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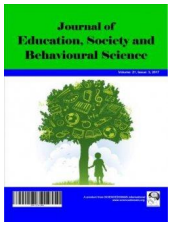

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Effectiveness of Feedback and How It Contributes to Improved Instruction and Learner Performance: A Case Study of Newly Qualified Mathematics Educators in Johannesburg West Schools in Gauteng Province

Chinangure Farai[1*], Lawrence Mapaire[1] and Andrew Chindanya[2]

[1]Mfundo Development Foundations, Da Vinci Institute, South Africa.
[2]Great Zimbabwe University, Zimbabwe.

Authors' contributions

This work was carried out in collaboration between all authors. Author CF designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author LM managed the analyses of the study. Author AC managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The purpose of the study is to re-emphasis the importance of feedback and show how it could be used to improve instruction and learner performance in mathematics. The study adopted action research design that resulted in the collection of both qualitative and quantitative data through observation checklists, self administered questionnaires and in-depth interviews. A sample of grade 6 newly qualified mathematics educators from Johannesburg west schools was randomly selected for the study. The data was analyzed through the thematic approach. The study established that the educators observed did not provide immediate feedback. Planning or preparation was not informed by the feedback from previous lessons. Errors that were indicators of misconceptions were not identified and corrected in their marking. Furthermore, teachers did not move around to probe and discuss with individual learners how they got their answers. Feedback was largely by educators, yet

**Corresponding author: E-mail: flchinangure@gmail.com;*

its purpose was to inform instruction. The educators employed the talking method that was not child centered. The use of the traditional chalk and talk method did not take into cognizance other approaches that could capture learners' interests. The study established that there was a need for effective mentoring and in-class training for newly qualified mathematics educators who had acquired their teaching qualifications through open distance learning. There was a methodological gap that could have resulted from lack of mentoring during teaching practice. Furthermore schools did not fully support newly qualified educators due to the fact that some of the heads of departments for sciences had not specialized in mathematics. The study also found that the newly qualified educators delayed feedback due to too much work load as some of them were teaching too many subject areas. The study recommended intensive mentoring and coaching of both new and experienced educators during teaching practice so that they could share the right practices at the school level.The study further recommends that teachers should value the learners' work and effort by giving prompt, corrective and immediate feedback. Officials who design annual teaching plans should leave enough time for feedback and revision. Congestion in the primary school curriculum contradicts the value of feedback and self regulation. The annual teaching plan should provide enough time for teachers to elaborate on concepts that are not well understood by learners towards the end of each term.

Keywords: Feedback; marking; instruction; errors; misconception and performance; self-marking; peer marking; group marking; oral feedback; written feedback; connectivity.

1. INTRODUCTION

My work as a mathematics mentor for mathematics educators in Johannesburg west district in Gauteng Province exposed me to challenges that were major impediments not only to mathematics educators but to most educators in the primary school. I have focused on feedback, particularly marking as a major challenge that gave educators a hard time. Most educators went for weeks without giving learners adequate feedback but continued to teach new concepts before they got enough feedback on the concepts that were already done. The educators complained that learners had lost interest in school work because they did not do homework or finish class work, yet the same learners spent countless hours glued to video games, social networks, and internet and watching movies on television [1]. The attention being paid by learners to technology was supposed to be seen as an advantage that had rejuvenated the learner's quest for new information and skills. What educators did not understand was that society is not static; it was continuously changing in response to the forces imposed on it by the environment both natural and human-made [2]. Thus, while the video games, social networks, internet tasks and movies provided the learners with immediate feedback, educators delayed the feedback and sometimes they did not give it at all. What reason did learners have to do or finish work that was accompanied by outdated feedback, sometimes showing wrong answers without accompanying comments or guidelines? In light of this practice, learners had no reason to do homework and finish work because the instruction and feedback often given was not in synch with their styles of acquiring knowledge. To me, technology was the future and what defined learning today and beyond the 21st century [3]. Therefore, if instruction and feedback were not infused into learner centred-technology based methods, school work would continue to have a secondary role to approaches that appealed to learners. In light of the given ideas, I made an assumption that if teachers improved their feedback strategies, new practices could lead not only to improved instruction but learners might be motivated and encouraged to do their homework and improve performance.

