at providing researchers, education specialists, teachers and anyone seeking statistical understanding with assistance in how to interpret the mean, median and mode.

Mean, median and mode

The mean and median are commonly used summary measures in Statistics, referred to as measures of central tendency. The former is an average of scores or observations in the dataset, while the latter refers to the measure of central location. The median informs us where the data is. The meaning behind the central location of data is that the median takes the middle position, provided that the values of the dataset are sorted in an ascending (from smallest to largest) or a descending format (from largest to smallest). The middle position divides the dataset into two parts. This enables us to decipher which values in the data are above 50% of the data and which values are below 50%.

The median is not sensitive to outliers, i.e. extreme values or skewness in the data. By skewness, we refer to the distortion in the data caused by values favouring one side and, therefore, not

being centred. The median is relatively easy to calculate as it does not require complex mathematical formulae.

The mean of a dataset, commonly referred to as the arithmetic mean, is the average sum of all values divided by the total number of values. The arithmetic mean is different from the geometric mean used for logarithmic data. Mean, a measure of central tendency, uses all values in the dataset. The central tendency refers to where the data tends to be relative to the number of observations in the dataset. However, when extreme values exist in a dataset, the mean may provide a value that is not representative of the data.

The dataset may contain values from a sample or from a population. The former is a subset of a study group that may be the interest of a research project, while the latter is the overall study group. A sample mean estimates the population mean, whereas the population mean represents the average of the population.

There are, in fact, three measures of central tendency: mean, median and mode. The mode generally provides more helpful information for ordinal and nominal scales, and tells us how frequently a value occurs in a dataset. In most datasets, there may be more than one mode, while in others, there may be no mode at all.

Table 1 The examples of scales of measurements and the applicable measure of central tendency

Scales of measurement	Examples	Measures of central tendency
Nominal	<ul style="list-style-type: none"> • Gender <ul style="list-style-type: none"> ○ Male ○ Female ○ Other 	<ul style="list-style-type: none"> • Mode
Ordinal	<ul style="list-style-type: none"> • Pass levels <ul style="list-style-type: none"> ○ 1: 20–29% ○ 2: 30–39% ○ 3: 40–49% ○ 4: 50–59% ○ 5: 60–69% ○ 6: 70–79% ○ 7: 80–89%, ○ 8: 90–100% 	<ul style="list-style-type: none"> • Mode • Median
Interval and ratio	<ul style="list-style-type: none"> • Raw marks for Mathematics <ul style="list-style-type: none"> ○ 0, 1%, 0.5%, 50%, 80%, 85.76%, etc. 	<ul style="list-style-type: none"> • Mode • Median • Mean

To further determine which measure of central tendency to use, it is imperative to look at the distribution of the dataset. The ideal distribution is the normal distribution in which all measures of central tendency are equal, in other words, they are symmetric and therefore applicable. However, the median may be preferred in skewed distributions as it is insensitive to outliers.

The distribution of the dataset can be presented graphically or numerically. When

done graphically, a box plot or a histogram will be an ideal graphic method. A box plot is a pictorial representation of the five numbers that summarise a dataset: the minimum value, the first quartile, the median, the third quartile and the maximum values. The first quartile refers to the median of 50% of the values below the actual median, while the third quartile is the median of 50% of the values above the actual median of a dataset. The skeletal box and whisker diagram with labels is presented in **Figure 1**.

