

CONFERENCE: International Association for Educational Assessment (IAEA)
VENUE: Baku, Azerbaijan
DATE: 22 – 27 September 2019
THEME: Assessment and Decision Making – Individual and Institutional Solutions
SUB-THEMES: Creating Value-Add Measures for Better Predications
Assessment Data and Decision-Making Responsibility
Application of Competency Model in Human Resource Management

TOPIC: **Effectiveness of Using Competency Tests to Appoint Marking Officials in Grade 12 Examinations in The Western Cape, South Africa**

AUTHORS: Jaywant Parbhoo (Chief Education Specialist)
Moya Combrink (Deputy Chief Education Specialist)
Hendrik Swart (Director)

E-MAIL ADDRESS: Jaywant.Parbhoo@westerncape.gov.za
Moya.Combrink@westerncape.gov.za
Hendrik.Swart@westerncape.gov.za

ORGANISATION: Western Cape Education Department (WCED)

KEY WORDS: *Competency test; marking; tolerance; evaluation*

ABSTRACT

This paper will indicate results of an internal study to determine the effectiveness of using competency tests when appointing marking officials for the final Grade 12 examinations. The study, which will be carried out in June/July 2019, will compare the performance of markers in the competency test to that of other assessments conducted during the marking process itself.

Grade 12 examinations are the final exit examinations for school children in the country and count 75% while school based assessment (SBA) counts 25%. The examinations are furthermore used as the yardstick by which SBA is statistically moderated. Marking these final examinations is thus a very important activity. In appointing markers, the Public Administration Measures in South Africa prescribes minimum criteria. The Western Cape Education Department (WCED) uses an additional criterion, competency tests, in eleven selected subjects with high enrolments.

The study will focus on Mathematics and History marking. The competency test performance will be compared to two assessments conducted during the actual marking process: a pre-marking exercise featuring tolerance levels per question and item of the paper to be marked and an end of marking evaluation by the marker themselves and their immediate moderator. The marking evaluation instrument has components that evaluates marking skill but also has elements that evaluate attitude and values. Using the three instruments, a comparison was made for each marker. In so doing, an analysis was conducted for the different levels of performance of markers in the competency test against their actual evaluated performance at the marking. This pilot study may be extended to other papers as well in the future.

INTRODUCTION

South Africa conducts school leaving examinations in Grade 12 at a central level as question papers are developed at the National Department: Basic Education (DBE) and provided to the nine provincial education departments to print and distribute to schools. Once the question papers have been written, the marking thereof is managed by the provincial department. In the Western Cape province, the marking of the scripts is a responsibility of the Western Cape Education Department (WCED).

The final examination of a subject in Grade 12 counts 75%, with the remainder consisting of school based assessment (SBA). The SBA is furthermore statistically moderated using the final standardised examination marks as an anchor. The marking of the Grade 12 examinations is thus high stakes and of great importance to the lives of hundreds of thousands of young people. The marks are used to enter higher education institutions and the world of work.

This paper will indicate results of an internal study to determine the effectiveness of using competency tests when appointing marking officials for the final Grade 12 examinations. The study, which was carried out by officials in the Directorate: Assessment Management of the WCED in June/July 2019, compares the performance of markers in a competency test to that of other assessments conducted during the marking process itself, such as tolerance factor and an evaluation report.

BACKGROUND

Criteria and appointment of markers

The Public Administration Measures (PAM) is a national policy document that covers the conditions of service as well as employment matters regarding educators. The PAM (2016, 155) states the following as minimum criteria for employing educators (teachers and office based curriculum officials) as markers for the marking of Grade 12 examinations:

An appointee must have:

- *A recognised three-year post grade 12 qualification with the subject concerned at second or third year level*
- *Have at least two years teaching experience or curriculum experience in the last five years*
- *Have experience as a marker*
- *Preference will be given to school serving educators who are teaching the subject*
- *Language competency*

The PAM indicates that race, gender and area of educators must be considered when selecting markers for the various papers of the Grade 12 examination.