1.1 Background to the Study

The value of feedback to teaching and learning cannot be underestimated [4,5,6]. Feedback is a mechanism through which students discover whether they are successful in their work and on track to meet expectations [6]. Studies show that feedback and instruction are two sides of the same coin and it is anticipated that the newly trained educators are competent ambassadors who can rekindle the motivation of learners to have zeal to learn because the new educators have been exposed to integration of technology during their training. Feedback can be technology driven to be in line with what learners experience in their everyday lives. As such, both the old and modern generation must function within its horizons [1,2]. Seen in this light, educators must tailor their instruction to the

diversity required by technological needs of today's learners if they are to remain relevant and less boring to young people who need to be taught the necessary mathematics skills. Providing feedback infused into instruction increases learner satisfaction and persistence and acts as a source of self-regulated learning [7,8] and also contributes to learners adopting productive learning strategies [9].

My work as mentor /coach working with newly qualified mathematics educators prompted me to carry out this study. The marking of learners' work made me feel that the teachers did not understand what constitutes "good feedback". There was no evidence of corrective marking in the books I checked, no errors shown except a cross, no comments given to show the learners how they could get the correct answer or illustration on the procedure to be followed. I felt that because of the failure by teachers to give effective feedback, most of the learners would go to the high schools with a lot of unnoticed misconceptions. Hence, the need for carrying out this investigation in order to establish ways by which mathematics educators might improve the quality of feedback so as to improve students' performance.

This was a cause for concern because all of those schools were deficient in Mathematics in the Annual National Assessment. Was this practice not one of the discrepancies that led to poor mathematics results in our schools? In a study examining the importance of feedback, [10] revealed that learners who were given feedback and were assisted by the teacher or peers to correct misconceptions did well in mathematics and were more strongly motivated to finish their work than those learners who did not receive any feedback. Furthermore, learners who were given immediate feedback were finding it easy to correct misconceptions and were motivated to finish work because knowledge of results was immediately available [11,12,13,14].

1.2 Statement of Problem

A survey carried out by [10] showed that poor performance in mathematics was attributed to learners being promoted from one grade to another without basic skills and knowledge required for effective learning of mathematics. An analysis of feedback practices by most teachers in the study showed that the feedback provided did not adequately lead to identification and correction of misconceptions and errors learners made. Research indicates that where teachers take on feedback provision, particularly marking as an added burden, learners continued to be promoted from one grade to the other with a lot of misconceptions that could negatively affect their understanding of mathematics in the future [4,15]. Was this affecting the newly qualified educator who was expected to be techno-literate? It is against this background that this study attempts to answer the following research question. *How effective was feedback given to learners' written work in mathematics and how did it contribute to effective teaching and learning of mathematics at grade six level in Johannesburg west schools in Gauteng province?*

1.2.1 Sub -research Questions

The following sub-research questions were derived from the main research question.

1. What is the nature of feedback given to learners during teaching and learning of mathematics?
2. How do learners respond to the feedback given by educators in mathematics?
3. How does feedback improve quality of instruction and improvement of performance among learners?
4. What challenges do teachers face in providing effective feedback and how can the challenges be addressed?

2. CONCEPTUAL AND THEORETICAL FRAMEWORK

The current study was informed by the fundamental principles of the social cognitive theory [16]. The key principles that inform this study include interaction, scaffolding, mediation, feedback and apprenticeship learning. The social constructivists suggest that individuals construct knowledge through interaction in social contexts [2,3,10,17]. The cognitive constructivists believe that as individuals search for meaning, they test and modify their existing schemas [10]. Feedback given to learners by teachers, adults, peers or technological programmes helped to modify the learner's existing schemas to a new level of understanding. According to [18], to assimilate new ideas, individuals reconstruct their understanding by resolving a disequilibrium that is caused by a new idea or concept introduced by another person or programme [10]. When an educator or programme or game indicates a mistake made by the learner, there is mental disequilibrium in the learner's mental

reasoning. As a result, the learner would try to resolve the disequilibrium by correcting the existing schema or misconception through repetition, questioning others, or collaboration with other learners. Therefore, teachers should expose learners to programmes that show misconceptions and provide comments so that learners would be able to construct their own knowledge. Provision of feedback to learners enhances better understanding of concepts.

