INSTRUCTIONAL QUALITY OF LOWER GRADES NATURAL SCIENCE CLASSES: THE CASE OF PRIMARY SCHOOLS LINKED TO KEMISE COLLEGE OF TEACHER EDUCATION

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ABSTRACT

The main aim of this study was exploring the quality of natural science education classroom instruction in lower grade primary schools linked to KCTE. The study also sought to assess the extent to which classroom instructions is helping in filling the gap of students` science learning. The study employed mixed method within the descriptive survey research design. Of 14 primary schools linked to KCTE, eight of them were selected by using convenient sampling. Grade three, four and six sections were selected using probability sampling using lottery method. Grade three, four and six science teachers in the selected schools and eight schools` principals were selected using availability sampling. Questionnaire, interview and observations including recording were used to collect data. The collected data were analyzed using both qualitative and quantitative techniques. The finding of the study showed that the science classroom instructions have gaps in providing professional knowledge, practices and in exploiting methods of integrating science subjects. Based on the findings it is recommend that natural science teachers need capacity building training on pedagogical and subject matter issue, closer support and supervision. It is also recommended that Natural Science Department of KCTE should offer workshops on practical science teaching-learning and on selected topics of science content for the primary schools science teachers and school science department heads. Principals and cluster supervisors should work together to support the teachers and to make close supervision of the classroom instructions. Science teachers in schools need to engage themselves in professional dialogue. *[African Journal of Chemical Education—AJCE 7(2), July 2017]*

INTRODUCTION

Science is a human attempt to understand the mysteries of the natural world around us through research disciplines and ways of thinking rationally. It involves using the knowledge that has been generated through process skills to create and constantly refine testable models of nature that help us to describe, explain, predict and to conceptualize observable phenomena of nature; through processes such as observations, questions rising and hypothesing that ideas are used in trying to explain new evidence. Consequently, science aims to develop the conceptual and procedural understanding among the pupils, which were not developed independently, and to develop scientific process skills, to foster the acquisition of concepts and to develop particular attitudes. Further, science allows students to explore their world and discover new things and an important part of the foundation for education for all children [1]. That is why while learning science, children`s ideas as starting points, practical investigation, the local environment, balance between knowledge and skills, integration and linkage principle incorporated were important. The owing to facilitate a process of active construction, context-specific, inducing the transfer of knowledge, the interaction between what students know, the new information they encounter, and the activities they engage in as they learn.

The successful implementation of science curriculum requires effective planning by schools and teachers. Thus, teaching is a mechanism of delivering the lesson to the learners and a purposeful means to help students learn. Concept maps can be used in the teaching-learning processes [2]. In teaching science, the teachers require content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge [3]. Seen at classroom level planning, teachers are required to prepare long-term and short–term plans that are based on the

curriculum, and incorporate progress records, planning for individual difference, balance between knowledge and skills, allocation of appropriate time for activities, role of the pupils, text book.

In modes of instruction different contents need different strategies, different learning styles mean students learn better with some methods than others, and a varied repertoire keeps students engaged and interested in the subject matter. Matching teaching strategy to learning need should be done. Continuous monitoring of this alignment between teaching strategies and learning assures that teaching evolves to match changing student learning needs. Hence, the priority of the teachers is to match the learning needs of students to appropriate teaching strategies in order to maximize quality and quantity of student achievement. The teachers have to be both knowledgeable in their content areas and extremely skillful in a wide range of teaching approaches to cater for the diverse learning needs of every student.

The concern of quality of education has direct relevance to universal and countrywide plan. Even though, it does not have a universally agreed definition, it is an elusive, relative, multidimensional and dynamic concept. Accordingly; quality teaching leads to higher achievement and close the gaps [4]. Quality as a concept comprises both descriptive and normative characteristics [5]. Therefore, quality may be an attribute of an individual or organization in addition to the status or relative degree of worth. Three approaches are identified to defining quality; the learner centered-input-process-output and multi-dimension, but UNICEF (2000) and UNESCO (2004) recognize five dimension of education quality namely, the learner, environment, context, priorities and outcomes as cited by [5]. UNESCO`s vision for global education depicts quality as learning to know, learning to do, learning to live together and learning to be. Likewise, EFA Global Monitoring Report described quality education in terms of the tangible input, process and contextual factors the affect quality of outputs cited by [5].

Thus, quality teaching is at the center of schooling systems and school effectiveness, and recognition of the critical relationship between teachers and learners highlights the need to better define and communicate what constitutes good teaching [6]. Moreover, Improvement in access and quality of primary education has been one of the central focus areas of development for Ethiopia in the past decades. Specifically, in Ethiopia since 2006; significant achievements have been made in expanding access to primary education service for local communities through decentralized service delivery mechanism. Accordingly, PBS and GEQIP are among the key project that support expansion and improvement in quality of education service at decentralized levels [7]. Amare (2011) examine the extent to which the Ethiopia primary education system provides quality education to young lives, in particular and the Ethiopia primary schools pupils, in general as cited by [5]. But, the finding showed that neither students nor teachers were sufficiently engage in active methods of learning [5]. Similarly, Harlen et al. (1995) have pointed towards problems linked to primary teacher's lack of confidence in teaching science and their insufficient scientific knowledge background as cited by [8]. On other hand, Harlen (1996) commented that it might appear too difficult to find out the ideas of all the children in a class in such away as to plan activities to accommodate them as cited by [8].