In addition to the PAM criteria, the WCED implemented a system of testing educators in selected subjects to determine their competence to mark the subject. This testing system has been called the competency tests and is conducted for eleven (11) subjects with high enrolment numbers.

In 2018, the following subjects had competency tests: Accounting, Business Studies, Consumer Studies, Economics, English Home Language, Geography, History, Life Sciences, Mathematics, Mathematical Literacy and Physical Sciences.

During nomination meetings, which involve unions, chief markers, internal moderators and curriculum subject specialists, the WCED appointed markers who achieved 60% or more in their subject and paper specific competency test.

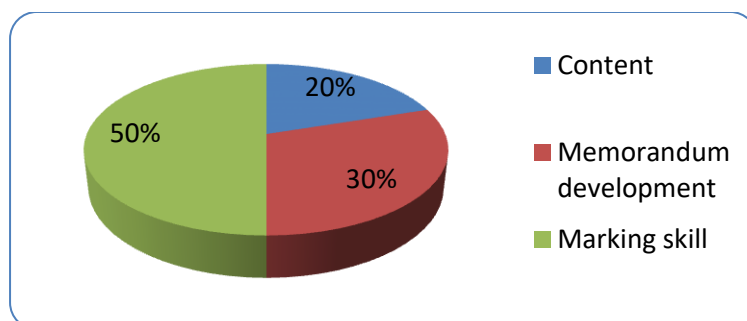
In Mathematics, there was a test for Paper 1 and one for Paper 2, similarly there were two tests for the two question papers for History. The competency test is the main yardstick by which markers are appointed as the other criteria must be met in all candidates that achieve 60% or more in their competency test. In the case of Senior Markers, Deputy Chief Markers, Chief Markers and Internal Moderators, the baseline competency test score is raised for each level of appointment. This score thus is used to make decisions on who will be selected for marking or even for management positions in the marking team.

Competency Tests: Assessment Type 1

The competency tests are set by experienced educators on an annual basis. To ensure fairness in the process, educators who met the criteria and wished to be an examiner or moderator of the competency test, had to apply for the position and were appointed by the WCED.

Appointed Examiners set their subject specific tests, providing English and Afrikaans versions, based on the following structure:

Fig 1: Proportions of the competency test



The appointed Moderators moderated the tests and submitted it to Directorate: Assessment Management (DAM) who quality assured the tests. Tests were written by applicants under examination conditions at eight (8) different writing centres covering all districts in the Western Cape.

After the tests were marked and moderated by the examiner and moderator respectively, the tests marks were recorded as a percentage on the online markers system which was then used in the nomination process of markers.

Training of marking officials

Tolerance Factor: Assessment Type 2

All chief markers and internal moderators attended national marking guideline (memorandum) discussion meetings at the DBE. Here they were trained to mark the subject and paper using the marking guideline for that examination and assessed on their marking ability using an item based tolerance instrument. All officials at the national marking guideline discussion marked three common ‘dummy’ scripts taken from the actual cohort who wrote the examination. In so doing, each official’s marking score per item was recorded and analysed to determine a tolerance factor (TF). The TF is applied at the total mark level and at the individual question level. This TF was agreed upon by the various provincial and national officials as well as the external quality assurance agency.

Another three additional dummy scripts were marked by the chief marker and internal moderator and evaluated by the national officials to determine whether their marking was conducted within the agreed upon tolerance factor. If the provincial official marked within the TF, he/she was authorised to mark and could continue to manage the marking at the provincial level.

All senior markers, deputy chief markers and markers must be competent to carry out their marking duties. A compulsory orientation session was held on the first two days of the marking period where the chief marker and internal moderator cascaded the marking guideline training and the authorisation process with the markers, using approved dummy scripts as supplied by the DBE. Each marker received dummy scripts which was marked to establish a tolerance range for each script. In 2018, all markers in the WCED were authorised and able to mark the final examination scripts in their subject and paper.