Disequilibrium can also be resolved by a discussion between the learner and the teacher. This can be enhanced through explanation or questioning. Effective reconstruction of knowledge can be achieved if feedback that is written is closely linked to a discussion or dialogue related to the errors or misconceptions reflected in the learners' work. Revision of any given piece of work in the classroom is a necessity. [10] indicates that feedback creates opportunities for the educators to devise methods of using concrete materials or illustrations that would enable the learners to discover knowledge and assimilate new concepts. Thus, feedback is an integral part of instruction which leads to better understanding of mathematics.

The social constructivists suggest that individuals construct knowledge through interaction in social contexts [2,10,17]. The concept of interaction implies that the teacher, programme or social network group provides feedback that would help the learner to move to a level of higher mental functioning [2].

The social constructivists' theory emphasizes that feedback helps to place acquisitions of new concepts into the learner's zone of proximity development (ZPD). The ZPD is the distance or gap between what the child can do alone and what he/she can accomplish with the aid of more capable adults or peers [16]. This assumption places feedback at the centre of effective teaching. Therefore, by providing constructive feedback the teacher would provide assistance to the learner, facilitating understanding of concepts.

3. LITERATURE REVIEW

3.1 Nature of Feedback Given to Learners during Teaching and Learning of Mathematics

Feedback can be provided in written comments, spoken, or in the form of grades or scores. As has been pointed out above, [4] explains that feedback needs to provide information specifically relating to the task or process of learning that fills a gap between what is understood and what is aimed to be understood. Feedback can do this in a number of different ways. This may be through affective processes, such as increased effort, motivation, or engagement and cognitive processes, such as restructuring understandings, confirming correct or incorrect responses, indicating that more information is available or needed, pointing to directions students could pursue, and indicating alternative strategies to understand particular information.

Feedback can be provided in an interactive formative way where teachers notice, recognize and respond orally to the child's thinking in a spontaneous and unplanned manner during the activity [18,19,20]. Nevertheless, some researchers argue that written comments are preferable to verbal communications as students can revisit them [8]. Feedback can be provided in the form of marks or comments which are given in written form. Marking is a form of formative assessment if it is done during the lesson. When educators mark, they have an opportunity to meet learners individually through what students do. When educators mark learners' work, they treat learners as individuals and this can be used to match students to specific errors or misconceptions. The timing of feedback is important [4,21]. In mathematics, simple error correction may be most effective if provided immediately. The learners should mark their own books and educators should ensure that they orally discuss the responses with learners and corrections should be made on the spot. Self-marking helps learners to proofread their work and identify the misconceptions they make.

In some cases teachers used highlighters or stamps to show were errors are. This is not the best because it does not illustrate how the error on misconception can be eradicated. Written feedback given to learners should be followed by oral feedback. Oral feedback would enable the educator to explain procedures in calculations and how to do corrections. It helps teachers to monitor and provide guidance to the learners. In addition, [22] notes or written feedback should be corrective, with examples. The diagram below shows how feedback assists students to develop skills [23].

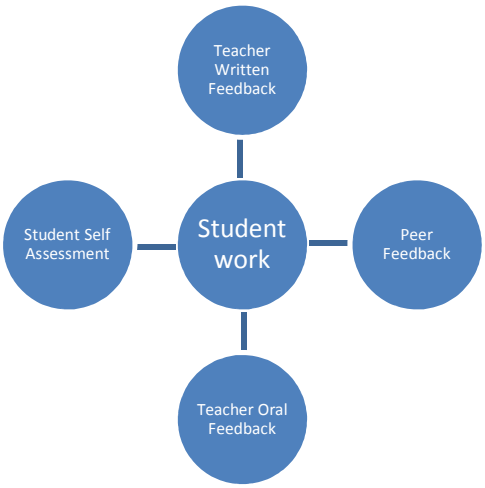

Fig. 1. Types of feedback that can improve learners' understanding

Complete feedback has oral comments to assist with corrections and guidance, and can be supported by written comments, and illustrations showing errors and misconceptions.

This study seeks to establish if these feedback strategies are part of the feedback given to learners in the study context with mathematics students.