A quality teacher is one who has a positive effect on student learning and development through a combination of content mastery, command of a broad set of pedagogic skills, and communications skills. Hence, Teacher` quality is one of the most important school factors in influencing student's achievement (Darling-Hammond, 2000, 2003; Santiago, 2002) cited by [6]. Hence in Australia, quality of teaching and learning is an important factor accounting for variations in school students` achievements (Cuttance, 2001: Rowe, Turner, and Lane, 2002) as cited by

[6].Because, effective science teaching helps students develop conceptual understandings and inquiry abilities necessary to be productive citizens and science learners.

Inconsistently; many parents invest in their children`s education, expecting that quality education will bring significant transformation in their personal and social development as cited by [9]. These show that the teachers must be equipped with sufficient knowledge; skills and awareness in order to carry out their jobs and the determinants of quality. Thus, general education quality improvement program project was designed as a package to address quality in education comprehensive approach mainstream cross cutting issues.

> *In SIP Blue print [10] teaching and learning is the first domain set for students'*
> *result improvements. In such away mastery of subject content and methods,*
> *effective teachers' effort and commitment, and students' learning are the key*
> *elements in the domain. In this direction the study is in this bench mark of this*
> *element on the instructional process in the class room in primary school science*
> *subject practice.*

From this blue print the mastery of subject content and methods, effective teachers' effort and commitment, were important for improving students results. Hence if these were in class room instructions it expected to promote MLC according to MOE students' profile. The following principles were   expected from science teachers while conducting science instruction.
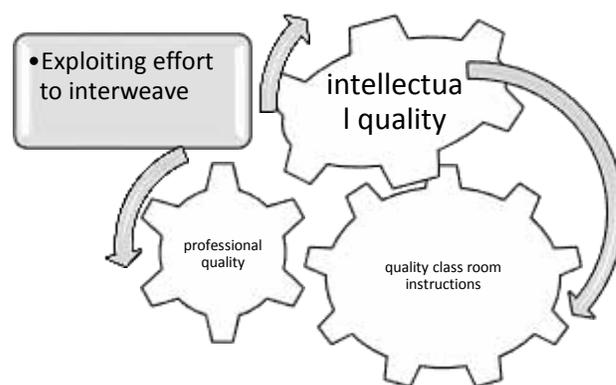

Figure 1:1 Framework of classroom instructions

Both constructivist and social theory of learning were concerned in the framework. In general the package' programs were introduces and agreements across each stakeholders made and the implementations were carried out for more than a years. Additionally, in schools different curricular and co-curricular activities were done by science teachers. But stills there are parents' questions on quality of instruction and, MOE struggle through schools` organization, stake holders, and EBC media to avoid the cheating of students. Similarly, the teachers themselves negatively criticized the students` learning. But, the Country focused on science and mathematics education intensively and extensively for sustainable growth and to have well qualified human power. Contrarily, the interest of our trainees to join science stream were become struggle. Thus, study the science classroom instructions was found to be important and also the right time.

PURPOSE, RESEARCH QUESTION AND METHODOLOGY OF THE STUDY

The main purpose of this study was to investigate the status science classroom instruction in students` learning science in primary schools of Oromo Zone, ANRSEB, KCTE Linkage schools.

In this direction, this study was aimed at answering the following basic questions.

- How natural science class room instruction succeeding the learning science of students` at classroom level?

- To what extent science classroom instruction fill the gaps of learners learning science?

The population of this study was lower grade primary schools science teachers. In such away, the targets of this study were grade three, four and six primary school sciences teachers who were teaching currently in the school now in 2016.The instruments to collect data were both developed adopted. Thus, Questionnaire, Interview, Observation followed by checklists and recording would

be employed to gather relevant data for this study. The data analysis methods were selected to fit both quantitative and qualitative data types.   For qualitative data thematic analysis methods was selected, while percentage and mean and portrayed using figures i.e. statistical methods would be used to analyze the quantitative data.

