Towards Developing INSET Materials for Secondary Schools Science and Mathematics Inspectors in Tanzania: Experience from Needs Assessment

Francis William[1*] and Elia Kibga[2]

[1]Department of Science, Mathematics and Technology Education*
University of Dodoma (UDOM), Tanzania
P.O. Box 523 Dodoma-Tanzania
e-mail: kyambo20001@yahoo.com
Mobile phone +255 755 827 276 / +255 713 896 691

[2]Secondary Education Sciences and Mathematics Coordination
Ministry of Education and Vocational Training (MoEVT),Tanzania
P. O. Box 9121, Dar es Salaam-Tanzania
e-mail: kibgaelia@yahoo.co.uk
Mobile phone +255 754 376 242
[*]Corresponding Author

Abstract

This is a research reported on the workshop made during needs assessment of a gap between knowledge and practice of Secondary Schools Science and Mathematics Inspectors (SSI) in the process of providing support, liaison and control to the implementation of developed innovation in science, mathematics and ICT. Thirteen (13) SSI attended the workshop. Questionnaire, interview protocols and observations were the means of collecting data. Findings and observations showed that the inspectors had inadequate knowledge and skills of providing support, liaison and control to the innovations that were continuously being implemented in secondary school. It was concluded that sustainability of the new innovations depended largely on the involvement of the SSI knowledge and skills to monitor and evaluate them.

Key words: *secondary schools, inspectors, INSET programme, ICT, monitoring, evaluation, innovations, MoEVT, workshop*

1. Introduction

According to (Leyendecker, Ottevanger, & van den Akker, 2008) classroom practices can be improved through capacity building of those involved in its provision and monitoring including teachers and inspectors. In most cases, professional development in countries like Tanzania focuses

mostly on the improvement in teacher classroom practices. A professional development is supposed to extend its role to all education practitioners including management and quality assurance personnel who usually ensure smooth practices in classroom through monitoring, evaluation and supervision of the implementation. Development in science and mathematics education in Tanzania can be traced back from early 1990's when the government started reforms in the education sector and ensured enrolment of reasonable number of students in secondary schools.

The Government introduced Alternative to Practical Examinations (APE) to allow schools without laboratories or adequate facilities and chemicals to do science examinations (Kibga, 2013; Kibga, 2004). This idea was not bad as many students opted for science subjects and gave great hope of assisting the country to get enough leaders in Science, Mathematics, Engineering and Technology. While this was taking place many schools, including those which had laboratories opted for APE for the sake of reducing running costs of real practical examinations (Kibga, 2013).

Thus, teaching and learning of sciences changed its role from developing student's concepts and understanding through inquiry to memorization of scientific facts (Kibga, 2004; William, 2009; William, 2012) that could be retrieved in APE (Kibga, 2013). The students who passed through APE learned only theoretical practical which had been a trend until late 2000's. In 2009, Ministry of Education and Vocational Training (MoEVT) designed science teachers' and students' practical guides which intended to assist teachers who had undergone through the APE process of teaching and learning. Students' practical worksheets were also designed and developed parallel to the practical guides. The guides and worksheets focused on the topics in the syllabi that required the integration of theory and practical during teaching and learning process to develop inquiry to teachers and students in science subjects. . A total of 109 topics were developed in Physics, 118 in Chemistry and 84 in Biology. The topics in ICT include computer fundamentals, operating systems, word processing, spreadsheet, PowerPoint presentation and internet use. The focus was to assist a teacher to manage ICT as well as enabling them to acquire knowledge and skills of integrating ICT into teaching and learning.

While teachers who passed through these interventions have started to transform classroom practices by integrating theory and practice in teaching and learning and students have started to like sciences and have started to perform better in sciences (William, 2012; Kibga, 2013) secondary school inspectors hardly provide support, liaison and supervision to quality implementation of the innovations (Ijaiya, 1997). Usually, SSI were expected to ensure conducive school environment that promotes productive implementation of education innovations (Oyetola, Kayode, & Okunuga) including advice and support on teachers efficiency and effectiveness.

It was, therefore, important for the MoEVT through the workshop to reason out the importance of SSI in monitoring and evaluating the ongoing interventions through capacity development to enable them cope with classroom practices including teaching, learning and assessment (Mamlok-Naaman, Hofstein, & Penick, 2007).

2. Purpose of the workshop

The workshop goals were among others, to assess the school inspectors' needs regarding classroom inspections given that there had been innovations initiated to promote science, Mathematics and use of ICT in teaching and learning. The identified needs were used to develop training materials for SSI that could guide them to support, liaison and control to teachers who went through INSET programme.

3. Specific objectives

The specific objectives were to:

a) Explore current classroom inspection practices in secondary schools in science, Mathematics and ICT ;
b) Get views from inspectors on the challenging parts in the developed science, Mathematics and ICT innovations that required to be addressed through INSET programmes; and
c) Develop guidelines for INSET materials design for SSI to be able to provide support, liaison and control to the implementation of science, Mathematics and ICT innovations in secondary schools.

