THEME	:	**ASSESSMENT AND BIG DATA.**
SUB-THEME	:	Use of big and small data in educational assessment
TITLE	:	***Data for learning: Generation and utilization of data in primary schools in Nairobi, Kenya.***

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Abstract

Schools generate and consolidate data all the time in the course of teaching and learning. This data can be used by teachers to improve teaching and learning in their classrooms as well as their schools. Much of the data generated is from formative and summative assessment tests; national tests, learner demographics, the teaching process and context. Teachers are expected to interpret this data for improvement of the teaching and learning in addition to school improvement. Nonetheless, this data often does not provide insight about teaching and learning in classrooms. It is based mainly on analyzed statistics leaving out learning environments, learner characteristics, emotions and relationships that drive learning in classrooms. Making large quantities of data available to schools and teachers may not address the challenges experienced in classrooms. A better understanding of good teaching and how it leads to quality learning outcomes in schools is critical in addressing education problems. Information about details, relationships, conversations and narratives that form bits of data from the classrooms, are crucial in uncovering huge trends in education. Bits of information are frequently hidden in the invisible fabric of schools. Understanding this fabric, which lies in gathering of small data from classrooms and schools, should be a priority for improving education. Therefore, there is need to shift focus to data that is generated by teachers in their classrooms, how it is used to promote learning and the best practice in effective use of data as well as challenges. Multiple case research design was employed in which in-depth interviews and document analysis were used to establish how teachers generated and used data to improve learning in their classrooms. Data was analysed by coding of the key themes of the interviews. Most teachers generated their own data. It is worth noting that, data apparently challenged expectations of staff, pupils and parents; led to transitions and transfers as well as identification of pupils' achievements and setting of targets. Capacity building of teachers' on skills in data collection, analysis and interpretation was imperative.

Key words: Data, small data, school improvement

1.0   INTRODUCTION

Decision making for improvement of teaching and learning is critical in ensuring that learning institutions remain relevant in their ever - changing environment. It is still essential for schools for the reason that, with proper decision making, the schools are able to know where to channel their limited resources, recognize areas of need, improve learners' achievement and also respond to their most pressing needs. Nonetheless, decision making without data can be difficult and sometimes can result in unintended outcomes. For this reason, data is critical in provision of adequate information to inform learning, curriculum implementation and school improvement related decisions.

1.1   Data generation in schools

The constitution of Kenya provides for access to education as a human right. This has led to various initiatives by the Ministry of Education and other stakeholders in ensuring the all children are enrolled in school. Increased enrolment brought with it the challenge of access to quality education. Due to increased numbers in most schools, facilities were overstretched the teacher pupil ratio increased and the learning materials became in adequate leading to low learning outcomes. This brought about a shift in focus from providing education for everyone to provision of quality of education to learners. This is in tandem with the sustainable development (SDG) goal 4 which calls for provision of quality and inclusive education to all learners. Data is critical in addressing the challenges to acquisition of quality of education and teachers are expected to generate this data for decision making. Schools collect data all the time and data -based decision making has begun to receive attention due to accountability for the kind learning taking place in schools. There is also evidence linking use of data in improving learning outcomes (Carlson, Borman & Robinson, 2011). The fact that Basic Education Act of, 2013 provides for free and compulsory education for every child, data is collected to ascertain that this is achieved (Republic of Kenya, 2013).

1.2   Categories of data generated in schools

There has been recent government effort to collect and make use of data in allocation of resources and decision making. The Kenya National Examinations Council provides detailed school specific analysed feedback examination reports to assist in self-evaluation and improvement of learning outcomes. Schools in Kenya have access to national examination performance data, school inspection reports, data on learners, teachers and internal examination tests. Teachers also collect data on learners from their classrooms. Data on absenteeism, discipline, continuous assessment tests, and learners' background characteristics. Schools have numerous data collected in the day to day running of the institutions that if understood and used correctly can turn around the schools' fortunes.

1.3 Principle of data use in schools

There is great potential for data to support and improved learning (Spillane, 2012). Proper use of data may lead to improved instruction, identification of problems and areas of need, motivation of students and staff, enhancement of individual self reflection and learning. Other sources argue that data may be used to provide evidence to support decisions as to where to focus resources and teaching meeting accountability demands and planning (Kirkup et al, 2005). For example data may aid a teacher in changing instructional strategy, professional development and improving learner understanding by re-teaching some difficult to understand topics which can lead to improved achievement of learning competencies. Policy makers' support of data use is resolute. They argue that learner achievement levels improve when teachers base their decisions on data, since this helps to focus teaching and learning (Spillane, 2012).