PRESENTATION AND ANALYSIS OF DATA

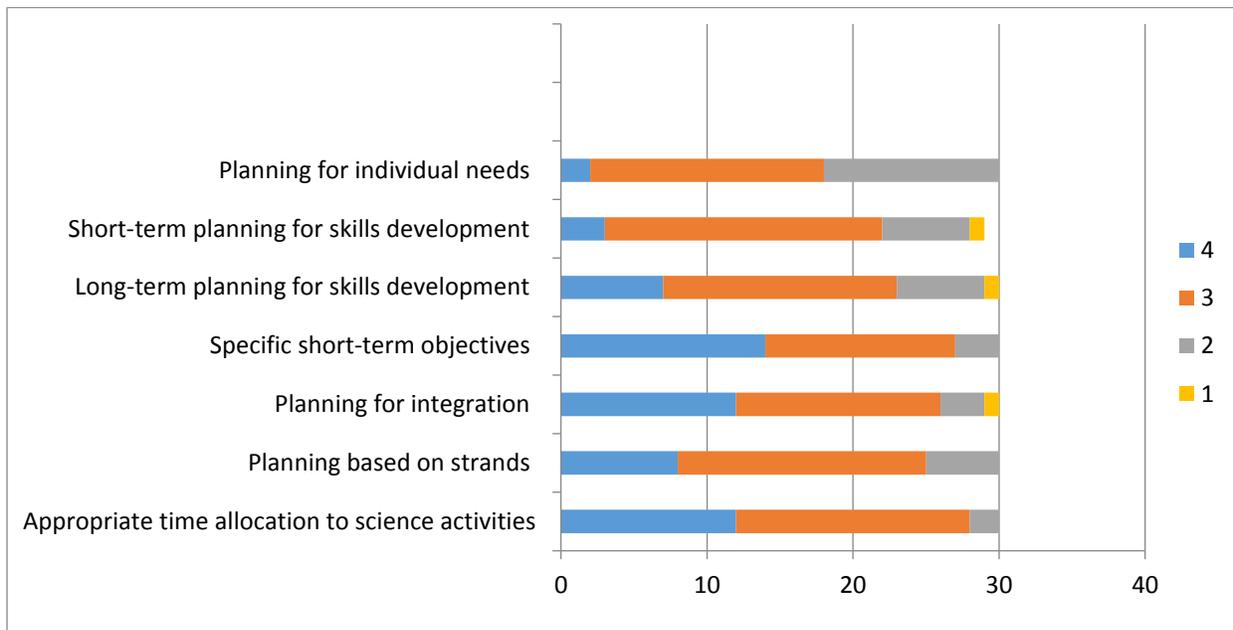### Aspects of Planning of Science Teachers

Fig. 1. Aspects of planning of science teachers

From the1 above the expected mean is 30 and the obtained mean is 24.2 with 8.3 for 4 and 15.9 for 3, and 8.8 with 5.3 for 2 and 0.5 for 1. i. e of 30 respondents   81% them   prepare instruction activities appropriately but 19% have gap planning instructional activities.

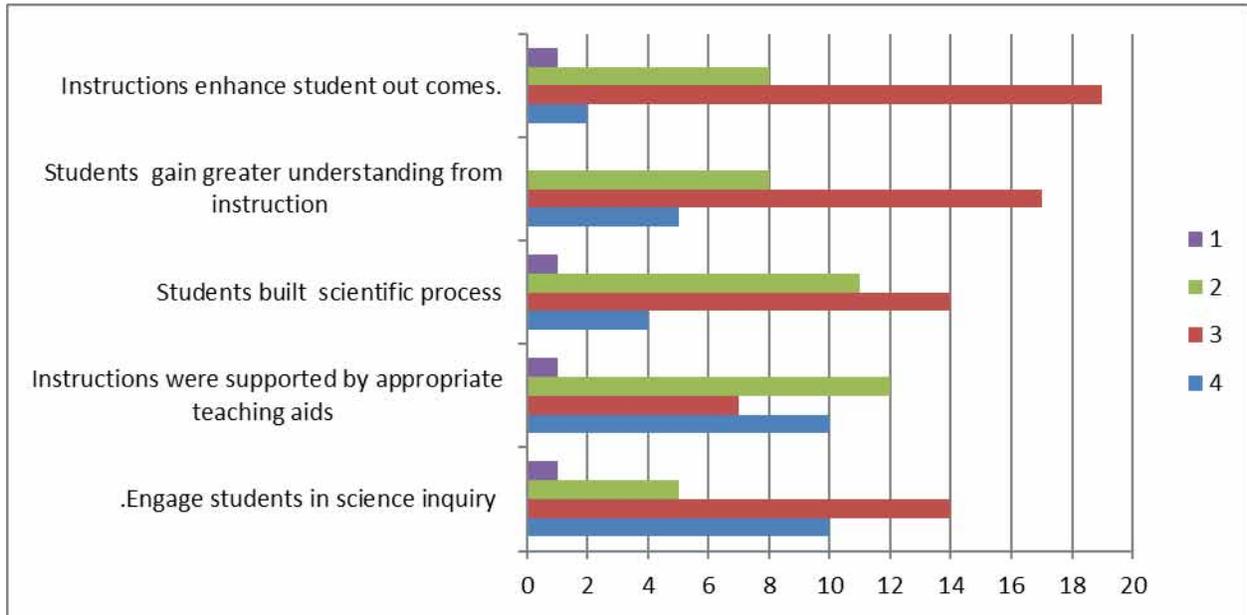**Science Teachers Lesson Delivering Reflection Response**

