

## **Level of use of the Five Key Formative Assessment Strategies in Mathematics Instruction in Secondary Schools; A case of Nandi County, Kenya**

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### **ABSTRACT**

Formative assessment is Key in Mathematics instruction and thus requires attention for optimization of learners' achievement. There is need for effective utilization of the five formative assessment strategies (FAS) including; clarifying and sharing learning intentions and criteria for success, engineering effective classroom discussions questions and learning tasks, feedback that moves learners forward, self-assessment and peer assessment. The study investigated the level of use of the five formative assessment strategies in Mathematics instruction in secondary schools in Nandi County, Kenya. Pre-Posttest control Quasi-experimental mixed method intervention design was employed. Research population consisted of 534 Form three students (54% male and 46% female), 33 Mathematics teachers (76% male and 24% female) and 12 school principals (67% male and 33% female). Experimental group were 227 students and 15 teachers while control group were 307 students and 18 teachers. Same topic in Mathematics was taught to both groups of students with experimental group taught using the five FAS, while the control group taught using normal methods for duration of six weeks. Questionnaires, interviews and observation schedule were used to collect data. The results indicated that there was a low utilization of FAS in Nandi County, Kenya (M=3.68, M=4.13 and M=2.0) for the learners, teachers and researcher mean ratings respectively due to lack of understanding and awareness of FAS. Also it emerged that there was lack of understanding of learners' context. It was concluded that teachers do not understand formative assessment strategies in Nandi County, Kenya and there is need to understand learners' context for better utilization of FAS. The study recommends that Ministry of Education should create more awareness and understanding of FAS through more in-service training and Professional Learning Communities, institutions of teacher training and Curriculum reviewers to rethink effective utilization of FAS to improve classroom practices for better learning and teaching.

***Key words: Five Formative assessment strategies, level of use, Mathematics, Instruction***

## 1.0 Introduction

The quality of an education system is a very crucial determinant of economic development and social stability of the nation (Maithya, 2012). Kenya's economy requires a steady supply of scientifically and technologically knowledgeable human resource (Mutahi, 2009). This underscores the immense role science and technology play in the development of a country. Hence, students should be well-equipped with the necessary knowledge and skills in science and technology to perform in the modern economy. Mathematics is a fundamental subject in every educational system that prepares the citizens to take up essential skills in the 21<sup>st</sup> century. The development of highly-skilled and well educated manpower is critical to support an innovative technology- driven economy especially in Kenya as spelt in Kenya Vision 2030. Furthermore, a strong grounding in Mathematics and talent pool is necessary to support the wide range of value-added economic activities and innovations to achieve Sustainable Development Goals in Education (Ministry of Education, Singapore, 2013).

According to Perry (2013), focus in education is shifting from access to quality (UNESCO, 2004; World bank, 2004; World bank, 2011) and one activity strongly promoted by international agencies to improve educational quality is student assessment (USAID, 2011; World Bank 2011). Classroom assessment has been referred to as the continual evaluation of the students conducted with the main intention of enhancing both teaching and learning (Stiggins, Chappuis & Arter, 2014), it is an indispensable component of the teaching and learning process and its' main purpose is to enable the teacher to realize areas that students demonstrate mastery and those that they experience difficulties. Classroom assessments can either be summative or formative. Summative assessments are used to evaluate student learning, skill acquisition, and academic achievement at the conclusion of a defined instructional period typically at the end of a project, unit, course, semester, program, or school year (Stiggins & chappuis, 2014). Formative assessment refers to frequent, interactive assessments of student progress and understanding to identify learning needs and adjust teaching appropriately (Clark, 2008). It typically involves qualitative feedback rather than scores for both student and teacher that focus on the details of content and performance. Teachers using formative assessment approaches and techniques are better prepared to meet diverse students' needs through differentiation and adaptation of teaching to raise levels of student achievement and to achieve a greater equity of student outcomes (Nicol & Macfarlane-Dick, 2006). Through formative assessments, teachers monitor student progress, provide students feedback, and adjust instructional approaches toward improved teaching and learning, (Earl, 2012).