3.2 How Learners Respond to the Feedback Given by Educators in Mathematics

The validity and effectiveness of feedback from peers and the self is dependent on interpersonal relationships and psychological issues related to self-disclosure and trust. [17,24,25] noted that students can do self-marking. Self-marking can reduce the turnaround time. Self-marking helps to encourage learners to do corrections and teachers can illustrate concepts not understood by learners as they revise. The process involves marking and discussing responses with the teacher. Learners identify cases that are important, misconceptions are corrected, demonstrations are given and learners can seek clarity on the spot [26]. However, although self-marking reduces the burden of marking on the teacher, some learners may cheat or over score and results may not reflect their real performance [8,12]. Students may also develop effective error detection skills, which may encourage them to seek alternative ways of getting the correct answer. This is important in that students can seek better strategies to complete the task or they can obtain more information from which they can then solve problems or use their self-regulatory proficiencies in the future by self-inquiry through goggling for answers.

Learners should be given opportunities to practice correcting their own learning and to reflect on that practice through self-marking. Research shows that, when suitably organized, self-making can lead to significant enhancements in learning and achievement [27,28]. Self-marking with integrated teacher oral feedback helped students identify and correct more errors. Thus, self-marking should be accompanied by a dialogue between the learner and the teacher [27,28].

The other method of improving quality of feedback is through providing students with opportunities to evaluate and provide feedback on each other's work both in class and through online discussion or through social networks [29,30,31]. This creates opportunities for learners to assist each other and share ideas. [16] describes this process as scaffolding. Scaffolding is the assistance given to learners by more capable peers or adults to correct and understand concepts better.

Feedback should have comments that carry information that helps students troubleshoot their own performance and self-correct: that is, it should help learners to take action to reduce the discrepancy between their intentions and the resulting effects [9]. For example you need to calculate the lowest common multiple first before adding fractions. It is important to consider how to frame feedback comments, what kind of discourse should be used, how many comments are appropriate, and the context in which they should be made to generate the right reaction and action [11].

Peer marking is another process used regularly by educators. It involves learners exchanging books and marking each other's work. As they mark the teacher can illustrate and ask each learner to demonstrate how to calculate the answers. Children can be encouraged to support each other and provide feedback on learning and achievement both in class and when at home through social networks. Children should be given the opportunity to act as response partners. Peers can explain and show each other how to correct misconceptions made in class and through social networks. However, if the

educator fails to check and monitor the marking the learners may cheat or mark wrong answers. In the end the misconceptions may not be corrected. Feedback from learners cannot be expected to be as accurate as expert feedback and peers cannot play the complex role of assessors [32]. Research has indicated that some students and teachers question the validity and reliability of the feedback received through these practices but use of technology can help students to verify their answers [33,34].

3.3 How Feedback Improves Quality of Instruction and Improvement of Performance among Learners

To be effective, feedback needs to be immediate, clear, purposeful, meaningful, and compatible with students' styles and show logical connections. [4,22] explains that effective feedback practices should indicate factual errors, misconceptions and gaps in subject content through learner efforts by inquiry. Furthermore, providing written comments is more effective than providing grades [35,34]. When learners interact with these comments they should be prompted to address the grey areas indicated. Further strategies that increase the quality of teacher feedback include providing timely feedback before it is too late for learners to change their work, soon after submission; providing corrective advice, not just information on strengths/weaknesses; limiting the amount of feedback so that it is actually used; and prioritizing areas for improvement [9]. This type of feedback may be missing if the use of technology is not available to provide on-the-spot remediation and correct guidance.

Another method of improving quality of feedback is to accompany written feedback with dialogue. Discussions with the teacher help students to develop their understanding of expectations, to check out and correct misunderstandings, and to get an immediate response to difficulties [9]. This is in tandem with the principle of social constructivist theory that emphasizes dialogue in shaping the thought process from low mental function to higher cognitive processes [16]. The teacher needs to know how and why learners carry out certain procedures and use this to improve on instruction. However, large classes can make it difficult for the teacher to engage every learner in a dialogue but small groups might be ideal. This previous study also noted that the practice of engaging learners in effective discussions was lacking because the educators themselves had not been exposed to such practices.