Fig. 2. Science teachers lesson delivering reflection

From the above figure 2 the expected mean is 30 the observed mean 20.4 with 6.2 for4 and 14 for 3, and 9.6 with 8.8 for 2 and 0.8 for1. i.e 68% science teachers response show that they deliver science instructions accordingly where as 32% of them claim their instructions delivering quality.
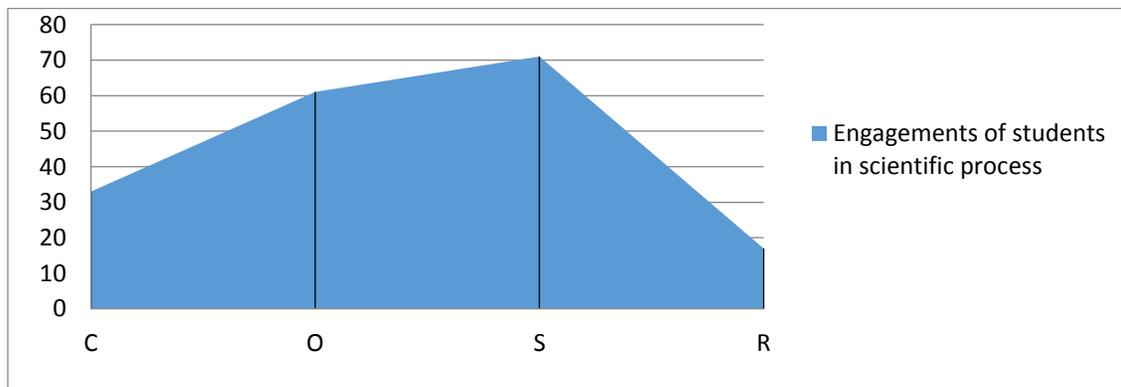
Student`s Science Learning

Fig. 3. Student`s science learning

As can be observed in figure 3 above, the EM is 30 and the OM is 15.7 with 5.5 C and 10.2 O, and 14.3 with 11.5 S and 2.8 R ; i.e 63% science teachers response show that their students engaged in science learning where as 37% of them agree that there is a problem of students` science learning (in both scientific kowlege and process) in their instructions. In Such away ; on average 66% (20) science teachers ` argue that often their students engaged in science inquiry and 49.333 % (14.8) of them argue that often their students engaged in scientific process.

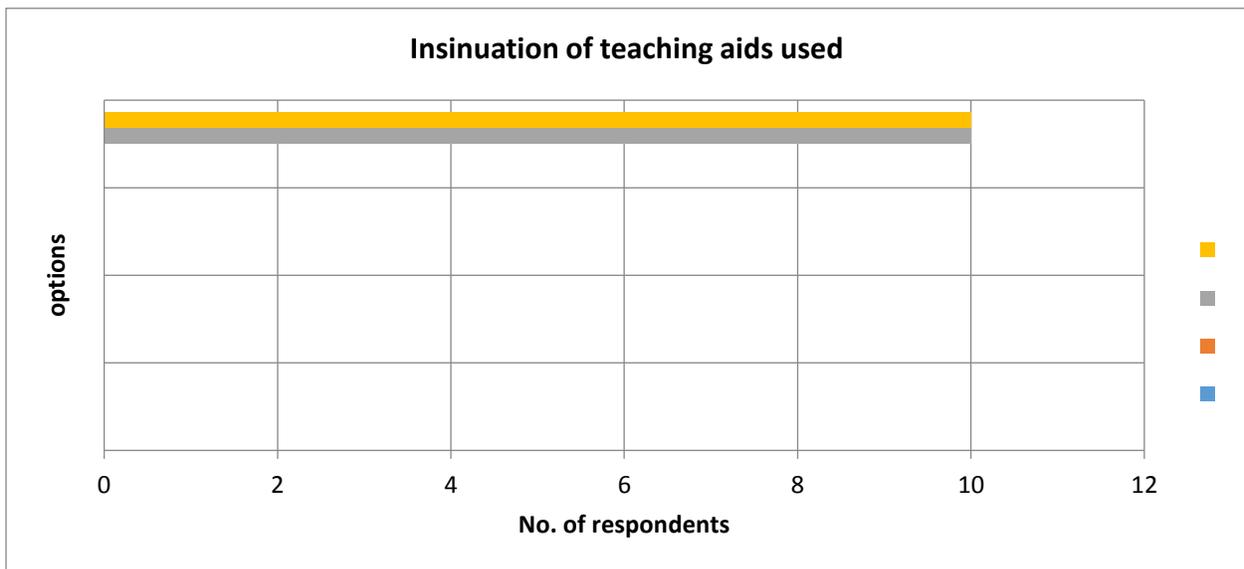**Insinuation of Teaching Aids in Realization of the Lesson**

Fig. 4. Insinuation of teaching aids

From the above figure, the insinuation of teaching aids in realization of the instruction, the average expected mean 30 and the average observed mean 22 with 7.75 for 4 and 14.5for3, and 8 with 7.5for2 and 0.75for1. i.e. the teaching aids that the teaches used help the students` active students involvement in instruction(23),in increasing content coverage(22),in addressing different

form of knowledge(22), and in promoting the high level of success of the instruction(21).Incase,

