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PROMOTING STUDENTS' ENGAGEMENT IN BIOLOGY LABORATORY THROUGH ACTIVE LEARNING

BY

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INTRODUCTION

Biology is the science of life. It is the natural science that studies life and living organisms, including their physical structure, chemical processes, molecular interactions, physiological mechanisms, development and evolution. (Robert, 1971). The knowledge of these aspects of biology makes the learner well-informed and motivated to assume roles in which the practical and theoretical aspects are used in unraveling some basic problems of life. (Ude, 2011). Biology curriculum contains a lot of abstract concepts like ecology, digestive system, nervous system, photosynthesis, and osmoregulation genetics, sense organs and their structures, food nutrients; and branches such as anatomy, physiology, to mention but a few. In biology, students reported consistent problems in water transport phenomena, genetics and even ecology (WASC, 2006). This finding suggests that it may be possible to re-design the curriculum or the way the curriculum is presented so that difficulties are reduced (Mbajiorgu , Reid and Ezeano, 2017). The learners need to be actively involved in the learning experiences. Biology is practical oriented and most of the topics lend themselves to practical activities in the laboratory for hands-on learning activities on the part of the learner. Students gain a lot when they are engaged in biology laboratory activities.

Biology laboratory is a modern research infrastructure, providing a broad range of biological and biochemical techniques with in-depth practical training offered by

experienced staff. Students are engage in the laboratory to ensure that they have access to important observations, provide opportunities to build microscopy an observational skill, and require little time to prepare. ‘When student are told what to do, how to do it and what they will arrive at, they are involved in laboratory exercise (Idoko, 2010). This is traditional method but active learning involves helping students to ascend Bloom’s Taxonomy from remembering and understanding to analyzing and creating. This paper therefore advocates for meaningful engagement of students in biology laboratory activities through active learning process.

MEANING OF ACTIVE LEARNING

The term “active learning” was first defined by Bonwell and Eison (1991) as “anything that involves students in doing things and thinking about the things they are doing”. In line with developments in adults, cognitive and educational research, active learning responds to traditional lecture formats but with more engaged activities that invite students to participate in learning, including developing conceptual awareness, applying knowledge through experience and transferring skills across contexts (Carr, Palmer, and Hagel 2015). Active learning process involves two activities which include students doing things and thinking about the things they do. In doing things, the students engage themselves in activities like discussion, debate and other process that require them construct their knowledge through higher order thinking as applying analyzing. evaluating, synthesizing and verbalizing concepts. This is in contrast with the knowledge passively transmitted to students through listening, memorizing and reading. The second activity is thinking about the things they do. Here met cognition promotes active learning by equipping students with their own learning habits. They will be capable of regulating and accessing themselves through student feedback methods.

APPROACHES THAT PROMOTE ACTIVE LEARNING

Teacher acts as facilitator. Students are asked to make connections between incoming knowledge and their current mental models. This helps to improve their understanding. The students are also presented with learning experiences that confront misconceptions thereby reconstructing their cognitive structure and understanding which are essential for learning according to the constructivist

learning theory. Active learning approach often times embrace the use of cooperative learning groups which helps in social interaction (Cantonwine 2014).

Managing the active learning environment

Teaching in an active learning environment promotes learning through flexible seating, white boards and other instructional technology. What really differentiates traditional laboratory and an active learning laboratory is not what students are expected to do during laboratory like observing, drawing and labeling activities which are acceptable in both, but the added responsibility of the student thinking about what he is doing. Actually active learning is necessary, for higher order skill development as critical thinking, analysis and application; as well as re-enforcement of lower-order content. This is because students require enough background knowledge and skills to support the engagement with the laboratory activities.

There are strategies that should be engaged in the laboratory such as problem based and cooperative learning. Others include designing the activities to be skill challenges like puzzles; activities being presented as tasks rather than instructions; encouraging the students to work as a team in their problem solving, making sure that everybody is carried along and the teacher acting as a facilitator. These help students think about how to solve their problems (tasks) and engage them to brainstorm about their observations thereby helping each other to understand the task and increase their communication skill. The instructor who has become a facilitator makes the students provide solution to their content questions instead of relying on the teacher for answers.

Promoting students engagement in biology laboratory through active learning

The teacher's role as a facilitator is not an easy task as he has to resist the temptation to directly answer students' questions. This can be easily overcome when the facilitator explains to the students the guidelines to be followed and even when they ask questions, the facilitator should be able to tell them to took it in their lecture notes. He waits to ensure the students carried out the request and found the correct answer. Where the students get the answer correct, it gives the confidence and ready to embark on more activities. As the students work on the tasks, the facilitator is expected to walk around the room and reinforce active participation

that is aligned with the expected answers. The students are also encouraged to cooperate as they like collaborating and working together to achieve a common task in the laboratory. This can be achieved by setting the tasks (similar specimens) on locations that are close enough on the laboratory tables so that students can talk to each other on their observations. The facilitator should then ensure that technological tools and multimedia are made available to enhance the laboratory environment for active learning.

