A major concern of teachers is applying theories and philosophies in ways to show their relevance to classroom practices. Science teachers are essential components in the entire system of science education. At present, there is no conclusive data or theory that will explain and describe the complex problems encountered in science teaching and science teacher education. Linking theory to practice has been the primary concern of many teachers not only science teachers for decades. (Thaver, T. & Tan, C.S., 2004).

The constructivist approach and direct instruction will be actively involved in science classes. The heart of constructivism is that, learners are able to generate their own knowledge and meaning from their own experiences (Fosnot, 1996). The constructivist view of learning is concerned with how learners construct an understanding of the world. When students encounter something new, they have to reconcile it with their previous ideas and experiences; somehow, they may alter what they believe in, or they will discard the new information as irrelevant.

In many cases, students are active creators of their own knowledge. In order to enhance their knowledge, students may ask questions, explore, and assess what they know. The constructivism proposes that meaning and understanding are built up in a process that depends on the existing knowledge foundations and cognitive operations of each individual and the learning activities they engage in. As stated by Bower (1990), constructivism is associated with an evolutionary perspective that sees learning and the creation of mental models as an adaptation to the environment.
This learning theory describes the process of knowledge construction. The construction of knowledge is not passive, but an active process. From the point of view of constructivists, knowledge should not just be instilled into the students ‘mind, but it should be created by the students via active participation in the learning process.

The theory of constructivism provides new landscape on teaching and learning science. It enhances students’ learning as they create knowledge and meaning from the learning experiences under constructivism. Furthermore, students learn science through a process of constructing, interpreting and modifying their own representations of reality based on their learning experiences. Therefore, constructivists acknowledge social dimension of learning such as the classroom and learning community whereby students make meaning of the world through both personal and social processes. (Driver et al, 1994).

Teaching and learning science with constructive approach, students should be provided with learning environment that promotes their understanding of nature of science and other relevant theories by co-constructing and negotiating ideas through meaningful peer and teacher interactions. (Solomon, 1987).

From a philosophical point of view, constructivism can be traced to Kantian epistemology where Empiricism and Rationalism are synthesized (Kant 1983; Kelly 1986). Its psychological basis can be found in the study of Piaget (Flavell,1963) who used the previously mentioned concepts of assimilation and accommodation to underpin his theory of cognitive development. Another strand in the origins of constructivist theory was derived from the writings of Dewey (1938) who stressed the importance of the learner’s active involvement in the learning process and proposed that learners should be ‘actors’ rather than ‘spectators’.

In the classroom situations, employing theoretical knowledge can encourage and stimulate problem-solving, critical thinking, and decision making. A constructive
approach of teachers involves teachers and students constructing meaning from the different activities through active participation and interaction.

In the classroom level, the constructivist science teachers’ view of learning can point towards a number of different science teaching practices. In a general sense, students should be exposed in active techniques such as real-world problem solving and experiments to construct their understanding and then to reflect on and talk about how they construct the knowledge for deeper understanding. Recognition of students’ preexisting conceptions is also one of the responsibilities of a constructivist science teacher in order to guide students in generating of knowledge. Constructivist science teachers encourage students to constantly assess how the activity is helping them and gain understanding. By reflecting and asking themselves and their strategies, students under constructivist science teachers ideally become expert learners. This gives them ever-broadening tools to keep learning. With a well-planned classroom environment, the students will learn how to learn. Science teachers play crucial roles in the science learning of students not only by making scientific culture tools available to students, but also by guiding and co-constructing the knowledge with their students through discourse about shared practices. In the classroom interaction, learners create shared meanings to their teachers and with their co-learners.

From constructivist point of view on teaching and learning, science is not simply extending students’ knowledge about the nature of science or instilling conceptual change from students’ informal ideas to scientifically acceptable ideas. More so, learning science requires more than challenging learners’ prior ideas through discrepant events. Teaching and learning science involve the process in which novice students are introduced to a scientific community through discourse with their peers and expert teachers in the context of relevant tasks. Science classroom is a forming community in which students carry out discursive practices to co-construct ‘common knowledge’ (Edward & Mercer, 1987).
References:


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