Research has shown that using specific assessment strategies that provide feedback is a powerful tool to accelerate learning (Hauser, 2015). Despite the importance of formative assessment, teachers are not utilizing it to the fullest extent possible (Wyllie & Lyon (2012). Research carried out by the Kenyan National Examination Council (2014) revealed that teachers hardly use formative assessment in classroom instruction and in essence, summative assessments are dominant in Kenyan education system whose focus is exam oriented curriculum. Harlen (2006) notes that high –stake testing creates anxiety and dis-affection among students. . Despite the continued use of summative assessment approaches in schools in Kenya, little has changed in how students perform on national examinations. This is largely attributed to the fact that the current classroom instruction has not led to large gains in learning as measured by these forms of assessment.

## **2.0 Literature review**

A non-experimental, quantitative survey approach was used to test whether the levels of use of formative assessment strategies vary by content area taught (English vs. Mathematics), teacher's perceptions of their knowledge of these practices, and other teacher demographics (for example gender, years of experience, degrees or qualifications). Survey items on formative assessment strategies included specific items from Classroom Assessment for Student Learning Doing It Right – Using It Well. Feedback survey questions were based on Nyquists' typology of feedback. The findings of the study revealed teachers' self-perception of their knowledge of formative assessment practices and participation in professional development activities had a significant association with their level of use of such strategies. In addition, content area taught (English or Mathematics) did have a significant association with the type of feedback provided to students most often. Overall, teachers are not always using effective formative assessment strategies during instruction (Hauser, 2015).

The value and effectiveness of formative assessment in the classroom has gained an increasing amount of attention. A case study investigated internally constructed and externally imposed contextual elements that constrained or facilitated the use of formative assessment by three high school science teachers in China. The research revealed distinct differences among the three teachers and several different factors that constrained or facilitated the use of formative assessment in their instruction. The forms of teacher knowledge that played a critical role in shaping their assessment practices and had a bearing on their ability to convert espoused theories about assessment into actual classroom practice and other externally imposed barriers that constrained the use of formative assessment included expectations, habits, and dispositions of students; the pressure that teachers felt to “cover” all of the curriculum in order to prepare students for the end-of-year, high-stakes exam: an instructivist rather than constructivist approach to teaching (James, 2015).

The empirical support for accelerative practices, ability grouping, and formative assessment does not always translate into practice. This qualitative study sought to explore how teacher expectations about student ability influenced teacher use of accelerative practices, ability grouping, and formative assessment. The findings indicate that the availability and use of formative assessments, coupled with high teacher expectations about student ability, support teacher use of best practices in pacing and grouping strategies (Misetti, 2016).

Research carried out by the Kenyan National Examination Council (2014) revealed that teachers hardly use formative assessment in classroom instruction and in essence, summative assessments are dominant in Kenyan education system whose focus is exam oriented curriculum. Harlen (2006) notes that high –stake testing creates anxiety and dis-affection among students. (Hauser (2015) asserted that teachers are not always using effective formative assessment strategies during instruction. Another study was conducted to explore the perceptions, attitudes and frequency of use of formative assessment strategies of teachers in the Grenadian lower secondary school (Forms 1, 2 and 3). The study involved 252 lower secondary school teachers. Overall the participants had positive perceptions and attitudes towards formative assessment. Significant differences in the perceptions of formative assessment held by trained and untrained teachers as well as in the attitudes towards formative assessment were found. Trained and untrained teachers were found to have similar frequencies of practice of formative assessment strategies. About half of the teachers reported not allowing students to provide input into test construction and encouraging students to engage in journal writing (Young, 2014).

