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Examiners' Feedback Reports and their Effects on Mathematics Performance in Tanzanian Secondary Schools

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ABSTRACT

The National Examination Council of Tanzania (NECTA) issues Candidates Items Response Analysis reports (CIRA) as feedback reports for improving performance in secondary schools. Despite such initiative, the performance is in critical condition. Therefore, this paper presented in the NECTA 50th years' anniversary conference which had the theme about 'Assessment bodies as stirrers for effective learning', evaluated such reports. Specifically, the study explored students' awareness of candidates' items response analysis reports; examined the perceived usefulness of candidates' items responses analysis reports; evaluated the availability of candidates' items analysis reports, assessed students access of candidates' items response analysis reports and evaluated the influence of candidates' items responses analysis reports on mathematics performance in secondary schools. The study adopted a sequential exploratory mixed methods design, multiple regression model and feedback intervention theory. Data were collected through semi-structured questionnaires and interview from students and teachers in secondary schools. The study found that, most of the students in secondary schools are not aware of examiners' feedback reports issued by the National Examination Council of Tanzania, hence do not make use of them, as the results they influence little on mathematics performance. Therefore, the study concludes that, there is a dire need for enforcing the effective utilization of such reports for improving performance. The study recommends therefore, teachers' professional training institutions, T.I.E and ADEM to incorporate the use of feedback reports in their training packages. Further study may develop intervention programme on effectiveness use of feedback reports for improving performance in secondary schools.

Keywords: Mathematics Performance, CIRA, CSEE, NECTA, Feedback Theory.

INTRODUCTION

This study as part of conference presentations for NECTA 50th years' anniversary, under the theme 'Assessment bodies as stirrers for effective learning' evaluated the influence of Candidates Items Response Analysis reports on mathematics performance in secondary schools due to the critical conditions of mathematics performance which threatens the development of reasoning, critical thinking, and decision-making skills to the learners who are prospective workforce for global, regional and national sustainable development (Narayani, 2015). Globally, Mathematics is taught as a branch of science which deals with number operations, computations, calculations, and problem solving (Yadav, 2019). Mathematics skills is essential for scientific innovations, technology development and business operation towards sustainable development (Algani, 2022).

Therefore, it is taught at different levels of education, from nursery, primary, secondary, tertiary and university level of education in both, developed and developing countries (Mazana et al., 2020; Mkenda, 2022). Despite its importance in human resource development, the performance of mathematics subject in the certificate Certificate of Secondary Education Examination (CSEE) is in critical condition (Ndume et al., 2020). There is empirical evidence of poor performance in Mathematics even in developed countries like England, China, Japan, Korea, Hongkong, Singapore and Russia (Richardson *et al*, 2020; Mullis, Martin, Foy, Kelly & Fishbein, 2019; Hanushek, Peterson & Woessmann, 2010; Bee & Kaur, 20214; Koul & Rahmawati, 2015). The situation is worse in developing countries such as Ghana (Ansah, Quansah & Migha, 2020), Rwanda (Mbarute & Ntivurugwa, 2022) and Tanzania (Joseph, 2013; Kyaruzi, 2017; Kalla et al., 2023; Masele, 2018; Tvako eta al., 2019; Kyaruzi et al., 2019; Mazana et al., 2020; Mbedule,

2020). In Singapore, students' poor performance in Mathematics subject is associated with students' misconceptions (Bee & Kaur, 2014). For the case of Ghana, minimal teachers' competences in Mathematics subject affect students' performance (Ansah et al., 2020). The study in Rwanda, noted shortage of resources, distance from home to school, little interest among students towards Mathematics subject and less parental involvement in students learning Mathematics as contributing factors for failure in Mathematics subject (Mbarute & Ntivuguruzwa, 2022). In Kenya, the study revealed that most of the students in secondary schools (76.4%) had negative attitudes towards Mathematics subjects (Njaggah, 2003). Since the Tanzania Development Vision relies mainly on the quality of its workforce, improving the academic performance in Mathematics subject is the national strategy. This is pointed out in the paradigm shift of education monitoring systems from school inspection to school quality assurance (Shahanga et al., 2021; Shahanga et al., 2021). In this sense, the poor performance in Mathematics as associated with pedagogical and poor teaching and learning environment requires the effective use of feedback reports (Michael, 2015).