4. Methodology

Thirteen (13) SSI from eleven educational zones attended a fourteen days' workshop. Twelve (12) National Facilitators (NF), who were secondary school science, Mathematics or ICT teachers, joined the inspectors for them to share information about the innovations that were in place and their implementation status. Five (5) researchers from different Universities and three (3) researchers from Ministry of Education and Vocational Training (MoEVT) were involved in the workshop. Questionnaire, interview protocols, observations and discussions were the means of collecting data.

SSI and NF were randomly assigned to four groups and each group was assigned three same questions to discuss and present. The questions included:

a) What were school inspectors currently doing in science and Mathematics subjects monitoring and evaluation?
b) What did secondary school INSET programmes wanted teachers to implement that SSI were not aware of?
c) What should training materials for SSI include for them to be able to support the implementation of the innovations in science, Mathematics and ICT?

It followed presentation and plenary discussion whereby, unstructured interviews and close ended questionnaire were the means for collecting data.

5. Findings and observation

5.1 Findings from the current practices of school inspectors during science, Mathematics and ICT monitoring and evaluation

Observation from plenary discussions revealed that the inspectors usually inspected the availability of science and Mathematics materials, teacher qualification, presence of laboratories and their status and teacher content mastery. They also inspected scheme of works, lesson plans and teaching and learning process. Thereafter, they did post conferences with teachers to discuss areas which needed improvement.

5.2 Findings from SSI regarding the INSET programmes content which was implemented by secondary school teachers

It was revealed through interviews that most SSI had inadequate knowledge and skills of monitoring and evaluating the implementation of the innovations that were continuously being implemented in secondary schools. Table 1 summarizes their responses. 12 (92.3 %) SSI who reported to have knowledge and skills of assessing competence based lessons had inadequate knowledge and skills on designing and developing competence based assessment tools including skills to apply them during monitoring and evaluation process. A SSI said:

> *"… we do not have sample competence based lesson or assessment tools which should guide us during inspection …"*

They used knowledge and skills gained from teachers colleges to observed teachers' ability to question and students' ability to answer the questions as an indication of competence development in the lesson. The observations from Figure 1 indicate that SSI had inadequate knowledge and skills of monitoring and evaluating using ICT although secondary school science and Mathematics teachers were integrating ICT in teaching and learning. Another SSI said:

> *"… I hardly inspect a lesson that included ICT… I have inadequate knowledge in using computer and its applications…"*

The inspector explained further that he usually opened word processor and typed letters or notes but not other applications including Ms. Power Point Presentation (PPT), Ms. Excel, and Mail merge, to mention few. He gave an experience of inspecting a teacher who used PPT in classroom. The three inspectors were unable to comment on the lesson because of little understanding of the use of PPT in teaching and learning. They score zero (0) on the item that required the teacher to use chalk board properly because they used PPT technology.

5.3 Agreed Knowledge and Skills to be included in SSI's INSET Programme materials

The SSI needed the knowledge and skills of inspecting some of the innovations including Competence based teaching and learning, role of laboratory and laboratory activities, improvisation in teaching and learning, effective use of textbooks in teaching and learning, competence based assessment techniques, students' project work, lesson study, monitoring and evaluation, and report writing. It was agreed that the design guidelines and specifications for the developed INSET

programme materials based on the identified content should include topics, subtopics, specific objectives for every subtopic, activities to be done by the SSI, the descriptions on how to accomplish each proposed activities, and achievement indicators of the activities.

6. Discussion

Inspection of availability of science and Mathematics materials, teacher qualification, laboratories and their status, teacher content mastery, scheme of works, lesson plans and teaching and learning process is common where the inspectors and teachers hold a pre- and post-meetings to discuss improvement in standard of implementation of educational innovations (Oyetola, et al.)**.** However, when teachers are more oriented to better approaches to classroom processes and SSI have inadequate skills to provide support, liaison and control there is a great chance of a continuous use of traditional (inspector-centered) monitoring and evaluation approach (Tella & Adu, 2009) . For instance, inadequate ICT skills to SSI were drawback to assist teachers improve classroom collaboration for sustainable education (ibid. p.58).

Although SSI had little understanding on assessment of the innovations, they were aware of the difficulties they encountered (Mamlok-Naaman, et al., 2007) as they were able to identify specific areas to focus on when designing and developing the INSET materials. It indicated that the process of developing the training materials for their INSET programme was of paramount important for SSI to enhance their decision and advice during inspection process (Skilbeck, 2005).

(Mamlok-Naaman, et al., 2007) argue that lack of familiarity with the instructional strategies necessary for diversifying classroom procedure, including how lesson study is conducted, the use of ICT in classroom and competence based teaching and learning process would be a barrier for inspectors to provide support to teachers and students during inspection process.

Needs assessment was an essential process for the development of materials that have desirable future (Skilbeck, 2005) to address SSI needs. Although SSI proposed the list of content to be addressed in INSET materials it was not regarded as final, even though, SSI wanted to see their decisions being implemented immediately (Punch & Bayona, 1990). The process of polishing them was inevitable to get proper INSET materials.