Quality feedback needs to enable learners to use the feedback to produce improved work, through for example, re-doing the same assignment or corrections [29]. Feedback provides an opportunity to close a gap between current performance and the performance expected by the educator [33]. Students should identify where they are having difficulties through their own efforts through technology and then share that in social groups. Instruction can be shaped online to improve methodology [34].

3.4 Challenges Educators Face in Providing Effective Feedback and How the Challenges Can Be Addressed

Generally, educators stressed that they provide feedback during lessons but did not use out of class technological strategies to support learners at home. The educators stated that notes and comments are difficult to provide to all learners' work because the classes were too large. On the basis of large classes they often gave brief and sketchy feedback that provided learners with little information to help with corrections [10].

The feedback to be provided to learners should have ideal answers that would allow learners to compare with their work. According to [36] this is taken as a punishment to teachers who feel that self-marking by learners is the best because it is fast and immediate. However, teachers complain that most of their learners do not write corrections. Strong feedback can be further promoted through computer based programmes where learners would play games and check their own answers without the educator's assistance. A study by [10] indicates that teachers cite large classes, too much work and failure by learners to respond positively to feedback for reasons why they may not provide the type of feedback that is needed [28]. These teachers complained that learners did not finish or do homework, and hence they felt that providing written feedback was not very important because learners did not value their comments. In turn, the learners may not finish their homework because they do not receive feedback on time and homework is often over prescribed and it becomes an unnecessary punishment to learners. Scholars suggest that educators can place instruction and feedback in

social network groups when learners are not in class. The programmes can then mark and provide immediate feedback and examples that assist learners.

It may be that teachers feel that marking and providing feedback immediately is not possible because of too much work load. In South African schools, the paper work was reduced to allow the educators enough time to concentrate on their core functions. If feedback is provided immediately learners feel motivated and technology, computer games and programmes do exactly that [5]. Most agree that knowledge of results provides motivation to students and achievement improves [4] but some may not follow through with such processes to enhance learning.

A study by [14] found that mostly teachers complain that written feedback is ignored by learners and learners do not read the comments and giving feedback was a waste to time. Feedback is ignored by learners if it is vague, negative and does not contain guidance and suggestions and if not incorporated into the styles that are used in day-to-day interactions among learners [4]. To improve quality of feedback, educators should provide concrete suggestions on what should change through technology based activities that show how learners can change or correct followed by a verbal explanation later in class [4]. A full complement of feedback comprises *feed up* (where are we going); *feedback*, (how I am going); and *feed forward* (where do I go next?) [2].

4. METHODOLOGY

I was compelled by my position as a mathematics mentor or coach to carry out action research and participate together with the educators who were my mentees. Action research involves a systematic process of examining the evidence on the ground in a practical way to inform educational practices [2]. In light of this, my fellow mentees were my collaborators. Through critical reflection of teachers' experiences and careful examination of the evidence I collected, I could provide suggestions that could inform effectiveness of feedback and influence learner performance positively in mathematics. Data was collected through observation checklists, questionnaires and in-depth interviews among all 40 mathematics educators who worked with me. Demographical data was not collected because it was not used to answer any of the research questions.

4.1 Ethics Clearance

Permission was sought from Gauteng Department of Education and Johannesburg District. Teachers gave informed consent to participate in the study for the three years.

5. FINDINGS

5.1 Observation Checklist

The feedback practices by all participants were recorded on a checklist that is given in Table 1.

Table 1 shows that all (100%) of these teachers agreed that they used peer marking every day. Ninety per cent (90%) of the teachers agreed that they used the telling method and did not use learner centred methods to explain how to get answers. Many (87,5%) teachers do not use computer games to teach mathematics. Most (82,5%) acknowledged that learners did not do corrections while only 12,5 had all their work marked in 14 days. The majority of the participants (72,2%) indicated that there was no time to revise and 62,5% taught new concepts before revising previous concepts.

5.2 Responses to Questionnaire Items

Most of the teachers did not know their learners by name. They only know learners who were naughty and bright. The comments that were frequently provided may have been damaging the learners' egos. The following extracts show this response.

> *I teach too many learners. I do not remember their names. (Female participant 1)*

The teachers expressed that they did not have time to mark. The learners were collected by their transport very early so the teachers could not work with students to revise with them.