27% science teachers agree that their utilization of teaching aids didn't realize their instruction.
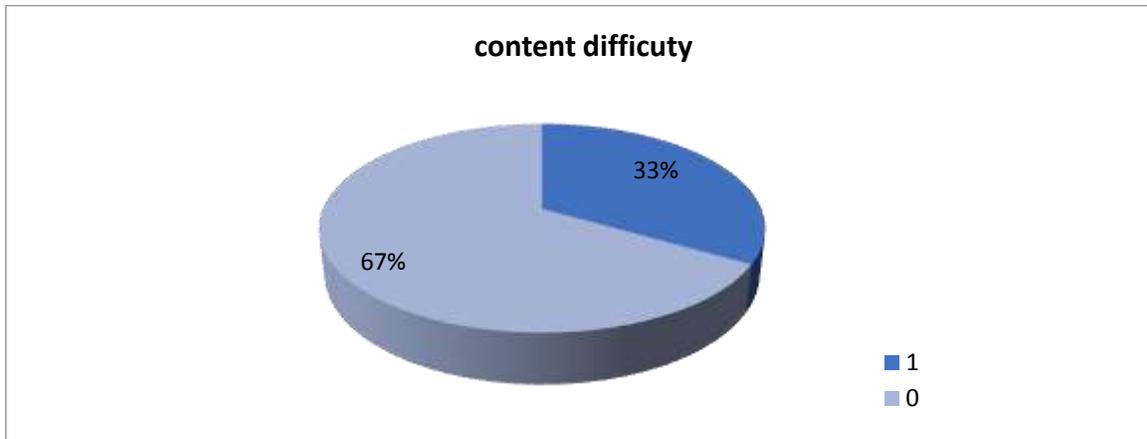
Subject Matter Knowledge

Fig. 5. Subject matter knowledge

From figure 5, 67% teachers response show that they didn`t face content difficulty in

instruction where as 33% face content difficulty in there instruction.

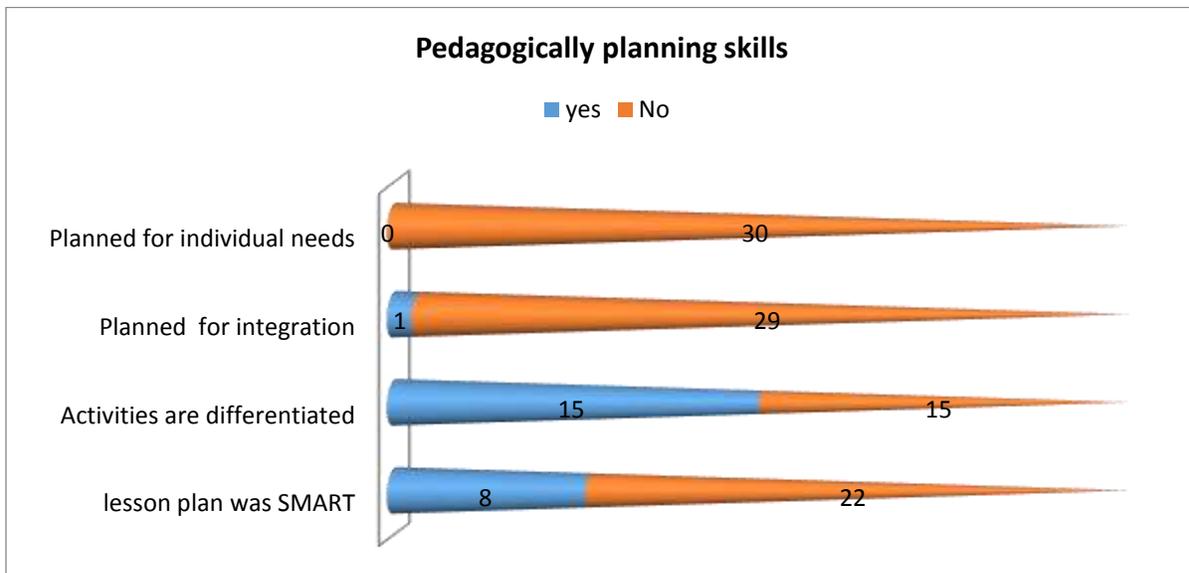**Science Teacher's Pedagogical Skill in Planning Science Activities**

Fig. 6. Pedagogical skills in planning science activities

From figure 6, the science teachers have gap in planning participatory and SMART plan. The EM 30 and OM is 6. Hence ;27 % (8) of science teachers have SMART lesson plan,3% (1) plan for integration, No one plan for individual needs,50% (15) of them differentiate activities in their lesson plan. Therefore, 80% science teachers have gap of pedagogical instructions planning.

