International Journal of Social Science And Human Research

ISSN(print): 2644-0679, ISSN(online): 2644-0695

Volume 04 Issue 11 November 2021

DOI: 10.47191/ijsshr/v4-i11-54, Impact factor-5.586

Page No: 3440-3443

Teaching Science Practical's in Tanzanian Secondary Schools

Shadrack Ernest Mwakalinga

Department of Education, Faculty of Arts and Social sciences, Jordan University College (JUCo), P. O. Box 1878, Morogoro – Tanzania.

ABSTRACT: This paper is aimed at analysing the importance of teaching science practicals as they are shown in the syllabus of science subjects lather than waiting for the national examinations or waiting learners to reach form three or four. Among the importance of teaching science practicals as shown in the syllabus include, Development of student's scientific knowledge through practicals, Involving students in action and reflection, Practicals develops learners interest, Practical enhances creativity and deep understanding. Finally the paper recommended that the teaching of sciences in secondary schools in Tanzania needs to be reviewed and restructured so as to accommodate the current needs and challenges.

1.0 INTRODUCTION

Practicals help learners put into practice what they learn theoretically and help learners develop various skills in performing different scientific operations. The most important skills to be developed in practical subjects are referred to as applied competency[1]. The applied competency covers three levels which are; foundational competency, practical competency and reflexive competency. Applied competence refers to the integration of the knowledge, the skills, the attitudes and the applications that a learner is able to perform in a way that suits the learning this has been summarized in the figure 1.1.

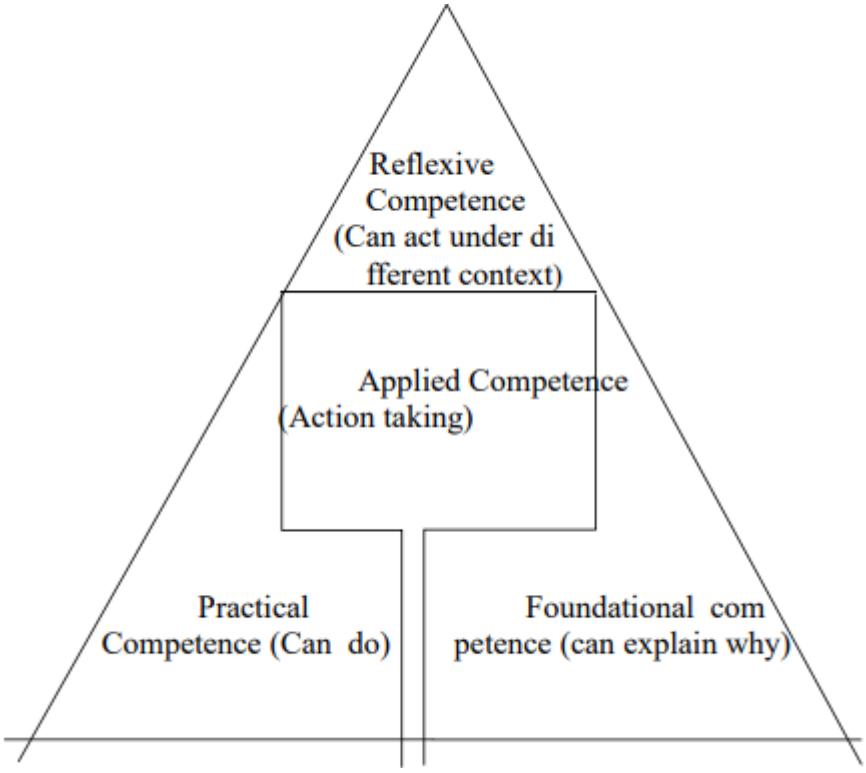

Figure 1.1: Developing competencies in physics practicals
Source: (*Modified from Mwakalinga,- 2015, p.3)*

From figure 1.1 above, through practical competency a student is capable of doing things practically and accurately, that is s/he has the knowledge and can perform the activity. Having knowledge and being able to do something does not make an individual

[1] S.Mwakalinga, Challenges facing physics teachers in teaching physics practicals, 3.

competent. One needs to explain the principles underlying what is done. This is what is referred to as foundational competence. This is the kind of competence which enables an individual do something and explain why he/she is doing it in that way and not otherwise. Still an individual is considered to be competent when he/she can use the knowledge and skills to act in different contexts; which is referred to as reflexive competence. The three levels described above, result into applied competence. At this juncture teaching through practicals will make students be able to create things which will suit their new existing environment. This is what is required of them in the world of work. Therefore practicals aim at making learners develop applied competence.