> *I have too many subject areas I am teaching to concentrate on mathematics. (Male participant 1)*

The educators did not ask learners to explain how they got the answers. They also did not write comments to guide them. They stated that they had no time to do this. The statements below help to explain the above sentiments.

Table 1. Observation checklist

Variable		Responses			
		Female	Male	Total	Percentage response
All work was marked in the last 14 days.	Y	0	5	5	12,5
	N	20	15	35	87,5
New concepts are taught before previous one was marked.	Y	15	10	25	62,5
	N	5	10	15	37,5
I do not write comments after marking.	Y	12	16	28	70
	N	8	4	12	30
I explain answers to learners.	Y	20	16	36	90
	N	0	4	4	10
I use peer marking.	Y	20	20	40	100
	N	0	0	0	0
Some the answers were wrong but not shown in the feedback.	Y	13	18	31	77,5
	N	7	2	9	22,5
Most learners do not do corrections.	Y	20	13	33	82,5
	N	0	7	7	17,5
We do not have enough time to revise given work.	Y	17	12	29	72,5
	N	3	8	11	27,5
The curriculum is too congested.	Y	15	15	30	75
	N	5	5	10	25
I have no time to assist learners who struggle.	Y	15	15	30	75
	N	5	5	10	25
I use computer programmes or games to teach mathematics.	A	15	20	35	87.5
	Dis	5	0	5	12,5

We have no time to ask learners to explain. We just explain to them and then give written work (Male participant 4).

The educators were supposed to get learner feedback in order to use it to improve instruction. By probing they should identify gaps in the learners' knowledge and then assist with correct processes. This did not happen. The statement below shows what educators typically did.

The learners are hyper. They rarely listen to us. You can use one or two questions to get their feedback but most of the time we just write the answers for corrections for them to copy on the spot (Male participant 7)

The educators rarely used technology in giving feedback or encourage their learners to use social networks to give each other feedback. The statements from educators help to explain the above conclusions.

We were never introduced to the use of technology so our skills are limited. There is no way we can promote use of self-regulated learning because our training did not expose it to us. (Female participant 1)

The teachers revealed that they were the main sources of feedback given to learners and they did not give room for students to assist each other or explain to others. The only opportunity available was to give students answers and mark each other's work. The responses below help to clarify the above trend.

We have never asked learners an opportunity to set questions and decide on the criterion for assessing the quality. (Male participant 6)

Group work is a non starter. It is time wasting and learners are not disciplined in this area. Immediate feedback cannot happen.(Male participant 1)

Responses from in-depth interviews on how quality of feedback can be improved through technology shows that the cost of bundles was prohibitive and the educators had not been trained adequately on how to use technology. Some pointed out that unless their salaries were increased, use of technology to them meant more work and therefore they needed to be paid more. The following verbal quotes illustrate these views.

The training is piecemeal it does not give us enough skills and confidence to try new things. (Female participant 4)

The schools cannot afford to support us because the bundles are too expensive; all our computer labs are closed due to lack of connectivity on a day-to-day basis. (Male participant 10)

Most of the educators who mentored us during teaching practice lacked ITC skills. They did not appreciate its usage hence we did not even try it at all. (Male participant 10)

Most learners do not finish homework and written work because they feel that teachers are boring; they do not understand computer games or understand cartoons. We are not even allowing learners to bring phones to schools to have. (Female participant 1)

Schools did not fully support newly qualified educators due to the fact that some of the heads of departments for sciences had not specialized in mathematics. There was a methodological gap that could have resulted from lack of mentoring during teaching practice. Furthermore schools did not fully support newly qualified educators due to the fact that some of the head of departments for sciences had not specialized in mathematics during the four years of training.

We are not supported by our heads of departments because they did not specialize in mathematics education. They have little knowledge in the subject they supervise (Female participant 1)

During our training we were not assisted in this feedback thing. It is learning the hard way. (Female *participant 10)*

Errors that were indicators of misconceptions were not identified and corrected in their marking. The educators did not having enough knowledge of the value of feedback. The views given below help to shade light on the issue.

This feedback thing is new to us .Our mentors did not visit us during teaching practice and no one assisted us on this concept during the four years (Male participant 1).

Educators delayed feedback due to too much workload as some of them were teaching too many subject areas.