The implementation of formative assessment strategies is challenging for teachers all over the world. A study to evaluated teachers' implementation fidelity of a curriculum-embedded formative assessment program for primary school science education, investigating both material-supported,

direct application and subsequent transfer and furthermore, the relationship between implementation fidelity and teacher variables was explored. German primary school teachers participated in professional development on formative assessment, teachers formed a control group. Teachers' implementation reliability was evaluated via classroom observations student ratings and an analysis of students' workbooks, focusing on the frequency and quality of intended formative assessment elements (assessments, feedback and instructional adaptations). Regarding direct application, treatment group teachers' implementation fidelity was high, with slight variations in quality. Regarding transfer, implementation fidelity was lower but teachers still implemented more formative assessment elements than the control group. Teachers' pedagogical content knowledge and their evaluation of the formative assessment intervention were associated with implementation success (Handrich, 2016).

A study by Kemboi (2015) on Classroom assessment practices by Mathematics teachers in secondary schools in Kenya found out that the new alternative classroom assessment practices (CAPS) namely self assessment, peer assessment and use of portfolios were least used or not used at all by Mathematics teachers. Also he found out that mathematics teachers had little or no neither experience nor training on the use of these types of CAPS, teacher made tests are widely used in schools and in classroom. In addition, he found that mathematics teachers seldom use the information from CAPS to plan for future lessons and that timely use of assessment helps students foster meta-cognitive skills such as positive attitude towards Mathematics and responsibility towards ones' own learning.

In another study, twenty teachers working in elementary and secondary schools were interviewed from 2 school districts in southern Ontario, Canada about their understanding and use of particular formative assessment strategies. Analysis of the interviews followed a constant comparison method and revealed a variety of emerging themes. Results suggested an imbalance in the use of formative assessment methods associated with improvements in student learning and achievement. Many teachers noted tensions in utilizing particular formative assessment strategies such as peer assessment and self-assessment. The discussion focuses on the implications for teacher education reform and in-service professional development so that greater synergy between formative assessment research and practice can be obtained in contemporary classrooms (Volante, 2015).

A study that supports the work of Black and Wiliam (1998), who demonstrated that when teachers effectively utilize formative assessment strategies, student learning increases significantly was conducted. But the researchers also found a "poverty of practice" among teachers, in that few fully understood how to implement classroom formative assessment. The study examined a series of voluntary workshops offered at one middle school designed to address this poverty of practice. Results indicated that teacher workshop participants experienced a growth in their capacity to use and teach others various formative assessment strategies, and even non-participating teachers reported greater use of formative assessment in their own instruction. Workshop participants and non-participating teachers perceived little growth in the area of differentiation of instruction, which contradicted some administrator perceptions (Stewart, 2014).

There is an accumulating research base that supports the effectiveness of formative assessment practices in enhancing the quality of educational outcomes, yet research findings seem to indicate sluggish implementation of these formative assessment strategies in the classrooms. Many factors influence teachers' formative assessment practices including the school environment. A school environment can be broadly characterized by its members, facilities and policies. They are external factors that can affect teachers' practices. In this study, the extent of the influence of a school environment in influencing teachers' formative assessment practices was investigated. Using a qualitative approach, the study examined how two teachers teaching in a similar school

environment conducted their formative assessment practices. The findings revealed that the two teachers exhibited very different formative assessment practices. The implication is that perhaps having similar school environment may not be the only factor that influences teachers' formative assessment practices. This study suggests that perhaps the bidirectional relationships between teachers and their environment play a more significant role in determining teachers' practices (Ranuka, 2016).

Among the present-day means of enhancing student learning, formative assessment is perhaps one of the most important and effective. While formative assessment ideas and practices have been shown to have a proven record enhancing student learning, these practices are slow to be fully integrated into teachers' day-to-day classroom practices. This study describes a collaborative effort among university faculty and public school partners to train teachers in the skills and practices of formative assessment. Regarding teachers' involvement in the formative assessment professional development, findings highlight that , teachers' participation in the professional development efforts did strengthen their understanding of both general knowledge of formative assessment and the use of formative assessment practices, teachers' plans to use the strategies in the future were related to their understanding of these strategies, and in-depth and comprehensive understanding of formative assessment practices were critical to concrete applications of such practices in their classrooms.