1.4 Statement of the problem

Schools are faced with challenges that may be solved by generation, understanding and proper use of data. The data can be generated and used in schools by teachers to make decisions about learning. More often than not, teachers come up with strategies to tackle these problems. These strategies may be as a result of observations, information and data gathered over a period of time. These observations and data may be documented or not. Schildkamp & Kuiper (2010) argue that, an understanding of how teachers collect, interpret and use data within different contexts is significant. Data in the hands of well trained teachers can lead to increased learner achievement and the general school improvement. It is against this backdrop that the study seeks to establish the kind of data generated in primary schools, its use, impact on learning and the challenges faced by teachers in acquisition and use of data.

1.5 Research questions

The study sought to answer the following questions:-

i) What type of data is available in schools?
ii) How is the available data used to promote learning in schools?
iii) What is the good practice in effective use of data?
iv) What are the challenges to data use in schools?

1.6 Significance of the study

Teachers endeavour to provide personalized education to learners despite classrooms having a wide range of academic levels. To deliver this, they need to systematically and routinely use data to guide instructional decisions and meet students' learning needs.

At the managerial level, contextualizing the problem being researched underpins the implications drawn out for professional practice. The findings from the cases indicate the necessity of the teachers, school management and other key stakeholders to

engage actively in promoting data use in promoting learning and school improvement. The findings of the study have policy implications too. The study provides insights especially for education institutions that are grappling with issues of data generation and use. The study unravels the challenges facing teachers in a bid to generate and use data to increase learning outcomes in primary schools in Nairobi County. Nonetheless, the study findings and recommendations may be replicated in other counties in Kenya.

2.0   Research methodology

The study employed multiple case research design to explore data generation and use by teachers in improvement of learning and the school. The same questions and instruments were used to collect data from teachers in four primary schools in Nairobi County. Although case study does not allow generalization, it was deemed appropriate by the researcher since it provides an in-depth evidence of phenomena and allows for replication of the findings thereby making them more compelling and robust (Yin, 1994).

2.1   Sample and sampling procedures

The researcher employed non-probability purposive sampling to select three schools from each sub- county. Purposive sampling is based on the assumption that the researcher is able to select elements which represent a typical sample from the appropriate target population (Kerlinger, 2000). With non-probability sampling technique the researcher was not able to include a large number of samples in the study which is in line with qualitative research whose aim is to explore the quality of the data (Nachmias, 1996).

2.2   Sample size

Four schools were purposively sampled based on school performance based on final national examination results (KCPE) of 2016 and category of school, that is whether public or private. The best performing public and private schools in the national examinations were purposively sampled. The sampling of schools was homogenous so as to allow for replication of the findings across cases (Patton, 2002).

2.3   Respondent sampling

Respondents were also purposively sampled. Five teachers per school were included in the study i.e. two class teachers, a teacher of English, teacher of Mathematics, Guidance and counselling teacher and a head teacher per school. Purposive sampling allows researchers to select people or events which have good grounds are critical for answering the research questions (Dane, 1990). The researcher consequently selected participants who most likely generated or handled data in school.

2.4   Respondent sampling

Respondent	Public school 1	Public school 2	Private school 1	Private school 2	Total
Head teacher	1	1	1	1	4
Guidance & counseling teacher	1	1	1	1	4
Class teacher	2	2	2	2	8
English teacher	1	1	1	1	4
Mathematics teacher	1	1	1	1	4

2.5   Study approach

Qualitative data collection techniques were used. In-depth interviews and document analysis were used to collect data. Qualitative techniques produce words in the form of remarks and statements aimed at finding out the respondents' feelings, attitudes as well as experiences with data generation and use from their own point of view. This ensures that the explorative nature of the study is upheld and that an in-depth understanding of data generation and use by the respondents is revealed.

2.6   Research instruments

The main data collection instruments were in-depth interviews and document analysis.

2.6.1   In-depth interviews

Interview schedules were used to collect data from school head teachers and teachers. The interview guides were developed based on the objectives of the study. The interview schedules were used to collect data on how teachers gathered data from their classrooms, the type of data available in school, purpose for which the data was collected and challenges experienced by the teachers in the course of data generation and use.

2.6.2   Document analysis

Document analysis is a procedure of qualitative analysis that requires location, interpretation analysis and making conclusions about the evidence presented (Fitzgerald, 2007). Documents showing data available in schools and its use were collected and analysed. These documents provided other data for corroboration with data from the interviews. They also provided information used for clarification during the interviews with the teachers besides providing more inferences for other areas of investigation.

2.7   Piloting of the instruments

The pilot study helped to refine the data collection plan. Yin (1994) argues that, a pilot case is used to assist the researcher to develop relevant lines of questioning thereby providing a conceptual definition of the study. The pilot case was selected in an area close to the area of study. The interview instrument was piloted in a school that was not selected for the study. The purpose was to enable the researcher ascertain context reliability and validity of the instruments as well as procedure.