Senior markers, who are allocated to markers in an equitable manner, moderate 10% or more of the scripts of the markers. At the level of moderation conducted by a senior marker:

- *if the tolerance range is exceeded in more than 50% of the examination answer scripts moderated, the entire batch must be returned to the marker and remarked in the questions where the deviation is outside the tolerance range;*
 - *if the tolerance range is exceeded in 50% of the examination answer scripts moderated, the senior marker must moderate additional examination answer scripts to confirm whether the marker is marking within or outside the tolerance range before a decision is made to either accept or remark the scripts; and*
 - *if the tolerance range is exceeded in less than 50% of the moderated examination answer scripts, the batch will be accepted.*
- (DBE, 2014)

Evaluation of marking officials at the end of the marking

Evaluation/Performance Report: Assessment Type 3

After the marking process has been completed, all markers complete an evaluation form which has a total of 25 points for ordinary markers and 30 points for management team officials (Senior Marker, Deputy Chief Marker, Chief Marker and Internal Moderator). The evaluation form which is supplied by the DBE and WCED, is the same for all subjects and consists of different evaluation topics using rubrics to score the marker. This scoring rubric

enables all marking officials firstly to do a self-evaluation and then have their moderator to conduct the evaluation. This is a transparent process and both officials sign the form once completed by the moderator.

The following categories are evaluated:

Table 1: Categories of skills and values measured in evaluation form for markers

Ethics/Values (total score 10)		Marking Skills (total score 15)		Management Skills (total score 5)	
Punctuality	3	Quality of marking	5	Management competency	1
Work ethic	4	Subject competence	5	Moderation ability	2
Marking tempo	3	Competency in marking	5	Administrative ability	2

RESEARCH FOR THIS PAPER

This paper is a pilot study of the effectiveness of the competency test as a measure to determine which educators to select for the important process of marking grade 12 examination scripts of candidates. The research sought to determine how the competency test scores of those markers selected compared with their actual training accuracy prior to the actual commencement of marking and to the final evaluation record completed at the end of the marking period.

Table 2: Assessments used in the research

Type of assessment	Competency test	Tolerance accuracy	Evaluation performance record
When administered	Prior to selection as a marking official	Prior to actual marking of live scripts	Post marking live scripts

Mathematics and History were chosen as two subjects for this study. Mathematics is a key subject for the province that is constantly looking to improve performance in this subject as it is deemed to be a gateway subject for further study and work. History has many questions that require insight and interpretation thus is marked in a different manner to Mathematics and requires specific skill from the markers.

Both Mathematics and History have two papers and each paper was used as part of the study.

Table 3: Subjects and papers involved in the study

Subject	Paper	Topic (from DBE Exam guidelines, 2017)
Mathematics	1	Algebra
Mathematics	2	Geometry and Trigonometry
History	1	Cold War, Civil Resistance protests and Independent Africa
History	2	Cold Was, Civil Resistance in South Africa, Democracy and the past

METHOD

The competency test scores were captured from the test scripts and verified by WCED officials on the internal marking system. The competency scores in History and Mathematics Papers 1 and 2, for all markers that were appointed in 2018, were provided by the WCED in

an excel spreadsheet to the research team. The overall score of the marker is represented by an overall percentage score in the competency test. Only the markers appointed were included in this study.

Competency tests

The research team determined three groups from the appointed marking officials. The total group of marking officials for a paper, a group consisting of the Deputy Chief Markers and Senior Markers (**management team**) and a group consisting of the ordinary markers only (**marker team**). The Chief Marker and Internal Moderator were not included in the research as their tolerance accuracy was conducted at a national level and they were responsible for conducting the testing of tolerance accuracy for the rest of the marking officials at the beginning of the marking period.