With respect to the impact on student learning, an overall effect size of 0.41 was found for teachers who utilized a formative assessment strategy compared with district averages for similar learning objectives when the practices were not use (Reed, 2014). The purpose of this research study was to investigate the level of implementation of formative assessment strategies among Rhode Island high school teachers and students in three districts. Furthermore, the research analyzed the relationship of the disciplines taught the amount and kinds of professional development teachers had, and district urbanicity relative to their levels of implementation of formative assessment strategies. Formative assessment is a bidirectional process between teacher and student to enhance, recognize, and respond to the learning.

The results of a "t" test found significant difference between students and teachers regarding teacher modification of instruction when students are struggling. Students reported that implementation occurs sometimes ( $M = 2.47$ ,  $SD = 0.92$ ), while teachers reported that they almost always change their instructional practice ( $M = 3.67$ ) and with strong agreement among themselves ( $SD = 0.57$ ). A large effect size was calculated ( $d = 1.57$ ). Correlational analysis results showed a significant positive relationship between teachers use of feedback strategies and the amount of professional development received on this same topic ( $r = 0.25$ ) (Burns, 2015).

### **3.0 Methodology**

The study was guided by Wiliam and Thompson (2007) formative assessment framework grounded in Vygotskys' socio constructivism theory and Heritage (2010) model of formative assessment with Pragmatic paradigm. Pre-Posttest control Quasi-experimental mixed method intervention design was employed. This study adopted an explanatory sequential mixed methodology. The qualitative data was used to explain in depth the quantitative findings of this research. Quantitative data were collected using questionnaires (teachers' and students') and observation schedule analyzed by use of frequencies, percentages and means. Qualitative data were collected using interviews (face to face & focus group interviews) and analyzed thematically. Proportionate Stratified simple random sampling technique was used to classify schools into three categories namely: National schools, County schools and Sub-County schools. Only public sub-county schools participated in the study whereas simple random sampling was used to select 12 schools. Furthermore, all the Mathematics teachers and all the students in the selected classes participated in the study. Simple random

sampling method was used to group classes into experimental and control group. Research population consisted of 534 Form three students (54% male and 46% female), 33 Mathematics teachers (76% male and 24% female) and 12 school principals (67% male and 33% female). Experimental group were 227 students and 15 teachers while control group were 307 students and 18 teachers. Same topic in Mathematics was taught to both groups of students with experimental group taught using the five FAS, while the control group taught using normal methods for duration of six weeks. The five formative assessment strategies in the William and Thompson framework (2007) were investigated on their level of utilization. Mixed methods allowed for triangulation within method to validate the findings. The quasi-experimental research design was chosen which involved the use of pre-test, post-test control group design with no randomness on participants instead intact classes of learners and their Mathematics teachers were used.

#### **4.0 Findings and discussion**

To establish the differences in the level of use of the 5 strategies, the responses of both the teachers and students who participated in the study were scored and their means computed before and after the treatment. The students in the experimental group were subjected to the five effective formative assessment strategies by their teachers as those in the control group were not. The results of the teacher and student questionnaire mean scores were computed as indicated in table 1 below.

**Table 1: Teachers' and students' Means of the Experimental and Control Groups on the level of use of formative assessment strategies**

Strategies	Students Data				Teachers Data			
	Experimental Group		Control Group		Experimental Group		Control Group	
	Means		Means					
	B	A	B	A	B	A	B	A
Clarifying and sharing learning intentions and criteria for success	3.90	4.72	3.67	3.89	4.05	4.6	4.14	3.54
Engineering effective classroom discussions, questions and learning tasks	3.78	4.57	3.79	3.60	4.17	4.8	4.062	4.03
Providing feedback that moves learners forward	3.94	4.50	3.87	3.87	4.159	4.89	4.28	3.9
Activating students as the owners of their own learning (Self-Assessment)	3.75	4.42	3.56	3.74	4.093	4.73	4.05	4.18
Activating students as the instructional resources for one another (Peer assessment)	3.24	4.26	3.30	3.49	4.080	4.84	4.23	4.34
<b>Overall Mean</b>	<b>3.72</b>		<b>3.63</b>	<b>3.71</b>				<b>4.00</b>
		<b>4.494</b>	<b>8</b>	<b>8</b>	<b>4.110</b>	<b>4.772</b>	<b>4.152</b>	