Such reports are essential as they address digital literacy, negative attitude to the subject among students, lack of parental involvement as well as lack of responsibility and accountability among students, teachers, and school management (Mazana et al., 2020; Mbedule, 2020; Kyaruzi et al., 2019; Masele, 2018; Kalla et al., 2023). The performance reports in Mathematics assessment should serve as feedback for intervention improvement (Hattie & Tmperley, 2007). It should enable the interaction between students and their teachers to correct misconceptions and improve accuracy in number operations, and problem solving (Barana et al., 2021). It enables teachers to work shoulder to shoulder with their students to address issues raised in Mathematics feedback (Stovner, 2021). The meaningful feedback in

Mathematics works effectively to students if accompanied with teachers' guidance to direct students on how to perform Mathematic operations (Koskinen & Pitkaniemi, 2022). The effective use of examination feedback, bridges skills gaps through suggested improvement strategies towards high performance from the crisis of failure (Yusoff, 2013). It tells the desired directions towards maximum performance through effective implementation of the given recommendations (UCL, 2017). The suggested measures must be scalable, affordable, and manageable by different school stakeholders, such as students, teachers, parents, and management (Grayson, 2018). The students, as the victims of learning assessments, need to know why, which, and how the marks are awarded in each item response hence improve their preparation for the forthcoming examinations (OECD, 2011). This enables feedback to be a useful tool to students, teachers, and management as it gives directions from the current state to the desired future (Yusoff, 2013). It requires continuous reflection, collaboration strategies and intervention measures to address performance challenges (Santos & Pinto, 2010).

Feedback informs teachers and management on pedagogical weakness; it motivates learners and enable them to capitalize on their strengths and work out their weaknesses towards the pre-determined academic goal (Pearson, 2016). However, the study in South Africa indicates that there is inadequate use of constructive feedback to enhance teaching and learning Mathematics subject, hence prolonged poor performance of the subject (Naroth, 2010). In the context of Tanzania, the National Examination Council (NECTA), through candidates' items responses analysis reports gives recommendations to students, teachers, and school management as intervention measures towards improving the academic performance of Mathematics and other examined subjects (NECTA, 2017; 2018; 2019; 2020; 2021). Despite the improvements

recommendations, the pass rate in Mathematics has been very low in five years consecutively: 19.19% (2017); 20.02% (2018); 20.03% (2019); 20.12% (2020) and 19.54% (2021). Moreover, the pass rate for ten years, between 2012-2022 has been less than 25% (Mkenda, 2022). This situation makes the use of candidates' items responses analysis reports questionable, hence a need for thorough investigations. This study, therefore, this study examined examiners' feedback reports and their effects on Mathematics Performance in Tanzanian secondary. The study adopted a feedback intervention theory by Kluger and DeNisi 1996 which based on the assumption that relevant feedback information and individual initiatives influences the achievement of the performance target (Luger & DeNisi, 1996). The study was guided by the following specific objectives: to explore students' awareness of candidates' items response analysis reports and to examine the perceived usefulness of candidates' items responses analysis reports. Others are to evaluate the availability of candidates' item analysis reports, to assess students access to candidates' item response analysis reports, and to evaluate the influence of candidates' item response analysis reports on Mathematics performance in secondary schools. To achieve such objectives, the study tested the following alternative hypotheses:

H_1 Students' awareness about CIRA contributes to improvement of Mathematics performance

H_2 Students perception about CIRA contributes to improvement of Mathematics performance

H_3 The availability of CIRA in schools contributes to improvement of Mathematics performance

H_4 Students' access of CIRA contributes to improvement of Mmathematics performance

H_5 Students' use of CIRA contributes to improvement of Mathematics performance

Methodology

The study adopted a sequential exploratory mixed methods design in which data were collected through questionnaires and face to face semi-structured interviews. The questionnaires were administerd to 252 four students and interviews were conducted to five Mathematics teachers. The simple random sampling was employed to select 252 students from five public secondary schools in Nyamagana City – Mwanza region. The five schools were also randomly sampled. Nyamagana City was purposively selected due to its favourable geographical location at the heart of the region. It was expected such reports to be adequately available and used in schools for improving Mathematics performance, as compared to schools in remote areas due to exposure and resource availability. The quantitative data were coded into themes and subjected into statistical package for social sciences (SPSS) software to generate frequency, percentages, and coefficients through multiple regression model. The qualitative data were subjected to content analysis where themes and subthemes were organically generated (Cresswell & Plano-Clark, 2018).