DEMONSTRATION OF STUDENTS' ENGAGEMENT IN THE LABORATORYTUROUGHACTIVE LEARNING

Laboratory Activity

A sample one-hour laboratory activity is outlined below:

The topic is the mammalian eye as organ of special sense. The session is divided into three parts, each of which aims to maximize students participation while maintaining a high degree of organization. Number of students is fifty (50). Attendance is taken and students assigned to groups by giving them a number (from one to ten) as they walk in through the door.

For introduction, the day's work is posted on the board, and as they look at the memo, the groups of five each start brainstorming. The facilitator elicits students questions and concerns; and puts them on the board. The questions may be like "What do we know about the eye?" and they recall points from their lecture notes; what do we need to know? They collaborate, brainstorm and come up with aims and objectives of the laboratory activity. The facilitator writes their points on the board. Each student is allowed to ask questions they want to be answered also.

Then similar models of the longitudinal section of the mammalian eye are distributed on the long laboratory table for each small groups of five. In the course of their interaction, critical thinking, collaboration, co-operation and socialization skills are being developed by the students. These are attributes of active learning; and the facilitator encourages the groups to refer and compare their notes, delegate responsibility and ensure that every member of each group is carried along. Below is diagram of the

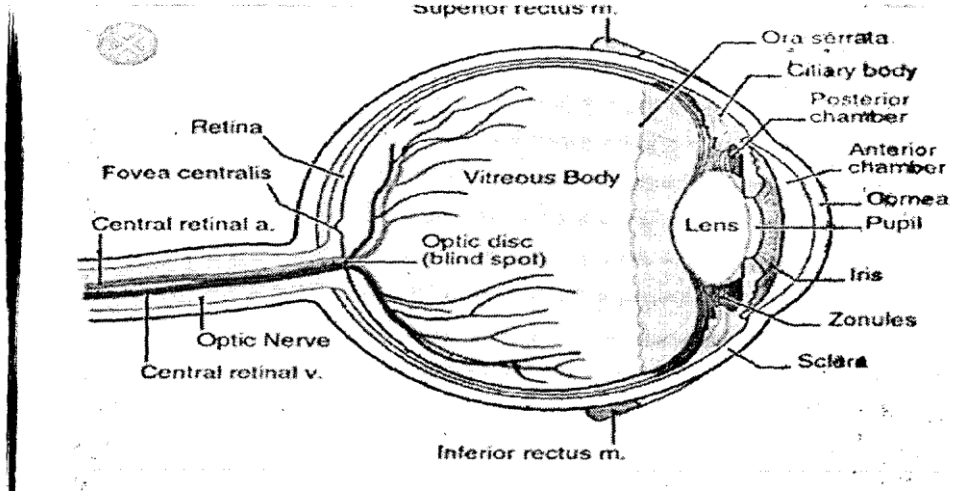

Fig. 1 Diagram of longitudinal section of Mammalian eye

(See slides and models)

Which photo receptors serve in daylight and responsible for colour vision?

What is the function of the lens?

Flow can myopia be corrected?

Here the facilitator can employ variety of strategies to elicit answers from the students such as “quiz by the pairs” where students ale. paired to quiz each other on the topic treated (Ben e,23l8). They can also be given few minutes for individuals to write down abbut five things they learnt from the laboratory session. At the end each group presents its work to the whole groups for discussion with active participation by individuals.

SUMMARY

Biology is science of life and practical oriented. Different methods of teaching biology abound but that of engaging the students in the laboratory through active learning has been confirmed to be most effective, Here the students carry on the task and also think about the things they are doing. They often times engage in the activities that require them construct their ideas knowledge through higher order thinking as analyzing, evaluating and verbalizing concepts. The approach is student-centered while the teacher assumes the role of facilitator; all activities taking place in an active learning environment. A demonstration of some biology

laboratory activities of students' engagement will go a long way in helping teachers engage their students through active learning approach.

RECOMMENDATIONS

Promoting students' engagement in biology laboratory through active learning is constructivist student-centered learning approach which exposes them to acquire creativity, collaboration, cooperation and socialization skills.

- Biology teachers should assume the role of facilitators while students are actively involved in the teaching and learning process.
- Biology textbook authors should include indigenous materials with colour and attraction as well as puzzles that lend themselves to student's activities through active learning.

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