Tolerance Factor

Once appointed, markers were trained by the chief markers and internal moderators. The training involved the use of item analysis from the question paper to determine an accepted tolerance factor for the marker in the subject and paper. Markers are only allowed to mark their allocated scripts if they mark 'dummy scripts' within the accepted tolerance range for the subject and paper. These dummy scripts were provided by the national DBE to all the markers in the country.

This study envisaged using data from the tolerance ranges of all markers in the two subjects and their respective papers. The data envisaged was from the overall tolerance factor for the marker in marking the common 'dummy scripts'. Data from the tolerance testing was requested from the chief markers of the four papers selected but detailed data was only obtained for Mathematics Paper 1.

In Mathematics Paper 1, three groups were formed during their training and each group marked specific questions in a set of five (5) dummy scripts. Each group agreed on a standard mark for each question and thus there was a standard total per group for the questions in a dummy script. By totalling the scores awarded for each question by a marker for each dummy script, the research team could compile an overall total for each marker for their five dummy scripts. For each marker, a tolerance factor score was determined by the following formula:

$$\frac{\text{Overall score of a marker for 5 dummy scripts}}{\text{Standard total for a group for 5 dummy scripts}} \times 100$$

In this way, tolerance factor scores were obtained for the markers and could be compared with the competency test scores.

Evaluation of the marking

After the completion of marking in a subject and paper, all marking officials completed a common evaluation form which included six (6) questions. Three questions deal directly with marking while three questions deal with administration. There are a further three questions that are only used for managers in marking the subject.

All markers thus could score a total out of 25 and managers of marking a total out of 30. These scores were converted to percentages when captured in a database.

The data from the three sources was aligned for each marking official in the case of Mathematics Paper 1. In the other three papers, comparative analysis was confined to the competency test scores and the final evaluation forms.

Table 4: Data from each marking official

Performance instrument	Score	Conversion of score
Competency test	Score/100	Percentage
Tolerance factor	Score variance from expected norm	Percentage
Evaluation form	Score/25 marker	Percentage
	Score/ 30 manager	Percentage

RESULTS

For Mathematics Paper 1, there were 102 marking officials for which there was a record for the competency test, tolerance accuracy and evaluation score. A total of 18 management officials were included and there were 84 ordinary markers.

Results from capturing of the three Mathematics Paper 1 assessments are as follows:

Table 5: Analysis of all marking officials for Mathematics Paper 1

Total number of marking officials for Mathematics Paper 1				102
	Age	Competency test	Tolerance factor	Evaluation score
Average	46.1	78.0	97.6	89.1
Standard deviation	11.2	10.7	2.5	7.5
Correlation coefficient		0.3 (with evaluation score)	0.0 (with competency test)	0.2 (with tolerance factor)

Table 6: Analysis of marking management officials for Mathematics Paper 1

Total number of marking management officials for Mathematics Paper 1				18
	Age	Competency test	Tolerance factor	Evaluation score
Average	52.6	88.8	98.0	95.1
Standard deviation	9.6	5.3	1.7	3.1
Correlation coefficient		0.2 (with evaluation score)	0.2 (with competency test)	0.6 (with tolerance factor)