Model specifications

$$IMP = \beta_0 + \beta_1 WMC + \beta_2 PMC + \beta_3 VMC + \beta_4 AMC + \beta_5 UMC\ \varepsilon$$

Whereby:

IMP= Improved Mathematics Performance

WMC = Students Awareness of Mathematics' CIRA in Secondary Schools

PMC = Perceived Usefulness of Mathematics' CIRA among Secondary School Students

VMC = Availability of Mathematics' CIRA in Secondary Schools

AMC= Students Access of Mathematics' CIRA in Secondary Schools

UMC= Students Use of Mathematics' CIRA in Secondary Schools

β_0, β_1, β_2, β_3, β_4, β_5 = Coefficients of variables used in the study

$\acute{\varepsilon}$= Error term.

Findings and Discussions

The statistical tests were conducted to evaluate the effect of candidates' item response analysis reports on improving performance in Mathematics subjects. The reliability test results as shown in table 1, indicates a Cronbach's alpha of 0.65, which is reliable and acceptable measure of internal consistence (Tavakol & Dennick, 2011). This means, the data and results are accurate and reliable for generalization.

The Multicollinearity Test

The analysis of associations among independent variables related to candidates' item response analysis reports were tested. Results in table 1 reveals that the Variance Inflation Factor (VIF) for students' awareness, perceived usefulness, and availability of CIRA in secondary schools have a VIF of 1. Such results imply that all the explanatory variables: Students' awareness, perceived usefulness, availability, and access of Candidates Item Response Analysis Reports (CIRA) as independent variables were free from multicollinearity, hence no need of redundancy (Shrestha, 2020).

Table 1: Multicollinearity Table

Variables	VIF	1/VIF
Students' awareness of CIRA	1.06	0.93
Perceived usefulness of CIRA	1.01	0.98

Availability of CIRA in schools	1.15	0.86
Students access of CIRA in schools	2.97	0.33
Students use of CIRA in schools	2.97	0.33
Mean (VIF, 1/VIF)	**1.83**	**0.69**

Diagnostic Tests Results

The results of multiple regression model used in this study was statistically significant and fit for the study as the R-squared was 76% and adjusted R-Squared was 76%. The result means, 76% of the independent variables explained the changes in dependent variable and only 24% of the remaining variables were not used in this study. The Durbin-Watson test results 1.81 which implies that, there is no autocorrelations among variables of the study (Beer & Swanepoel, 1988).

Regression Results

The study tested if Candidates Items Response Analysis reports (CIRA) predict performance in Mathematics subject in secondary schools. The hypothesis had five measurements which were students' awareness, perceived usefulness, availability, accessibility, and use of CIRA in secondary schools. Out of the five measurements, only one which based on perceived usefulness of candidates' items response analysis reports (CIRA) significantly predicted students' performance in Mathematics subject at ($\beta = 0.982$, $p < .000$). The rest of the variables such as students' awareness ($\beta = 0.008$, $p < .391$) and students' access of CIRA ($\beta = 0.004$, $p < .806$) positively but insignificantly predicted students' performance in Mathematics subjects. Further, the availability of CIRA in secondary schools ($\beta = -0.006$, $p < .616$) and the use of CIRA among students in secondary schools ($\beta = -0.001$, $p < .942$), negatively and insignificantly predicted students' performance in Mathematics subject.

This suggests that, candidates' item analysis reports, as examiners' feedback, had little contribution on improving performance in Mathematics subject in secondary schools. That means, the recommendation given by examiners to improve teaching, learning and Mathematics skills in such reports are not put into use. As a result, little positive improvement in examination performance year after year is observed. The result deviates from feedback intervention theory which emphasize the use of feedback as a tool for intervention strategies towards improved performance (Luger & DeNis, 1996). Also, the results differ from previous studies on availability, accessibility, and effective use of feedback reports to improve performance in Mathematics subject (Sambell et al., 2018; UCL, 2017; Stovner, 2021; Yusoff, 2013).