6. DISCUSSION

Feedback from teachers is often damaging and biased against some of the learners. Teachers base their feedback comments not only on what learners fail to do but on other factors such as playfulness, insubordination, and absenteeism. This is often damaging on the learners' drive and ego. This finding is in tandem to findings by [30]. Self-feedback often obtained by a learner on their work is intrinsic in nature. It propels the learner to improve and reflect on the quality of their work unlike what comes from outside learners.

The curriculum assessment policy statement for mathematics is too congested. It does not provide ample time for giving enough feedback. To be precise, the specialists who designed the mathematics curriculum did not consider that feedback is critical because it informs revision and correction. This study established that students were given answers by their educators and they received feedback based on the views of their educators. The findings from this study show that the educators do not understand the role and value of stimulating live feedback. According to [20,25,36,34] feedback helps learners to set goals and how to achieve them. It is assumed that failure by educators to provide meaningful feedback incapacitate learners' efforts and abilities.

The teachers should give learners the experience to do self-assessment and assess their peers' work. Giving learners an opportunity to assess themselves and analyse feedback from their peers empowers learners and helps them develop self-regulation skills [4]. Learners can be sources for feedback for their own learning if given an opportunity to explain how they got answers in a language they understand. This finding is consistent with what was established in earlier studies that showed that students can be sources for their own feedback [34], students can manage to reflect on the quality of their own work [20], have powerful impact on performance [31], and that teachers should provide opportunities for reciprocal teaching that does not take away from the students' context, culture, and language.

Teachers do not have enough time to regularly and promptly respond to individual needs of each learner. This finding was established in studies carried out by [1] on the integration of technology in teaching mathematics. More offline

programmes should be made available to learners [1]. Feedback from technology goes beyond feedback that is ego damaging, insulting and biased against certain learners [31]. Therefore, to ensure that feedback is more feasible and practical, educators should make learners aware of the importance and value of feedback. This can be done through encouraging collaborative learning, encouraging learners to set criteria to inform feedback and providing enough time for revision that is learner driven [25,27,28]. In contrast to this claim from previous research, the present study found that most educators were opposed to using group work and collaborative learning strategies because these were thought to be causing discipline problems.

The study established that most educators stamped learners' work instead of giving corrective feedback. Teachers spent very little time with their learners and rarely talked about learners' work with their learners. Teachers rarely sit and discuss learners' challenges. Likewise learners cannot confide in strangers who rarely remember their names. Yet research studies [30,34] show that for feedback to be effective, teachers should provide supportive conditions for students to set goals, criteria for assessment, and share their experiences with learners in a trustworthy relationship where confidential information can be shared. The study found out that because of subject teaching, teachers and learners lacked attachment that would make other conditions of learning applicable. Good relationships generate trust and they also make the process of sharing expectations natural and sharing of challenges between teacher and learner possible [27]. Learners do not trust strangers and they cannot confide in people who negatively judge them and despise their ambition and efforts [24]. The educators were supposed to display a more fatherly and motherly role but due to a lot of pressure they were irritable and not accommodating to learners who should have provided them with valuable feedback.

The findings of this study are in tandem with research evidence emanating from the USA that found that learners spend most of their time on social media networks [5,6] Seen in this light, the educator can take advantage and assign learners more group tasks to encourage them to collaborate and share information. By so doing, more opportunities are also created for the educator to provide scaffolding through various forms of interaction such as whatsapp and Facebook communication among their learners. In addition, the educators can even go on Skype and facilitate video conferencing when learners are not in the classrooms but where they are connected by wifi to receive educator comments on their work [1].

The newly qualified educators agree that technology and its integration is the only way to ensure learner participation and involvement but they lack the skills to implement its use [1]. Using technology as a source of inquiry was what they were used to doing but it was not translated into their teaching practice. While they agreed that integration of games and ITC was the only way to cater to today's learners' needs, they had not been supported to fully apply the skills by their institutions. Seen in this light, the educator can take advantage and assign learners more group tasks to encourage them to collaborate and share information [1]. By so doing, more opportunities are also created for the educator to provide scaffolding through various forms of interaction such as whatsapp and Facebook communication among their learners [4]. The mentoring involved class teachers who had no idea or knowledge on how to implement curriculum with ITC integration. By and large they felt let down by schools that had no connectivity and the curriculum assessment policy statement (CAPS) document that did not mention the use of ITC in the teaching clarification section. Technology in teaching mathematics acts as a source of motivation for learners through the development of communication networks and social network groups where they assist and interact with each other online. To learners, this kind of teaching and learning style is what they can appreciate because they are bound to inquire, investigate and collaborate with their peers to check the correctness of their answers.