2.8   Data analysis

Mills asserts that it is better to begin data analysis immediately after collection in a qualitative research so that it guides as a guide for further data collection. As such, samples of documents from respondents that contained various types of data were studied before proceeding to the interview sessions. This allowed the researcher to establish trends in data generation and utilization before proceeding to the next school. All interviews were audio taped, transcribed and analysed for themes in each interview in line with the research questions. Themes on generation of data were coded under subthemes such as assessment, background data, discipline issues, class records, and learner inventory. Similarly, interviews on data use were coded under sub-themes such as instructional use, accountability, monitoring and identification of areas of need. Themes on challenges of data generation and use were also coded under availability of data, organization of the school and characteristics of the user. The themes were then summarized in tables showing the how data was generated, the data available, how it was used and the challenges experienced by teachers in generation and utilization were prepared for each school and comparisons made across schools.

2.9   Reliability and validity

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trial (Mugenda and Mugenda, 2005). The pilot study was used to ascertain the reliability of the interview schedule. This enabled the researcher to assess the clarity of the interview items so that those items found to be vague were changed to improve the quality and context reliability of the research instrument. Validity was fostered through triangulation, member checks, se of multiple case design as well as audio-taping the interviews (Lincoln & Guba, 1970, Yin, 1994).

3.0   FINDINGS

This section presents findings of the study beginning with how teachers generate data, the data available, purpose for which it is used and the challenges experienced by teachers while using the data.

3.1   Question 1: Data generation and availability in schools

Schools generate large amounts of data in various forms. This data may be in form of figures or narratives about pupils, teachers, school workers, parents and other entities of interest to the school. The data is generated for various uses by teachers for making decisions about improvement of learning and school improvement. The study revealed that teachers produce data on learners such as registration data which will include the names of the student, age, gender, whether orphaned or not, vulnerability of the learner, capitation grant per pupil, parental economic status and whether they have special needs or not. Some of these data is also generated by class teachers in the classroom when drawing up the class registers. Teachers indicated that they make their own schemes of work and lesson notes. It emerged from the study that teachers seldom prepare lesson plans for their lessons. One teacher argued: ''*I use my lesson notes for teaching. It works for me since in most cases I transfer the notes to the lesson plan*''. Teachers also conduct continuous assessments in their classrooms to gauge their pupils understanding from these continuous assessments scores are produced which form classroom performance data. Other data produced by teachers include data on absenteeism, discipline cases, data on class discussions with parents, needy and pupils, progress records and pupil inventories. Records on how pupils relate to one another were also kept by teachers in private schools. The teachers argued that this information was critical in formation of learning groups that enhance learning.

Data available in each school were collected and analysed. They were also confirmed through interviews. The findings revealed that data available in schools were similar. Input, process and outcome data were comparable in the schools studied. Input data was kept by the school administration. Nonetheless, the teachers accessed this data from time to time for various purposes. Teachers kept the process and outcome data which were used most of the time to make decisions about learning. Process data were comparable in the schools studied. It was evident that the types of data under this category were varied. Despite teachers indicating that they had data on lesson plans, pupil transfers, annual policy plans, new admissions and school inspection reports, the latest records were not provided. Teacher performance appraisal records were also available in all schools studied.

The study established that outcome data available in the schools studied were results from continuous assessment tests, sub-county level examination results and final examination results. Fee payment data and data on pupil drop out were available. This category of data is used at all times by teachers and is accessible by teachers, pupils and parents in making critical decisions about learning.

Study findings revealed that, context data was generated and used in the sampled schools. Data on remedial lessons for academically weak learners were kept to enable teachers monitor progress. Three of the sampled schools kept data on orphaned, vulnerable and needy pupils which was used to source for funding towards feeding and other upkeep expenses.

3.2 Question 2: Use of data to promote learning in schools

The study findings revealed that data use by teachers was limited. Many sources of data were not used by teachers. Many teachers focused on the syllabus coverage, attending to their lessons and trying to improve their subject mean scores. One teacher in school 4 argued that: - *''I ensure that I attend my lessons because that is key for my performance appraisal and to ensure that I cover the syllabus on time. I also use the schemes of work to gauge how far I have covered the syllabus.* were used by teachers to monitor learning progress and identify areas of need, carry out planning and instructional changes, for accountability, and support conversations between pupils and parents and other stakeholders. One of the class teachers said: *''I use classroom assessment to evaluate, account, compare performance with other classes, set class targets and convene meetings with parents to brainstorm on strategies to be put in place to improve learning''.*

Responses from the interviews with teachers indicate that the impact of data on teaching operates at two levels: directly by means of interventions targeted at individual pupils and indirectly by means of a whole school approach. The teachers interviewed reported that the data generated was used to track pupil progress, inform teaching, learning and planning, identify underachieving pupils for further support, set targets, compare progress between individual pupils, the study also revealed that proper use of data facilitated effective use of resources and performance management. At classroom level, teachers argued that effective use of data enabled them to identify specific weaknesses in individual pupils, indentify weaknesses in topics for that specific class and provide evidence on where to focus teaching. The study also established that with the help of data teachers were able to provide one-to-one support for individual pupils and also make changes to the teaching programme by either providing personalised or differentiated teaching or learning.