Table 2: Regression Table

Variables	**Coefficients**	**t-statistic**	**Sig**	**Decision**
(Constant)	.035	.520	.603	
Students' awareness of CIRA	.008	.858	.391	Rejected
Perceived Usefulness of CIRA	.982	.78.32	.000	Acceptable
Availability of CIRA in schools	.-.006	-.502	.616	Rejected
Students access of CIRA in	.004	.246	.806	Rejected
Students use of CIRA	-.001	-.073	.942	Rejected
Diagnostic Tests				
R-Squared	76%			
Adjusted R-squared	76%			
F-statistics	1035.624			
Prob(F-statistics)	0.00000			
Durbin-Watson Test	1.814			

Thus, the multiple regression model of this study is:

$IMP= 0.008SWC+0.982PIC – 0.006ACS+0.004SAC-0.001UCS+ \varepsilon$

The model is fit for the study because the Prob F-Statistics is 0.0000 which is not above 0.5 as the rule of thumb.

Descriptive Results

The descriptive analysis of qualitative data was conducted to validate the quantitative data. The results in frequency and percentage are presented in table 3.

Table 3: Descriptive Results on the Effects of Candidates' Items Response Analysis Report on Improving Mathematics Performance in Secondary Schools

Variables	Frequency	Percentage
Students who are aware of candidates' items response analysis reports in secondary schools	39	16
Students' who perceive candidates' items response analysis reports as important in Secondary Schools	153	61
Students who noted the availability of candidates' items response analysis reports in Secondary Schools	21	8
Students who accessed candidates' items response analysis reports in secondary schools	15	6
Students who used candidates' items response analysis reports in secondary schools	11	4

Source: Field data (October, 2023).

Students' Awareness of Candidates' item Response Analysis Reports

Students gave their responses on whether they were aware of the candidates' item response analysis reports or not. Out of 252 students, only 39 (16%), indicated that they were familiar with such feedback reports; the rest 213 (84%) students were not familiar. When asked the reasons for not being aware of such reports, most of the students

declared that they have never seen them; so, they are not aware of them. Triangulating such information, interviews were conducted to Mathematics teachers. Teachers were asked: "Are your students aware of the candidates' item response analysis reports?" One of them commented:

> *We normally receive such reports every year. However, a single copy of the report for a class of 250 students is not enough. Since it is a single copy provided, it is retained by the teacher himself* (Mathematic teacher school A: October, 2023).

This suggests that, most of the form four students in secondary schools (84%), were not aware of the candidates' item response analysis reports. Lack of awareness suggests that they cannot utilize them to improve their performance. This result deviates from the feedback intervention theory which requires students to be aware of the feedback in order to plan for intervention strategies (Luger & DeNisi, 1996).

Students' Perception on the usefulness of Candidates' Item Response Analysis Reports

Students supplied their perceptions about the usefulness of candidates' item response analysis reports on improving their performance in Mathematics subject. Out of 252 students, 153 (61%), perceived candidates' item responses analysis reports as useful for improving the performance of Mathematics subject. When asked the reasons for their responses, most of the students said that such reports are important to enable them identify common mistakes in mathematical operations and how to avoid them. Also, they may help them to make proper work arrangement and develop skills for solving mathematical questions. Triangulating such information, interview questions were asked to Mathematics teachers "What are your views on the usefulness of

candidates' item response analysis reports on improving performance in Mathematics subjects?" One of them noted that:

> *The reports indicate the best answers, moderate, and the worst students attempt. Thus, they may enable students to learn the best ways of sketching, drawing and calculations. They enable students in solving past papers as they serve the role of marking schemes* (Mathematics teacher, school B: October, 2023).

This suggests that students perceive such feedback reports as essential for improving their performance. It can be argued here that, if students are exposed to such reports, they can utilize them. This is in connection with previous studies which also suggest that feedback reports are essential in performance improvement (Naroth, 2010; Peason, 2016). The main difference between this study and the rest is that, while in those studies students believe that feedback is useful and are utilized to correct students' misconception, in this study, students perceive feedback reports as useful but they do not make effective use of them due to lack of awareness, unavailability and accessibility of such reports (Bee & Kur, 2014). This revelation suggests that perceiving usefulness without an actual use does not yield positive results, hence a need for intervention to stimulate the actual utilization of those reports.