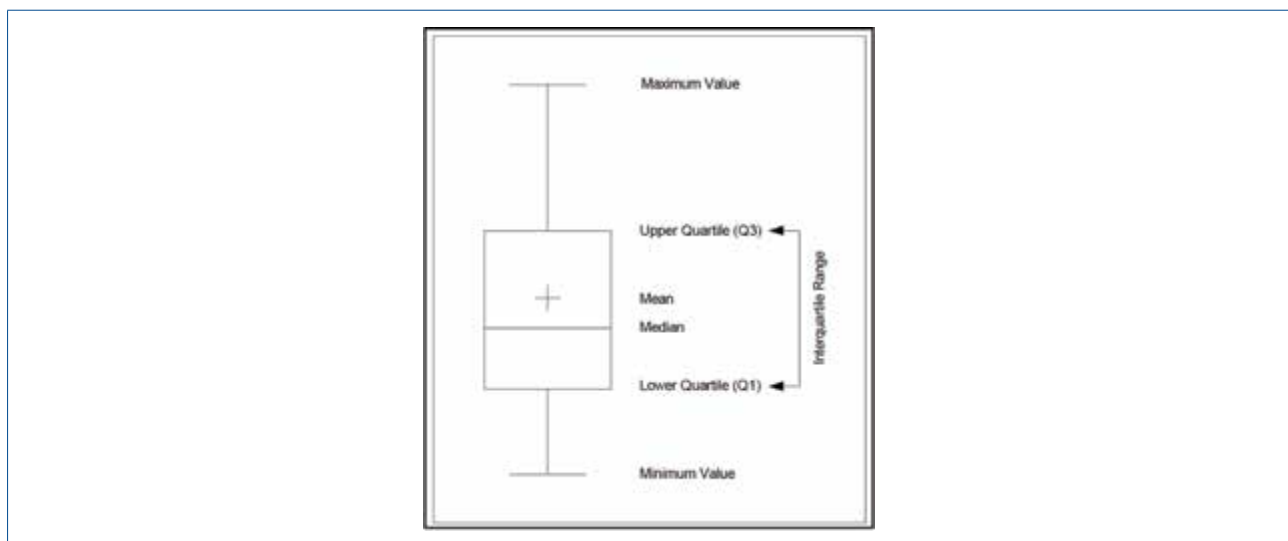


Figure 1 The skeletal presentation of the box and whisker diagram with labels of each element

In **Figure 1**, the whisker on the lower of the box is the minimum mark per group, while the whisker on the upper is the maximum mark for each

group. The vertical line through the box is the median, while the cross (in other cases it is a diamond) inside the boxes is the mean.