(Key: A – After/Posttest; B-Before/Pre-test; E-Experimental Group & C- Control Group)

An analysis of the results as shown in table 1 shows that, before the treatment, the means of the experimental and control groups on the use of the strategy of Clarifying and sharing learning intentions and criteria for success were 3.90 and 3.6 for the students and 4.05 and 4.14 for the teachers respectively from the experimental and control groups. After the treatment, the means of the experimental and control groups on the use of the strategy of Clarifying and sharing learning intentions and criteria for success were 4.72 and 3.89 for the students and 4.6 and 3.54 for the teachers respectively from the experimental and control groups. The results show that there was an increase in the means for the experimental group and a decrease in the means for the control groups. This is attributed to the use of this strategy by teachers on their students. An analysis of the results as shown in table 1 shows that, before the treatment, the means of the experimental and control groups on the use of the strategy of engineering effective classroom discussions, questions and learning tasks were 3.78 and 3.79 for the students and 4.17 and 4.062 for the teachers respectively from the experimental and control groups. After the treatment, the means of the experimental and control groups on the use of this strategy were 4.57 and 3.60 for the students and 4.8 and 4.03 for the teachers respectively from the experimental and control groups. The results show that there was an

increase in the means for the experimental group and a decrease in the means for the control groups. This is attributed to the use of this strategy by teachers on their students.

On the level of use of the strategy of providing feedback that moves learners forward, an analysis of the results as shown in table 1 show that, before the treatment, the means of the experimental and control groups were 3.94 and 3.87 for the students and 4.159 and 4.28 for the teachers respectively from the experimental and control groups. After the treatment, the means of the experimental and control groups on the use of this strategy were 4.50 and 3.87 for the students and 4.89 and 3.9 for the teachers respectively from the experimental and control groups. The results show that there was an increase in the means for the experimental group and a decrease in the means for the control groups. This is attributed to the use of this strategy by teachers on their students.

On the use of the strategy of Activating students as the owners of their own learning (Self-Assessment), an analysis of the results as shown in table 4.12 shows that, before the treatment, the means of the experimental and control groups on the use of the strategy were 3.75 and 3.56 for the students and 4.093 and 4.05 for the teachers respectively from the experimental and control groups. After the treatment, the means of the experimental and control groups on the use of this strategy were 4.42 and 3.74 for the students and 4.73 and 4.18 for the teachers respectively from the experimental and control groups. The results show that there was a higher increase in the means for the experimental group and a low increase in the means for the teachers in the control groups and a decrease in the means of the students in the control groups. This is attributed to the use of this strategy by teachers on their students.

On the use of the strategy of activating students as the instructional resources for one another (Peer assessment), an analysis of the results as shown in table 4.12 shows that, before the treatment, the means of the experimental and control groups were 3.24 and 3.30 for the students and 4.080 and 4.23 for the teachers respectively from the experimental and control groups. After the treatment, the means were the means of the experimental and control groups on the use of this strategy were 4.26 and 3.49 for the students and 4.84 and 4.34 for the teachers respectively from the experimental and control groups. The results show that there was an increase in the means for the experimental group and a decrease in the means for the control groups. This is attributed to the use of this strategy by teachers on their students.

From the table above, it's evident that there is a significant difference in rating by the students and teachers on the level of use after intervention between control and experimental groups. Therefore, students and teachers in the experimental group recorded higher rating as compared with control group.