In this jurisdiction there are no policies that are imbedded in current technological practices to improve teaching pedagogy. In light of this, the CAPS document needs to be transformed to be in synch with current trends of teaching [1]. If learners were given opportunities to collaborate online and Google for information, they could feel motivated through guided discovery processes and learning could be motivating. From the previous studies, principles of constructivism show that learners construct their own meaning from new information, as they interact with reality or others with different viewpoints from exposure to technology [2]. This gives the educator a new

role defined by facilitating and guiding students to construct their own knowledge [2]. Based on these views teachers need to have knowledge on how they can activate the previous experiences of learners to be in synch with the concepts being taught through a well -structured learning environment [1,2].

7. CONCLUSION AND RECOMMENDATIONS

This study recommends that the learners should be allowed to reflect on the quality of their own work on criteria they set themselves. Since the learners are techno savvy they should be allowed to search for answers from abundant technological resources available and explain to the teacher and others how they got answers. Peer and self-assessment may help students develop sustainable skills which can be used in future studies such as in open distance learning and editing of their own work.

Large classes and shortage of time have constrained educators from fully supporting the learners, hence learners should be trained to take the initiate to improve the quality of their work through self-feedback or assessment.

The study recommends that teachers should encourage reciprocal and collaborative assessment and provision of feedback among their learners. This makes learning more learner centred as learners would rely more on each other thereby developing autonomy and self-initiative to correct their own work. More time should be created in the annual teaching plan to give more room for feedback and correction based on continuous assessment.

There is a need to generate policies that are imbedded in current technological practices to improve teaching pedagogy. The current approaches should simultaneously re-skill educators while re-thinking about the place of connectivity and technology in educational practice. Limiting educators' space in technology during teacher training programmes impacts negatively on the educators' ability to engage learners fully in ways that are consistent with the demands of today's learner. By exposing learners to opportunities to initiate and set goals and how to achieve those, incidences of idleness that lead to discipline problems could decrease.

The study recommends that using technology in teaching mathematics acts as a source of motivation for learners through the development of communication groups and social networks where they assist and interact with each other online. To learners, this kind of teaching and learning style is what they can appreciate because they are bound to inquire, investigate and collaborate with their peers to check the correctness of their answers. It promotes self-regulation and the zeal to discover new knowledge through their own efforts and is rewarded through peer feedback that corrects their own mis-conceptions. The study recommends adopting current trends learners use to acquire knowledge to improve quality of instruction after engaging learners.

The study also recommends creation of supportive conditions that make feedback effective. As established in the study, teachers and learners leave the school too early in the day. If the learners are left to roam the streets too early when teachers have already left the school they would not believe in the value of using their free time to check if they did the correct thing.

The study recommends that teachers should value the learners' work and effort by giving prompt, corrective, and immediate feedback where possible.

In addition, the study recommends subject teaching in the primary school should be re examined because it robs learners of the opportunity to form lasting relationships with their educators. Primary school learners develop cognitively well in an environment where they are attached to people who can model the right behaviour which they can emulate.

The study also recommends that officials who design annual teaching plans should leave enough time for feedback and revision. Congestion in the primary school curriculum contradicts the value of feedback and takes away time for the use of self-regulated learning. Enough time creates an opportunity for teachers to elaborate on topics that are not understood while insufficient time coerces educators to provide feedback to concepts that are poorly understood.

Where heads of departments did not have expertise in mathematics the department was supposed to train lead teachers who had enough knowledge in mathematics to assist educators to develop the right culture of teaching mathematics that could stimulate interest among learners

through effective feedback. This practice should be followed under strict centralized supervision.

The study also recommended that the educators should be allowed to teach not more than two subject areas if they do subject teaching to enable them to have enough time to give feedback promptly and employ methods informed by preparation and planning as required.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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