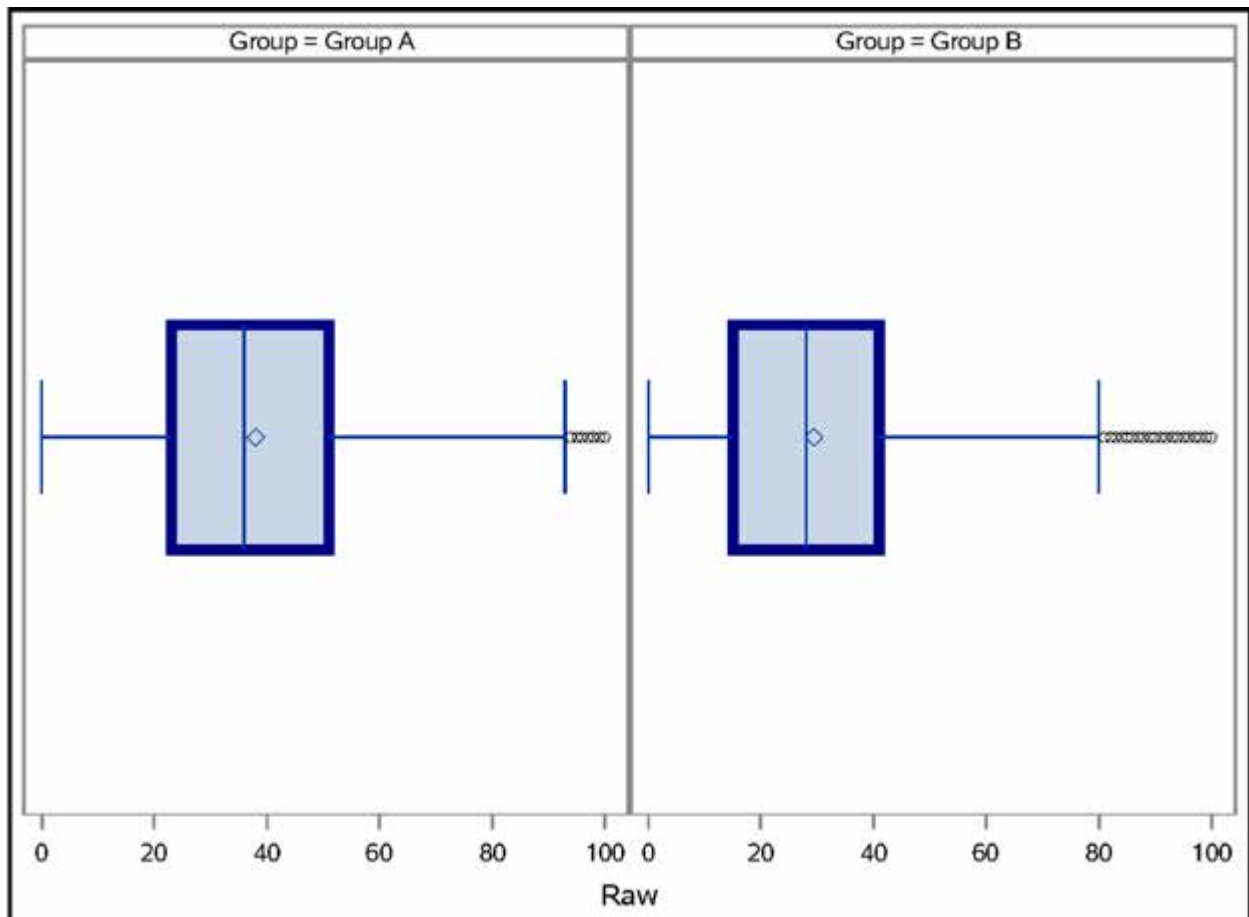


Figure 2 The comparison of Mathematics raw marks (as a percentage) of two groups of candidates, Group A and Group B

Figure 2 shows the distribution of Mathematics raw marks, but – most importantly – it shows the mean and median positions. The data on the candidates in Group A is skewed to the left. There are also outliers in this group of candidates.

Because these are performance marks, the number of candidates who obtain higher marks will be less than the average and, therefore, will stand out from the rest of the distribution. The appropriate measure of central tendency will be the median. The data on the candidates in

Group B is also skewed to the left. There are more outliers than in the other group. Interestingly, in terms of outliers, more candidates obtained higher marks in this group than those in Group A.

Nonetheless, the median and the mean are not far from each other in both groups. As such, there may not be computational differences between these two values. However, for statistical representation, it is ideal to use the median rather than the mean to measure the average raw mark.