The Availability of Candidates' Item Response Analysis Reports in Secondary Schools

Students were asked about the availability of candidates' items response analysis reports in their schools**.** Out of 252 students who gave their responses in this study, only 21 (8%), pointed out that such reports were available in their schools. A follow up question was asked about the place where such reports can be found in their schools. The places mentioned, included: The school library, academic office, the second master's office and the NECTA website. Triangulating such

information, an interview question was asked to the Mathematics teachers "Are candidates' item response analysis reports available in your school?" All teachers relied "*Yes, they are available*." When asked a follow up question on their whereabout, they had mixed answers between library, second master's office and academic office, just like their students. Then they were asked to locate any of the reports but they could not, giving different excuses. This suggests that there is poor management of such reports in schools; most of the students and teachers were not sure about their whereabout (Yusoff, 2013; Garyson, 2018; Santos & Pinto, 2010). Arguably, with such findings, there is a need to place such reports in a single place, for instance, school library for students' and teachers' consumption.

The Accessibility of Candidates' Item Response Analysis Reports in Secondary Schools

Students were asked if they have ever accessed the candidates' item response analysis reports in their schools. Out of 252 students, only 15 (6%), agreed that they had an access to such feedback reports in their schools. Triangulating such information, interview questions were asked to Mathematics teachers "Do your students access the candidates' item response analysis reports?" One of the teachers commented:

> *In most cases, students do not access print reports because reports are few compared to the number of students. Therefore, we identify key issues from the reports and communicate them to students in classes* (Mathematic teacher, School D, October, 2023).

The results imply that there is little access to feedback reports among form four students in secondary schools. The lack of access to such document affects negatively the utilization of such feedback towards the desired performance. This result differs from other studies which

found that effective feedback is accessible to all potential stakeholders who are required to take intervention measures (Barana et al., 2021; Halthe & Tmperley, 2007). That means, if the reports are available in schools and in the NECTA's websites but they are not accessed by the beneficiaries, the reports are meaningless as they do not serve the purpose and objectives of their presence.

The use of Candidates' Item Response Analysis Reports in Secondary Schools

Students were asked if they had ever used the candidates' item response analysis reports to improve their performance. Out of 252 students, only 11 (4%), revealed that they had ever used candidate item response analysis reports in their schools. During interviews, Mathematics teachers were asked "Are candidates' item response analysis reports used in your school to improve performance in Mathematics subject?" One teacher pointed out that:

> *In our school with 32 streams, we are only two Mathematics teachers; the teaching load is too huge to engage with such reports. I just struggle to accomplish the syllabus* (Mathematics teacher from school B, October, 2023).

This suggests that teachers in secondary schools do not influence their students to make use of feedback reports which affect the actual use of them. This result is contrary from the feedback intervention theory which insists on taking actions after receiving feedback. Therefore, feedback which is not used to improve performance is less relevant and a waste of resources (Luger & DeNisi, 1996). The results also differ from previous studies which instead on the use of feedback (Stovner, 2021; Koskinen & Pitkanieni, 2022). That means, if the reports are

prepared and distributed but not put into use to improve performance, the preparation of such reports is a waste of resources.

Conclusions and Recommendations

It is clear in this study that most of the students in secondary schools were not aware of candidates' item response analysis reports, although the printed copies are distributed by NECTA to schools and as well accessible online through NECTA's website. Further, lack of awareness on their availability in their schools and NECTA's website affects negatively their accessibility and use, hence little contribution on improving performance of Mathematics subject. Based on this observation, the study concludes that NECTA's feedback has not yet fully utilized so as to improve performance of Mathematics subject, hence a dire need for intervention mechanism. The study, therefore, recommends for Tanzania Institute of Education (T.I.E) and the Agency for the Development of Education Management (ADEM), as in-service teachers' professional development agencies, to incorporate CIRA in their training package to promote their use. Further study may develop training programme for school heads, teachers, and students on the effective use of examiners' feedback for improving academic performance.

Implication of the Study

The findings of this study may serve as feedback to the National Examination Council of Tanzania on the use of their product and services. To the ministries dealing with education, the findings of this study may be a tool for intervention on the effective utilization of the teaching and learning resources in schools. To the agencies for teachers' professional development like Tanzania Institute of Education (TIE) and the Agency for the Development of Education Management (ADEM), the study is a training need assessment report.

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