3.3 Question 3: Good practice in effective data use

Good practice emerges from the use to which data is put. Sometimes data is misused and abused by those who have access to it. For instance teachers may decide to select data that is easy to use while ignoring data that involves more complicated long term improvement trajectory. Some teachers appeared to use data to warn and threaten weak pupils to improve their performance or be asked to repeat classes instead of putting in place instructional measures to assist pupils to improve. For data to promote any meaningful learning then it has to be put to good use by those to whom it's available. One of the themes that emerged from the interviews with teachers was that data was only effective if it stimulated questions, discussions and actions. Data should evoke questions or interest about actual learning in the classroom. Teachers suggested that good practice in the use of data was supported by meaningful discussions, data that is easy to generate and use. In the same breath, data systems that allow flexibility of input, are accessible to staff, produce outcomes that are easy to interpret and

encourage engagement and ownership were perceived to be more effective in advancing data use.

3.4   Question 4: Challenges to data use

The study findings reveal that challenges to data use were similar in the schools. The challenges cited by teachers include: lack of access to timely data that coincides with the needs of the user. This was common especially where teachers needed to compare assessment data across classes. Some class teachers delayed in availing the data required by colleagues. Getting inaccurate data from sources is also another challenge. A teacher in school 2 said: ''*I have encountered parents and pupils giving conflicting dates birth or giving conflicting reasons for being absent from school''*.

Inadequate facilities and inefficient information management systems were also cited as major challenges to data use. More often than not, funds are not set aside for purchase of computers making it difficult for teachers to generate and analyse data. Further, findings revealed that most teachers lacked training in data management and use since they were computer illiterate. One teacher argued: ''*Most of the teaching staff in this school is computer illiterate including me. This prevents me from using data the way I want''*.

For those who had some kind computer training, inadequate data skills and knowledge, apathy towards use of data and lack of support from colleague teachers hindered their used of data effectively and efficiently. Lack of time to update and analyse data as well as difficulties in applying the data to classroom situations were also cited.

4.0   Discussion of findings

The findings from the study reveal that similar data was produced by teachers in both public and private schools. The data available in these schools was also comparable except contextual data which was varied within schools. This may explain the unique forms of data found especially in private schools such as the pupils' inventories and public schools like the school feeding program especially for the needy and the vulnerable pupils. This is consistent with what Breiter and Light (2006) who argued that institutional contexts shape the kind of data collected and the purpose for which it is collected. Teachers used outcome data such as continuous assessment scores equally in both private and public schools. This data was accessible to pupils and parents as well. A lot of emphasis was placed on data arising from assessment scores and national examinations since it was used to monitor learner progress and for accountability on the part of teachers. The study also revealed that schools and teachers frequently met to discuss performance of learners in assessments. It was evident from reports by the respondents that parents also took a keen interest in the performance of their children and would schedule meetings to meet teachers on the same as this had a bearing on the transition of the pupils to secondary school. Schools in this study also indicated that schools used assessment data as a basis to motivate

teachers which in turn led to increased efforts instructional improvement. This is comparable to Diamond & Spillane (2004), report that schools that record improvement over time use data to inform and plan how teachers are motivated. Data was also negatively used by teachers. Accountability resulted in undue pressure on teachers and pupils alike. Some pupils were made to repeat class while teachers were forced to narrow their instruction so as to assist the weak pupils.

5.0   Conclusion

Teachers generate data in schools and most of this data comes from their classrooms. There are also other data sources available in schools. Schools have similar types of data except contextual data which varies from one school to another. Despite availability of data in schools, results from the study reveal that only a small portion of the data is utilised by the teachers. Although majority of the decisions by the teachers were not data based, there are instances where good improvement decisions were taken based on data which were aimed at improving learning.

6.0   Recommendations

From the study findings, the following recommendations are made in regard to data generation and use. First, teachers need to be trained on data use skills such as data collection, analyses, interpretation and storage. Emphasis on the need to train by teachers in the study is an indictor of their interest in learning about use of data and owning the processes leading to data production and use. Secondly, schools need to invest in data systems and technology that make data available to a large audience. This way, data is accessible to class teachers, head teachers, pupils and parents for informed decision making.

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