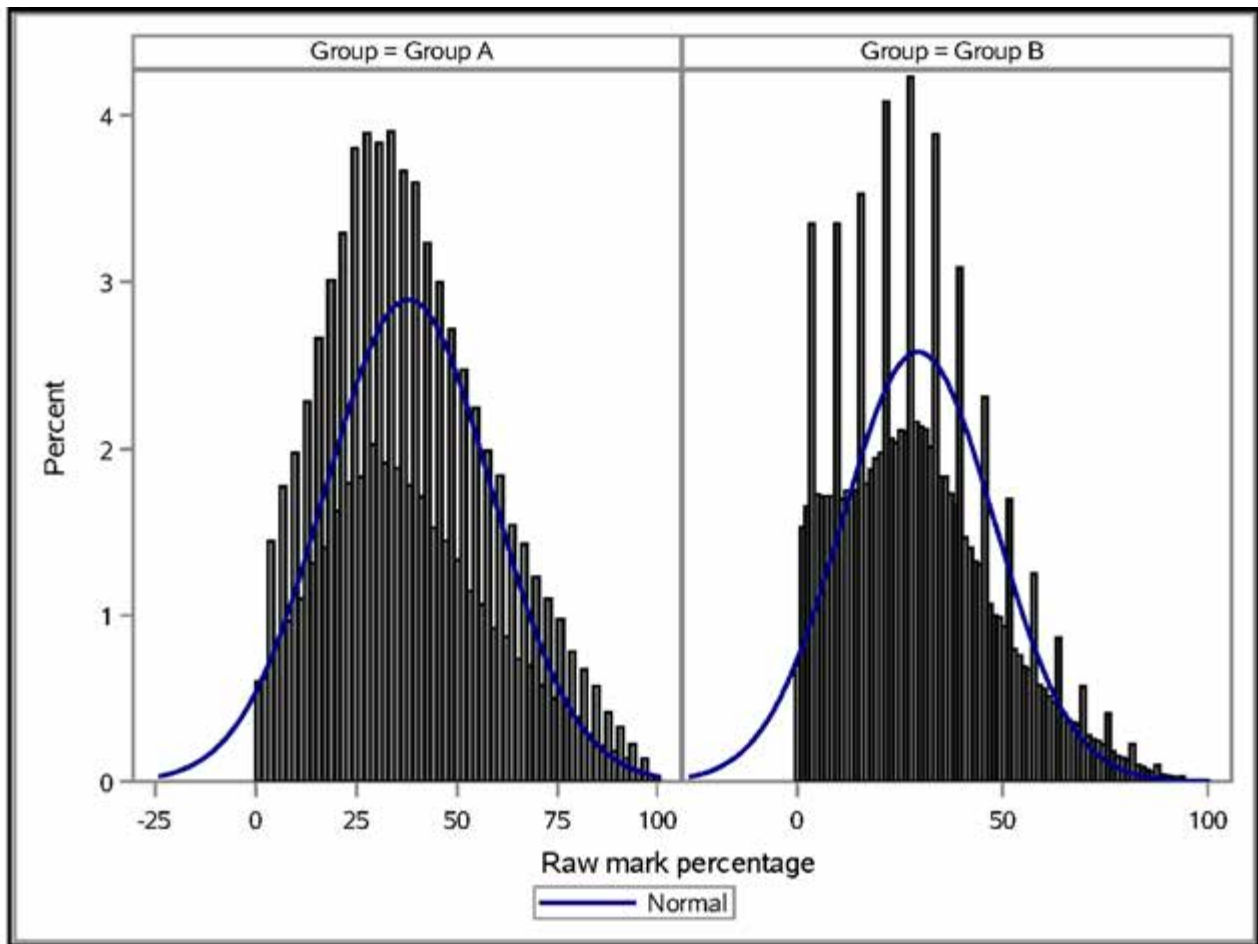


Figure 3 The histogram of Mathematics raw marks for the November 2021 examinations of two groups of candidates, Group A and Group B

Another graphic method of presentation is the histogram, which is used to quantify the data measured on an interval scale, such as the Mathematics raw marks in **Figure 3**. It provides us with all measures of the distribution of the data, but most importantly, it shows the mode of the data represented by the highest peaks. In **Figure 3**, there is more than one mode in Group A than in Group B. The histogram also reveals the skewness in the distribution of the data, similar to the box plot in **Figure 2**. The blue curve represents the normal distribution against which every distribution is benchmarked based on the mean, median and mode symmetry. In the case of the November 2021 Mathematics raw marks, the data is not normally distributed, hence the skewness and outliers.

Conclusion

It is of paramount importance to understand the data and its distributions. The mean, median and mode are all necessary summary statistics. It is even more important to know what they are and how they are applied. This article presented their differences and their respective uses. Skewness in the data can cause misrepresentations by the mean. As such, it is advised that the median should be used. The mode is appropriate for ordinal and nominal scales of measurement. However, it can still be used for interval scales.

Talk to us

37 General van Ryneveld Street, Persequor Technopark, Pretoria

Tel: +27 (12) 349 1510 Email: info@umalusi.org.za Website: www.umalusi.org.za



Umalusi_RSA



@UmalusiSA



Anti-fraud
Hotline

0800 408 409

UMALUSI



Quality Council for General and Further
Education and Training