2.0. TEACHERS'ATTITUDES TOWARD APPLIED COMPETENCE

Attitude is a tendency for individuals to organize thoughts, emotions and behaviours towards a psychological object[2]. Human beings are not born with attitudes; they develop them as they grow. Some attitudes are based on people's own experiences, knowledge and skills, and some are gained from other sources. However, the attitude do not stay the same. They change in the course of time. Studies have shown that, teachers develop negative attitude towards applied competence, because of change in science and technology[3].Likewise, if teachers have positive attitude towards teaching practicals they teach well and as a result, students will develop positive attitudes toward learning through practicals. Teachers as well as learners should be helped to develop positive attitudes towards practicals. This is due to the fact that if students have negative attitudes towards science, they will not like practicals and also will not like practical teachers[4], hence the development of applied competency becomes unsuccessful. Also if teachers have negative attitudes towards developing applied competence to learners, they will also have negative attitude towards learners. Therefore having frequent in-service training will help teachers increase confidence and develop positive attitude towards the teaching of practicals.

2.2 Teachers competence in teaching practicals (Pedagogical content knowledge (PCK) in Science)

Teaching science is a demanding task, requiring teachers to understand not only the science content but also how to translate the content and methods of science into analogous instructional practices. Such ability is what Shulman called pedagogical content knowledge (PCK)[5]. PCK is the knowledge of effective instructional practices pertinent to specific content areas. An excellent teachers have both expert content knowledge, and expert pedagogical skills. Because an expert science teacher know the difficulties that a student may face and the misconceptions they develop in the teaching and learning, hence knows how to tap prior knowledge while presenting new ideas so students can build new and correct understanding.

2.3 Recommended teaching methods in practicals in developing applied competence.

Practical work in the school science curriculum has become the nucleus of curriculum reform initiatives which have taken place worldwide[6]. In line with this development the Tanzania education system has taken on board the design practical as a cornerstone in its bid to make practical teaching and learning more responsive to global trends and expectations. Tanzania has a centralized education system so all schools follow the same national curriculum. The suggested teaching methods are participatory teaching methods involves hands on activities and maximum interaction during the teaching and learning process. These methods are experimentation, discussion, role play, KWL methods, futures wheels, jig saw, gallery walk and many others. Unfortunately the teaching methods which are largely used are the traditional ones (Teacher centred) like lecture and demonstration methods. The use of these teaching strategies are attributed to low weighting of the design practical question , lack of staff development workshops , and designing question requiring recall of facts rather than student initiative, lack of experience as examiners, lack of knowledge and skills.

2.4 Assessment of Applied Competence

Competency does not mean being expert. It means that the candidate has attained sufficient skill and knowledge to perform a given activity or service to a degree and quality that is acceptable to the agreed standards. In practicals quality of assessment directly correlates to the quality of learning. If there are clear learning objectives that are reflected in the assessment material then the student has a clear understanding of what they have to learn to what depth they have to understand what they are learning and how they are expected to demonstrate their knowledge and understanding.

The assessment of applied competence should be competence based. Competency based assessment is a process where an assessor works with a learner to collect evidence of competence, using the benchmarks provided by the unit standards that comprise the national qualifications[7].It is not about passing or failing a candidate. More evidence are collected than just setting a test. During a practicals and portfolio.

---

[2] V.M. Mistades, *Teachers attitude towards physics*, 7.
[3] D. E. Craker.*Attitudes toward science of students*, 27.
[4] J.Barnett - Hodson, *Science Education,* 426 – 453.
[5] S.Shulman, *Knowledge Growth in Teaching*, 9.
[6] R.Gott – S.Duggan, *Science and technology*, 27. [7]Biggs, *Assessing learning quality*, 8 -10.

It is the sum of all these assessments that makes a trainee to be competent (or not).The unit of progression in a competency based training system, is mastery of knowledge and skills and is learner focused. Two key components of competencebased training are: Skill referring to the ability of a person to perform a task or group of tasks performed to a specified level of proficiency which typically involves the manipulation of tools and equipment, or expertise that is knowledge or attitude-based.

3.0 SCHOOL SCIENCE AND ITS PURPOSE

Science can mean different things to different people and in different contexts. For the purposes of this paper, science has been interpreted to encompass the development, understanding and the application of the physical life and social sciences.The main purposes of science in schools, Colleges and Universities are to ensure young people enter the workforce with the knowledge, skills and attitude of technological development. The knowledge and skills are necessary in promoting economic, scientific and technological development. It also aims at giving future citizens an understanding of scientific and technological approaches and evidence, so that they will be able to make informed decisions on scientific and technological issues. Clearly, these two purposes are linked and indicate the importance of ensuring that all young people have a good education in science and technology so that as citizens and members of the workforce can engage critically and creatively with opportunities and issues relating to technology and science.