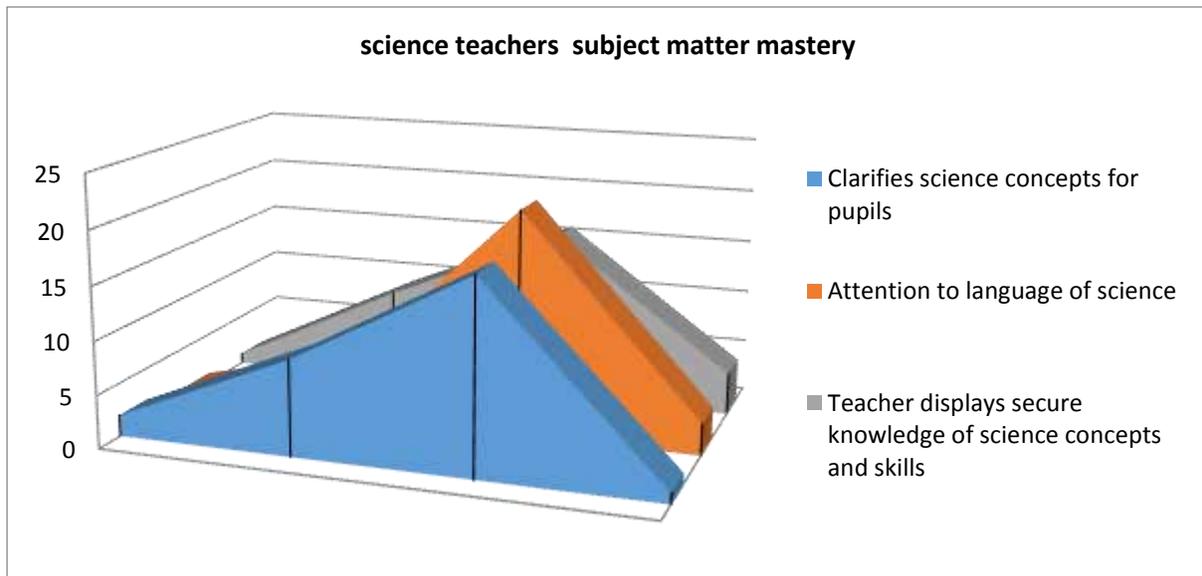**Science Teachers Subject Matter Knowledge**

Fig. 7. Subject matter knowledge

From figure 7, the EM is 30 where as the OM are 1.3, 7.7, 18.3 and 2.7 respectively with 4, 3, 2, and 1. This show that 70%(21) teachers teaching science have gap of subject matter knowledge. So that, on average, 9% science teachers have subject knowledge gap in delivering science instruction.
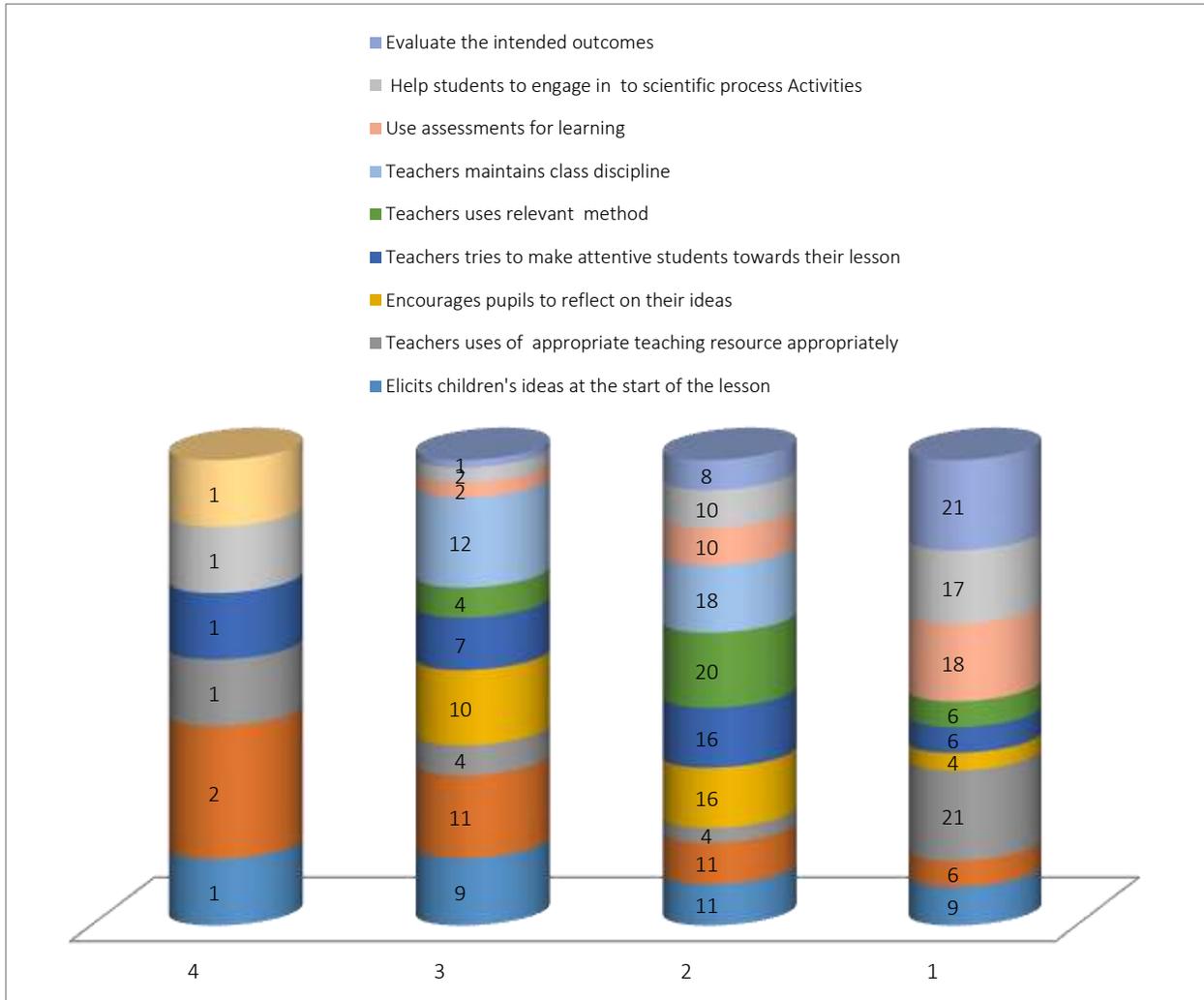
Science Teachers Pedagogical Practice