7. Conclusion

This paper concludes that development of any educational intervention requires systematic planned procedures which solely depend on identifying the needs of the users. Sustainability of the implementation of interventions in secondary schools depended largely on the involvement of the SSI before designing and development process. This includes identification of the gaps in their daily practices which should guide the design of the intervention that is relevant in filling properly the identified professional needs (Van den Akker, 1999).

8. Acknowledgement

Authors would like to acknowledge Ministry of Education and Vocational Training (MoEVT) for the deliberate initiatives of assisting secondary schools' inspectors to upgrade their knowledge and skills of conducting effective monitoring and evaluation during inspection procedures. MoEVT is appreciated for facilitating the upkeep costs for the participants in the workshop.

9. References

Ijaiya, Y. (1997). Teachers' attitude towards school inspection in selected states of Nigeria in Studies in education. *Faculty of Education, 3*.

Leyendecker, R., Ottevanger, W., & van den Akker, J. (2008). Curricula, examinations, and assessment in secondary education in Sub-Saharan Africa (Vol. 5): World Bank Publications.

Mamlok-Naaman, R., Hofstein, A., & Penick, J. E. (2007). Involving science teachers in the development and implementation of assessment tools for "science for all" type curricula. Journal of Science Teacher Education, 18(4), 497-524.

Oyetola, I. O. M., Kayode, S. J., & Okunuga, A. A. Quality Assurance and Effectiveness of Lagos State Junior Secondary Schools.

Punch, K. F., & Bayona, E. L. (1990). Teacher participation in curriculum development: A model and field study in Tanzania. International Journal of Educational Development, 10(4), 253-267.

Skilbeck, M. (2005). School-based curriculum development The roots of educational change (pp. 109-132): Springer.

Tella, A., & Adu, E. O. (2009). Information communication technology (ICT) and curriculum development: the challenges for education for sustainable development. Indian Journal of Science and Technology, 2(3), 55-59.

Van den Akker, J. (1999). Principles and methods of development research Design approaches and tools in education and training (pp. 1-14): Springer.

Figure 1: Percent of SSI and their ability to use common computer applications to provide support liaison and control to teachers during teaching and learning (N=13)

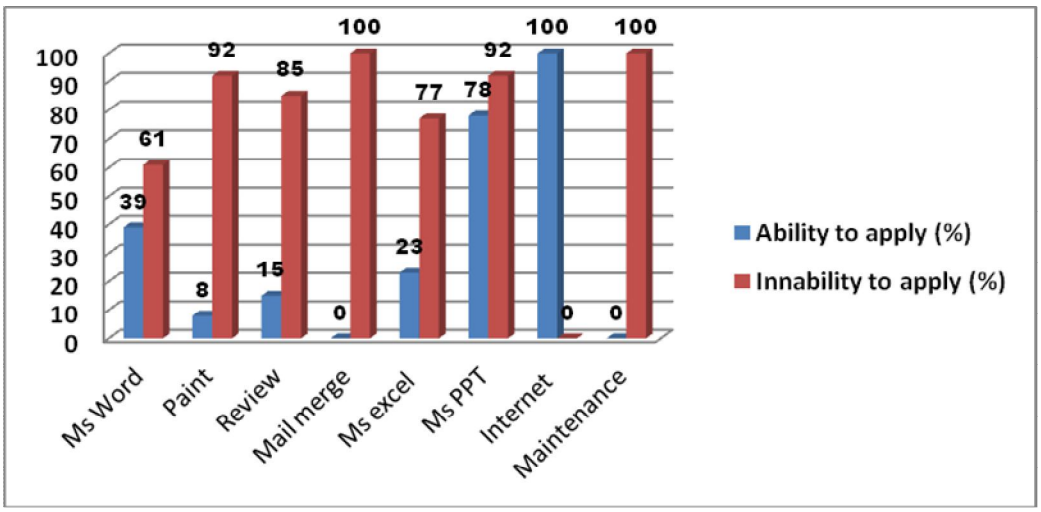

Table 1: Percentage of SSI regarding their awareness of science, mathematics and ICT innovations that were implemented by teachers

s/n	Implemented innovation	Aware		Unaware	
		No.	**%**	**No.**	**%**
1.	Implementation of lesson study	3	**23.1**	10	**76.9**
2.	The use of ICT in teaching and learning.	5	**38.5**	8	**61.5**
3.	Layout and apparatus	8	**61.5**	5	**38.5**
4.	Supervision of practical (hands on) activities	3	**23.1**	10	**76.9**
5.	integration of theory and practical	3	**23.1**	10	**76.9**
6.	Effective use of textbooks books	9	**69.2**	4	**30.8**
7	learner centered approach lesson	5	**38.5**	8	**61.5**
8	Improvisation techniques.	5	**38.5**	8	**61.5**
9	Assessment of a competence based lesson.	12	**92.3**	1	**7.6**
11	Students in project work	4	**30.8**	9	**69.2**

N = 13