3.2. The importance of practicals in the teaching

Practicals play a big role in the learning of sciences. This includes, developing students' scientific knowledge and involving students in action and reflection. The below subsections describe the importance of practicals in science subjects in general. Practicals help learner develop, scientific knowledge, action and reflection, interest in learning, and creativity as will be discussed in the following sections.

3.2.1 Development of student's scientific knowledge through practicals

Practical work is important in developing students' scientific knowledge. Given that the subject matter of science is the material world, it seems natural, and rather obvious, that learning practicals should involve seeing, handling and manipulating real objects and materials, and that teaching practicals will involve acts of 'showing' as well as of 'telling'. Practicals help students make links between the two 'domains' of knowledge: the domain of objects and observable properties and events on the one hand and the domain of ideas on the other. Through practicals a learner/ student can develop competencies of which can be applied in daily life. The development of knowledge is very important in all science and social science subjects. At the end of the learning, a student is expected to be a useful member of the society by participating effectively in solving societal problems. Therefore with scientific knowledge, learners can help in solving various problems in the community.

3.2.2 Involving students in action and reflection

In practical class, laboratory is central, integral, and sacred. More than a mere place at the back of the classroom, the laboratory is the place where students do practicals. It is in the laboratory that students learn to practice the activities of scientists through asking questions, performing procedures, collecting data, analysing data, answering questions, and thinking of new questions to explore. Doing practicals in the laboratory attempts to change the teacher cantered approach by making sure that students are at the central point of the learning.

Practicals involves action and reflection. 'Practical work' as any teaching and learning activity involves at some point the students in observing or manipulating real objects and materials. It is clear from the discussion above, and also widely recognised by science educators, that much of the learning associated with a practical activity taking place through the process of teaching and learning enhances deep understanding among the learners. The teaching of practicals must actively involve learners so that they can reflect the applicability and the relevance of doing such practicals. Reflection in any learning activity is very important because it gives feedback of what was done and how was it successfully done.

3.2.3. Practicals develops learners interest

Interest is the feeling that you have when you want to know or to learn more about something[7]. Practicals are important because, develops interest among the learners and maintain a sense of wonder and curiosity about the physical world. It also helps learners construct and apply knowledge , and appreciate the relationship between physical science and other disciplines.Practicals makes learners feel that what they are learning is relevant to the world they are living in. If practicals are taught properly more scientist will be produced and as a result more scientific discoveries will be done.

3.2.4 Practical enhances creativity

Creativity involves use of knowledge, skills and imagination to produce a new thing[8]. Practicals enhance creativity and problem solving skills in an individual. This can be seen when students apply different scientific principles to create a new thing. For example a student applying principles of simple machines to make a wooden bicycle or a wooden wheel barrow which help him/her in

[7] *Oxford dictionary*, 80.
[8] *Oxford dictionary*,783.

carrying loads.

4.0 CHALLENGES OF TEACHING SCIENCE PRACTICALS

The teaching of science practicals is influenced by many factors like teachers pedagogical skills, curriculum factors, changes of science and technology, changes of the current needs, pandemic diseases, short time of the teaching practicals and the influence from politicians.

5. 0 CONCLUSION

The teaching and examining of sciences in secondary schools in Tanzania needs to be reviewed and restructured so as to accommodate the current needs. It is important to put more emphasis on developing applied competency through having positive attitudes toward teaching practicals, competent teachers in teaching science (Pedagogical content knowledge (PCK) in Science, using recommended teaching methods and apply assessment of applied competence. Also practical exams should be done at every academic year lather than waiting for the National examination, this will make learners to be used to practicals and probably reduce the cheating in the practical exams.

REFERENCE

1) Barnet, J & Hodson, D (2001). Pedagogical content Knowledge: Toward a fuller understanding of what good science teachers know Science education, 85(4), 426 - 453.
2) Biggs, J (1996). Assessing learning quality: Reconciling Institutional, staff and educational demands, Assessment and Evaluation in Higher education
3) Craker, D.E. (2006) Attitude toward science of students enrolled in introductory level science courses; at UW - La Crosse, UW - Journal of undergraduate research IX, 1 - 6
4) Mistade V.M (2007). Profiling Secondary School Teachers' Attitudes Towards Learning Physics. De La Salle University - Manila, Philippines
5) Mwakalinga S. (2015). Challenges facing physics teachers in teaching physics practicals. Masters dissertation Jordan University College - Tanzania.
6) R. Gott & S. Duggan (2007) A framework for practical work in science and scientific literacy through argumentation, Research in Science & Technological Education, 25:3, 271-291,DOI:10.1080/02635140701535000
7) Shulman, L.S. (1986) Those who understand: Knowledge growth in teaching. Educational Researchers, 15(2), 4 - 14