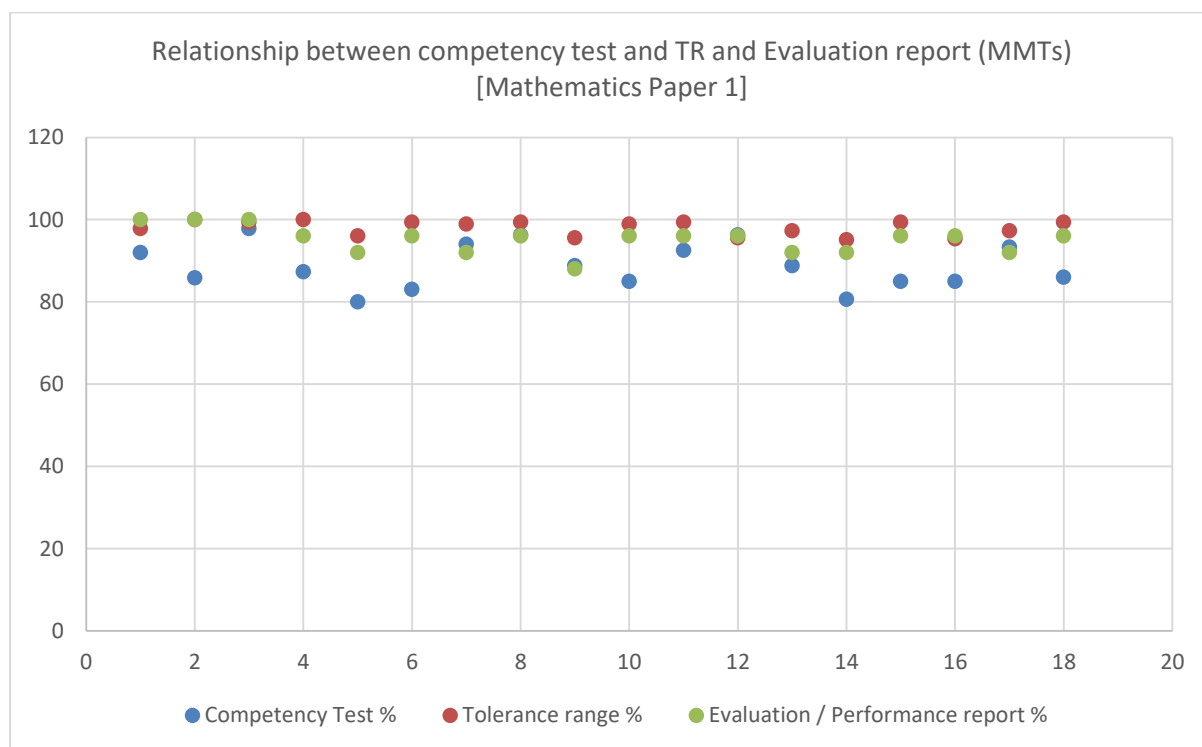
Table 7: Analysis of ordinary markers for Mathematics Paper 1

Total number of ordinary markers for Mathematics Paper 1				84
	Age	Competency test	Tolerance factor	Evaluation score
Average	44.7	75.7	97.6	81.8
Standard deviation	11.0	10.1	2.7	7.5
Correlation coefficient		0.1 (with evaluation score)	0.0 (with competency test)	0.1 (with tolerance factor)

The stronger relationship is displayed in the management team where the correlation between the tolerance factor and evaluation score is strong.

In the following graph, this correlation is illustrated between the tolerance factor and evaluation score.

Fig 2: Relationship between various assessments for markers



Results from the competency tests and evaluation performance of Mathematics Paper 2, History Papers 1 and 2 are as follows:

Table 8: Correlation coefficients regarding competency test and evaluation scores for History Papers 1 and 2, and Mathematics Paper 2

Subject and Paper	All marking officials	Marking officials management	Ordinary markers
History Paper 1	0.1	0.1	0.1
History Paper 2	0.3	0.3	0.3
Mathematics Paper 2	0.3	0.4	0.2