Researcher made lesson observations to validate on the level of use of FAS and data collected using observation schedule which was both quantitative and qualitative as indicated with five scale Likert (None, Poor, Fair, Good and Excellent).The researcher also wrote notes and categorize the participating teachers as developing, exemplary on every strategy. Mean ratings for the observations were calculated for both the groups before and after the experiment and the findings were presented in table 2.



**Table 2 Level of Use of Five Effective Formative Assessment Strategies as observed by the researcher**

Strategies	Mean Experimental		Mean Control	
	Before	After	Before	After
1 Clarifying learning intentions and criteria for success	2.45	4.54	2.21	2.33
2 Engineering effective classroom discussion (questioning)	2.5	4.13	1.73	1.53
3 Engineering effective classroom discussion (collaboration)	2.67	4.40	1.60	1.67
4 Engineering (Learning Tasks)	1.93	4.30	1.7	2.67
5 Feedback on instruction	1.61	4.47	1.44	1.47
<b>Total</b>	<b>2.232</b>	<b>4.368</b>	<b>1.736</b>	<b>1.934</b>

On the use of the five effective formative assessment strategies, the researcher observed the subjects before, during and after the intervention, scored the results and computed the means. From the findings as indicated in table, clarifying learning intentions and criteria for success strategy, the researcher observed that connection to previous learning, learning objective quality, learning objective implementation and the presentation of criteria for success (Rubrics) were noted with higher ratings for the experimental groups as compared to the control groups.

For engineering effective classroom discussion (questioning) strategy, the researcher observed that this strategy was indicated by the questioning pattern (more of probing questions), wait time for responses, eliciting evidence of learning (reveal students' thinking), determining progress of the learners and use of evidence to adjust instruction and which were noted with higher ratings for the experimental groups as compared to the control groups. For engineering effective classroom discussion (collaboration) strategy observed by the researcher was indicated by the classroom climate, use of small group discussion, use of student viewpoints, communicating expectations to the learners and classroom interactions (teacher-student, student-teacher and student-student) and which were rated higher for the experimental groups than for the control groups.

For engineering (learning tasks) strategy, the researcher observed that there were indications of the connection to learning objective (congruence), clarity of tasks (transparency), relevance of tasks to real life problems (authenticity), student autonomy (student consultation on tasks) and individualized tasks (student capabilities) which were noted with higher ratings for the experimental groups than for the control groups. For feedback on instruction as indicated by focused and action-oriented feedback, related to learning goals, self-assessment, individualized feedback, Peer assessment and feedback loops were noted with higher ratings for the experimental groups than for the control groups. Based on the weight of the majority a table on interpretation of means on five-likert scale was generated and used as shown in table 3.

**Table 3: Interpretation of means on five likert scale**

MEAN	INTERPRETATION	
	Questionnaire schedule	Observation
1.0 – 1.74	Never	None
1.75 – 2.74	Seldom	Poor
2.75 – 3.74	Sometimes	Fair
3.75 -4.49	Often	Good
4.50 -5.0	Always	Excellent

Descriptive findings before intervention based on the weighted means displayed on table 3 above, revealed that majority of the teachers were of the opinion that the five FAS were utilized both often (M=4.11, M=4.15) for experimental and control group respectively, majority of the learners were of the opinion that FAS was utilized both sometimes (M=3.72, M=3.64) for experimental and control group respectively and the researcher observation schedule indicated poor & none (M=2.23, M=1.74) for experimental and control groups respectively. After the intervention the scores for the teachers, learners and researchers' observation schedule increased and majority of the teachers rated always & often (M=4.78, M=4.00) for experimental and control groups respectively, majority of the learners rated always & sometimes (M=4.5, M=3.72) for experimental and control group respectively and the researcher observation schedule rated good & poor (M=4.37, M=1.93) for experimental and control group respectively. On triangulating the findings from the teachers' ratings, learners' ratings from their respective questionnaires and observation schedule before intervention, the overall finding revealed that there was low utilization of the five FAS in Mathematics instruction in Nandi County.