Fig. 8. Pedagogical practices

From the Figure 8 on science teacher's pedagogical practice, EM is 30 and the OM is 1.2, 6.2, 12.4, and 10.2 respectively with 4, 3, 2, and 1. These show that, on average 75 % (22.6) science teachers have gap in professional practice.
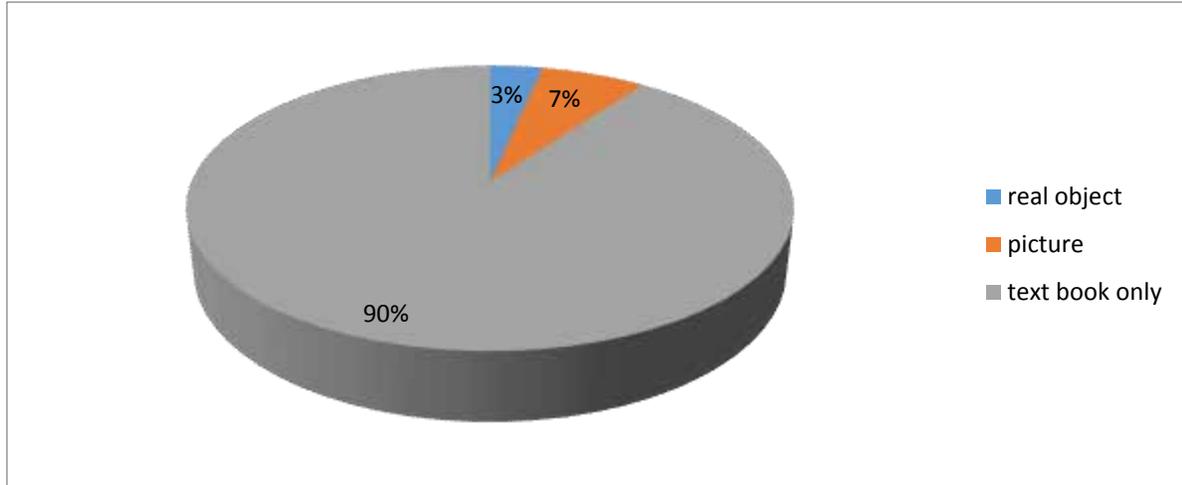
Types of Teaching Aids Used

Fig. 9. Teaching aids

From figure 9, 90% (27) science teacher use text book only for instruction, 7% (2) use

picture and 1(3%) use real teaching aids for realization of the instructions. This show that, science

teachers teaching aids utilization in realizing the instructions were low. The instructions were text

book based only.

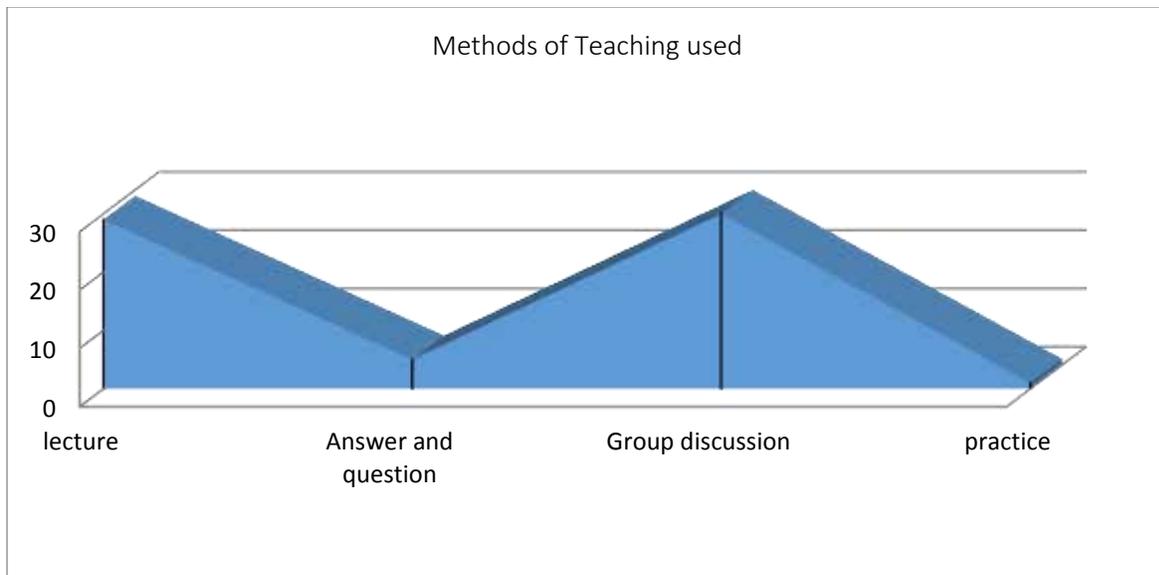**Methods of Teacher Teaching**

Fig. 10. Methods of teacher training

Figure 10 shows that group discussion and lecture methods were used by most science teachers; i.e. 30 and 29 respectively whereas answer-question and practical teaching were used by few teachers i.e. 5 and 1 respectively. So that, most science teachers' teaching methods were weak in learning science by doing.