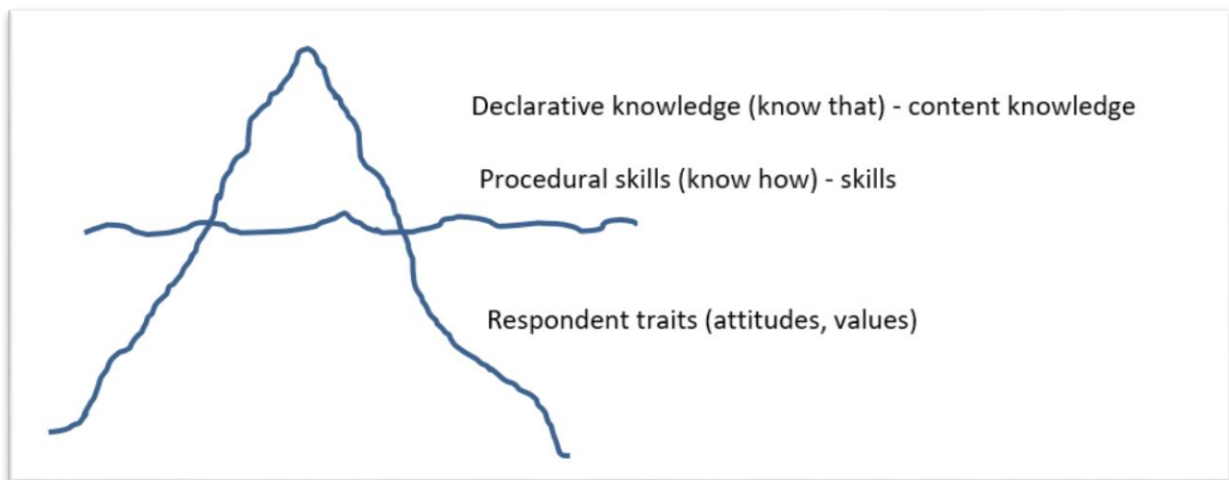
While History Paper 1 competency test results showed a low correlation with the evaluation scores of that paper, a moderate correlation was present in History Paper 2 where the content was more focused on South Africa. Mathematics Paper 2 also showed a greater correlation between the competency test and the evaluation score than in Mathematics Paper 1.

DISCUSSION

In their book, *What Works, Assessment, Development and Measurement*, Bassi and Russ-Eft (1997, page 7) state that 'a competency is any individual characteristic that can be measured reliably and that distinguishes superior from average performers or effective from ineffective performers at statistical levels of significance'.

They further classify competency as 'respondent traits, declarative knowledge or procedural skills' (1997, 7). The diagram below is a simplified version of an iceberg level of competencies as provided by Bassi and Russ-Eft (1997,8).

Fig 3: Iceberg levels of competencies



Design of competency tests and time to administer the test means that content and skills are easier to assess within the slice of time whereas attitudes and values are more difficult to assess and would take more time and be more expensive to conduct with larger numbers of applicants. This is especially true when dealing with recruiting thousands of markers for a ten-day end of year marking session. The WCED thus embarked on a content/skill based competency test for decision making in recruiting markers.

The results show that there is a low to moderate correlation between the competency tests and evaluation performance. There was a greater correlation between the competency test and the evaluation scores in the History Paper 2 than in History Paper 1 which could be ascribed to markers being more confident in South African content than non-South African content. The competency tests are 2-3 hours long and are marked according to a standard marking guideline whereas the evaluation performance is a rubric based assessment that is completed by the moderator of the marker and is an opinion given of how the marker performed.

In the Mathematics Paper 1, where the tolerance marks were captured in detail, there appeared to be a strong correlation between the tolerance assessment accuracy and the evaluation performance record for the marking management team (0.6) whereas there were low to moderate correlation coefficients where the overall group or only the markers were analysed.

CONCLUSION

The presence of a correlation between the competency tests and the other two assessments which were implemented at the marking centres indicates the usefulness of using a competency test for recruiting purposes. Although the competency tests were not able to assess respondent traits, the evaluation forms were able to provide an insight into these traits for the various markers.

Furthermore, senior curriculum officials and the chief marker and internal moderator of each subject and paper are invited to a meeting when selecting marking officials and they can provide much more qualitative inputs that will supplement the hard data of the competency tests.

In future, the WCED should ensure that all the tolerance data and evaluation scores are collected from each subject and paper. Tolerance accuracy scores and final evaluation scores should be calculated and captured on the marker systems of the department. Moreover, the department should also consider using the evaluation scores and tolerance accuracy scores in future selections of marking officials in conjunction with the competency scores.

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