There was need to explore further on the quantitative finding in order to get an in-depth explanation on the factors behind the quantitative finding (low level of utilization of FAS).

Qualitative data were collected using teachers' and Principals' interviews and were analyzed thematically. The qualitative finding revealed that teachers and principals lacked understanding and awareness of FAS in Mathematics instruction, there was inconsistency in the use of FAS, lack of knowledge and skills by teachers and learners on the use of FAS, poor attitudes towards FAS and lack of support in terms of head teacher support, curriculum inclusion, time to plan for FAS due to exam oriented curriculum dictating completion of syllabus on time and the emerging finding was that there was need to understand learners' context for effective utilization of FAS . All these were the findings on factors behind the low level of use of the five effective formative assessment strategies in Mathematics instruction in secondary schools in Nandi County, Kenya which could be a reason why learners' Mathematics performance has continued to be poor.

This finding was in agreement with the findings of (Hauser (2015) whose overall finding was that teachers are not always using effective formative assessment strategies during instruction. Also the finding on level of use is supported by Kemboi (2015) in his study on classroom assessment practices by mathematics teachers in secondary schools in Kenya, who found out that new alternative classroom assessment practices (CAPS) namely self assessment, peer assessment and use of portfolios were least used or not used at all by mathematics teachers. In addition, the finding was also in agreement with research carried out by the Kenya National Examinations Council (2014) which revealed that teachers hardly used formative assessment instruments in classroom instruction.

## **6.0 Conclusion and recommendation**

From the study findings, it was concluded that there was low utilization of formative assessment strategies in mathematics instruction in secondary schools in Nandi County, Kenya as a result of lack of teachers' & school principals understanding and awareness of formative assessment strategies in Mathematics instruction, inconsistency in the use of FAS, lack of knowledge and skills by teachers and learners on the use of FAS, poor attitudes towards FAS and lack of support in terms of head teacher support, curriculum inclusion, time to plan for FAS due to exam oriented curriculum dictating completion of syllabus on time and the emerging finding was that there was need to understand learners' context for effective utilization of FAS . The results of the study showed that, in most schools the teachers and the administration (school principles) understood FAS to be continuous assessment tests and not a process used by teachers and learners during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcome. There was no instance where teachers used all the five formative assessment strategies. The few who tried to use, did not use effectively and consistently as rated by the students and the researcher. Majority of the teachers were rated by the researcher as still 'developing' in the utilization of formative assessment strategies in Mathematics instruction.

This study recommends that the ministry of education should create more awareness and understanding of FAS through more in-service training of Mathematics teachers, school Principals and learners on what and how to use FAS so as to increase the level of use in order to maximize learners learning. Teacher training institutions and universities should review their instructional methods and embrace the use of FAS in order to produce well equipped teachers. Teacher trainees should be assessed on teacher expertise and knowledge on FAS. Teachers' professional Learning Communities should be started in order to train and support teachers on effective use of all the five formative assessment strategies in mathematics instruction. Suggestions for further research were to replicate the same study in other subject areas and to do comparative studies on the same study in order to understand levels of use of the five formative assessment strategies in different contexts.