Schools Principals` Response on Science Classroom Instruction
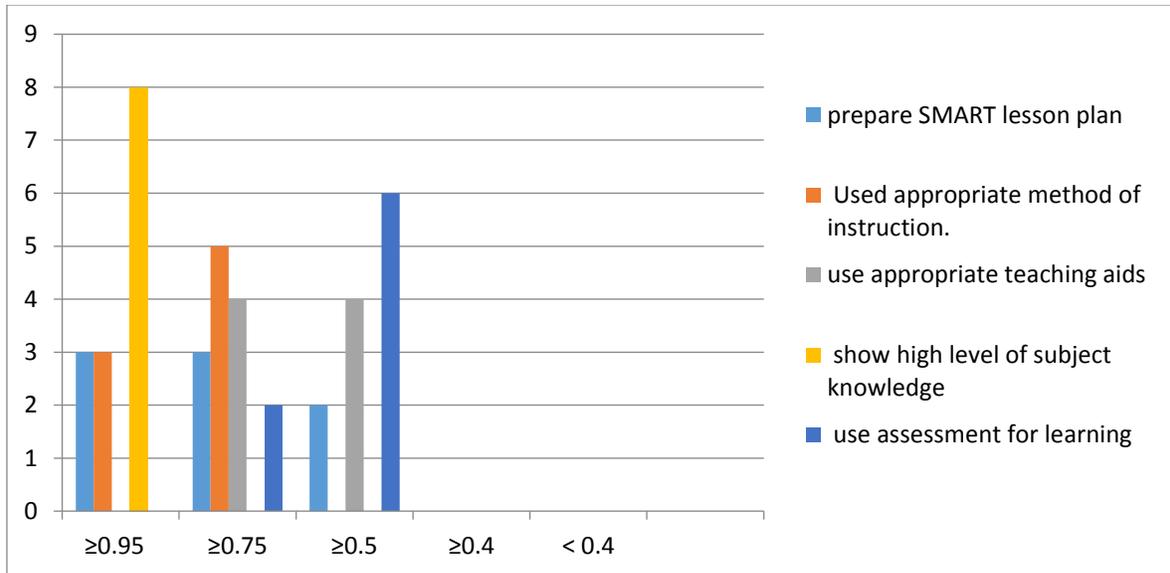

Fig. 10. Principals' responses

Figure 11 shows that schools principals' response EM is 8 but the OM is 2.8, 2.8 and 2.4 for 0.95, 0.75, and 0.5 respectively. According to schools` principals, on average 30% science teachers have gap in delivering science instruction properly.

The analysis data obtained from instruments used reveal that a number of primary school science teachers have gaps both in mastery of subject matter and methods, and in exploiting effort in succeeding students` science learning. In such way, the challenges were pedagogical knowledge, exploiting the effort to professional practice and subject matter knowledge. It is thus learnt that science class room instructions in lower grades of primary schools were not in position of

developing scientific skills and processes of the children. This assertion can also be deduced from

the following table that contains the expected and observed mean values.

Table 1: Summary of Expected and Observed Mean Values

Teaching activities	Teachers response results		Schools response results		Observation results	
	EM	OM	EM	OM	EM	OM
Mastery of Subject content	30	20	8	8	30	26.3
Professional practice	30	20.575	8	5	30	7.4
Exploiting effort to under rooting instruction by integrating subject knowledge with professional quality			8	5		

CONCLUSIONS AND RECOMMENDATIONS

The purpose this study was exploring the quality of natural science education classroom

instruction in lower grades of KCTE linked primary schools. The framework for the quality

instruction was SIP which has been implemented in the schools for the last six years. The target

of the population is primary school science teachers who were teaching in lower grades of primary

schools. Of 14 associated schools, eight of them were selected based on accesses to transportation

and proximity. The grades were selected using probability sampling using lottery methods.

Sections and the school principals were selected using availability sampling methods.

The instruments, the questionnaire and observation checklist, were both developed and

adopted from the effective instructions and the elements of teaching – learning domains of SIP.

The procedures of data collection were administering the questionnaires, interview and

observation supported by checklist and video recording.

The variables were mastery of subject matter and methods, and exploiting effort for integration of subject knowledge and pedagogical practice for delivering instructions.

The results obtained from the questionnaires, observation checklist and recording, and interview show that science classroom instructions have a problem. It was also observed that science teachers have gaps in subject matter knowledge, pedagogical planning and practice, in exploiting the effort for integration of them in delivering.

From this study we conclude that the primary schools lower grade science teachers classroom instructions` were not in a position of succeeding the learning science of students and filling the gaps of learners in science learning.

Based on the findings, the following recommendations are forwarded.

- KCTE department of natural science educators should give workshops based on selective topics of science contents for the primary schools science teachers, science practical teaching, pedagogical planning, the way of delivering science instructions.

- Schools science department heads, principals and cluster supervisors should work together to support and make close monitoring of classroom instructions and awakening of science teachers teaching.

- Science teachers should make professional dialogue among themselves through the departments on the way of science delivering and the contents delivered.

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