**References**

- Aboulsoud, S. H. (2011). Formative versus summative assessment. *Education for Health, 24*(2), 651
- Bennett, R. E. (2011). Formative assessment: A critical review. *Assessment in Education: Principles, Policy & Practice, 18*(1), 5-25.
- Black, P. (2012). Formative and summative aspects of assessment: Theoretical and research foundations in the context of pedagogy. *SAGE Handbook of Research on Classroom Assessment: SAGE Publications, 167*.
- Burns, R. (2015). Implementation of Formative Assessment Strategies as Perceived by High School Students and Teachers: Professional Development Implications. *ERIC:https://eric.ed.gov/?q=formative+assessment+strategies&pg=2&id=ED514475*
- Earl, L. M. (2012). *Assessment as learning: Using classroom assessment to maximize student learning*. Corwin Press.
- Handrich, A. (2016). Implementing Curriculum-Embedded Formative Assessment in Primary School Science Classrooms. *ERIC, (23)3, 353-376*.
- Hauser, D. (2015). Formative Assessment Strategies: Levels of Use by High School English and Mathematics Teachers. *Theses and Dissertations. Paper 410, 2-5*.
- Heritage, M. (Ed.). (2010). *Formative assessment: Making it happen in the classroom*. Corwin Press.
- Kenya National Examinations Council, KNEC, (2014). *Kenya Certificate examination report*. Nairobi: Kenya National Examinations Council.
- Kilpatrick, J. (2014). History of research in Mathematics education. In *Encyclopedia of Mathematics education* (pp. 267-272). Springer Netherlands.
- Lyon, C., Thompson, M., & Wiliam, D. (2005). continually adapt instruction to meet student needs. *Assessment, 63*(3)
- Maithya, R., & Mutua, E. K. (2012). Teachers and students perception on effect of extra tuition on academic performance in public secondary schools in Machakos County, Kenya. *Journal of Educational Policy and Entrepreneurial Research, 2*(8), 57-66.

- Michael & Susan Dell Foundation, (2016) *Formative Assessment in the classroom, Findings from 3 districts*. Education First Publishers.
- Ministry of Education, Singapore (2013), "Science syllabus primary 2014", retrieved from <https://www.moe.gov.sg/docs/defaultsource/document/education/syllabuses/sciences/files/science-primary-2014.pdf>
- Misetti, T. (2016). Exploring Teacher Beliefs and Use of Acceleration, Ability Grouping, and Formative Assessment. *Journal for the education of the gifted*: <http://journals.sagepub.com/doi/abs/10.1177/0162353214541326>, 256-264.
- Mutahi, K. (2009). Challenges in curriculum implementation, Quality and Delivery. In *Parents Teachers Association per presented during the Kenya Secondary Schools' Heads Association Conference held in Mombasa, 1st July*.
- Oswalt G., (2013) *Identifying Formative Assessment in Classroom Instruction: Creating an Instrument to Observe Use of Formative Assessment in Practice*. Boise State University. USA
- Perry, L. (2013). *Formative assessment use and training in Africa*. CIES (2013)
- Pinto, J., & Santos, L. (2012, July). Summative and Formative Assessment: A Difficult Dialogue. In *36th Conference of the International Group for the Psychology of Mathematics Education* (p. 315).
- Ranuka, V. (2016). Tale of Two Science Teachers' Formative Assessment Practices in a Similar School Environmen. *ERIC*, (17(2), 12.
- Reed, W. (2014). The Impact of an Alternative Professional Development Model on Teacher Practices in Formative Assessment and Student Learning. *ERIC*, (18)2, 141-162.
- Stewart, T. (2014). Deep Impact: How a Job-Embedded Formative Assessment Professional Development Model Affected Teacher Practice. *ERIC* (3)1, 1-82.
- Stiggins, R. J., & Chappuis, J. (2012). *An introduction to student-involved assessment for learning* (pp. 29-30). Boston: Pearson.
- Thum (2015) Keeping learning on track. A case –study of formative Assessment practice and its impact on learning in Meridian school District.
- William, D., & Thompson, M. (2007) Integrating assessment with instruction: what will it take to make it work? In C. A. Dwyer (Ed.) *The future of assessment: shaping teaching and learning* (pp. 53-82). Mahwah, NJ: Lawrence Erlbaum Associates.

Wiliam, D. (1998). What is assessment for learning?. *Studies in Educational Evaluation*, 37(1), 3-14

Wiliam, D., Lee, C., Harrison, C., & Black, P. (2004). Teachers developing assessment for learning: Impact on student achievement. *Assessment in Education: Principles, Policy & Practice*, 11(1), 49-65.

Young, D. M. (2014). *Iterative solution of large linear systems*. Elsevier.