

Context oriented teaching in mathematics

[Education](#), [Teaching](#)



Theoretical – Conceptual Framework

This study is anchored on the claims of Nikos and Stavros (2003) as cited in Journal for Research in Mathematics Education (2010), that in mathematics teaching using COT model – learning process is designed for the students to undergo the five Activity Types. Its goals is achieve through didactical theory and pre-formal proof. Along the process, the teacher finds himself comfortable as he/she will be in a position to locate exactly the learning set-up towards the students in which the learners will have a better strategy on how to start solving open problem. Below is figure 1 that shows the schematic diagram of the theoretical-conceptual -framework of this study.

Context Orientated Teaching is an avenue that describe in the theory of didactics. As cited in 4th Congress of the European Society for Research in Mathematics Education (CERME, 2005), Chevallard (2005) as he derived from dictionary definitions, the noun “ didactics” refers to the science, or art, or profession of teaching – dictionaries refrain from choosing. It derives from the Greek didaktikos, which means (or meant) “ skilful at teaching”. And it is akin (through Latin) to such words as docile, doctor, and disciple. The idea behind didactics is that someone attempts to do something so that someone – generally, someone else – learns something. This means that in mathematics teaching authentic learning happens in the hands of someone who is expert in the delivery and systematic of learning process.

Arguments has come to an end that the factual basis of didactics remain researchable. As what has been specified in CERME, 2005 that according to Chevallard (2005), didactic fact is any fact that can in some way be regarded

as the effect of a socially situated wish to cause someone to learn something. It is considered to the fact that didactic influences positively during the development of learning. Chevallard (2005) posits, that didactics should be defined as the science of the diffusion of knowledge in any social group, such as a class of pupils, society at large, etc. This “ definition” requires some comments. He emphasize further that its referring to a science is no writing automatism. This implies that, the search is continuously pursued and therefore the art of teaching is systematically delivered through didactical procedure. Meaning, Context Orientated Teaching is the product of doing research of which COT’s proponent had made knowledge available to the world.

Learning development have two parts. These are the part of the side of the teacher and the side of the learners. As what has been specified in google 2015, Context Orientated Teaching (COT) as describe by Nikos and Stavros (2003) the latter has two skeleton of teaching unit – first, it concerns the proof of mathematical proposition, while the other one concerns on the solution of the open problem (JRME, 2010). Proof is the last part of COT’s learning process. On the other hand, Context Orientated Proof which is basically in line with Blum’s (1999) pre-formal proofs. There are several reasons why proof is part of the learning context, this is because “ to know proofs” and more than that , “ to be able to prove” belong to the important goals of mathematics instruction; proofs and proving are features of mathematics (Hanna & Jahnke, 1996). This means that, real life situation leads toward mathematical proofs.

There many aspects of real life situation appears to be the most challenging task and that is proving. According to Nikos and Stavros (2003), as cited in google 2015, the notion of context appears in various understandings in epistemology, in philosophy of mathematics and in mathematics education. Mathematics education alone, appears in many facets; it is linked with didactical transposition, that is decontextualizations and recontextualizations, in order for the scientific knowledge to become teaching material. This implies that mathematics can't be departed from proof. It means that the most meaningful in learning mathematics must be ended up to the establishment of proof. It is then suggested in COT model the interconnected repetitions of the five Activity Types.

Specifically, learning development in COT model comprises of two task and these are the task context and situation context. As what has been cited in JRME, (2010), Nikos and Stavros (2003) posit that throughout the process, the word context is used in the broadest possible sense, referring both to task context and situation context; task context refers to the domain of the task given to students (Wedegge, 1999), while according to Borasi (1986), task context as a main role, to provide the problem solver with the information that may enable the solution of the problem. In ther words, teaching and learning in mathematics composes of two elements, first, situation context and second is task context. This means that, situation context refers to historical, social, psychological etc. conditions of learning. While task context is task given to the learners as they will bound to comply.

Similarly, teaching mathematics is not an easy task it requires didactics and excellent in theories of learning. As cited in google 2015, Artigue and Winsløw (2010), opined that the term “ epistemology” has been part of the didactics of mathematics since the 60’s, bringing with it the different meanings that accompany it and that bring us to different “ definitions” and interpretations in the various countries of the world and in multifaceted situations . Didactics is the science that takes, primarily, the teaching of disciplined knowledge as its object. Such a study may equally be more or less comprehensive, and more or less focused on local conditions and constraints. It implies that mathematics teaching had developed theoretically through didactics. It means that teaching mathematics should artfully and systematically imparted to the learners.

Therefore, it is obvious that whatever the child has been acquired of will show how much is being transmitted by the teacher. This follows that the child will represent the idea of “ live”. For Chevallard, (2005) asserts that “ live” the main position of didactics of mathematics and certainly, things cannot be considered as “ here since or forever”, elements of knowledge are products of human constructions, and their place and function vary according to places, societies, and periods of time. It shows then how is the theory of didactic especially didactic transposition will get into the difference between academic knowledge produced and the knowledge learned by the students. This processes of transposition of learning is a social production prepared by lots of different people within numerous institutions. A catalyst of learning whether political authorities, mathematicians, teachers and their associations explains the different meaning of issues and concerns of

teaching mathematics. Meaning, from the knowledge made it has to be done systematically and artfully.

According to Bosch and Gascón, 2005, as cited in google 2015, the theory of didactic transposition questions what seems obvious could be about knowledge present in didactical systems (and therefore breaks a certain illusion of transparency), about the fact that identical objects could live under different names, or more generally about the inclination to see only what institutions point out as worth of interest. With this claims, there has to be a process that will give clue among students and that is Context Orientated Heuristics (COH). This happens along the learning process specifically during the second activity type of COT model. In other words, COH will eventually extend beyond the four corners of learning because mathematical knowledge is most often produced outside school and that is in their daily lives. The purpose of didactic transposition theory is exactly to define and explain the circumstances of learning from its construction up to its teaching.

On the other hand, everyday teaching has a common denominator among teaching-learning most especially in mathematics teaching. This means that traditional way of teaching is what we usually do. Traditional teaching as describe by Nikos & Stavros, 2003 in which the teacher has the dominant role, concentrating on the development of students' knowledge rather than students' thinking. Because of its convenience, it tends to attract teachers and eventually will use this method but it will be lessen their skills in mathematics teaching.

In fact, some teachers having used the traditional teaching methods may be also deemed restricted to some degree. Despite of the fact that Friere (1967) was strongly opposed to the concept of education whereby knowledge is deposited into the minds of the students by the teachers, conventional teaching is nowadays a common denominator. Nonetheless, classroom settings are teacher-centered in which the teacher frequently do “ talk and chalk” at the students instead of encouraging them to interact, ask questions, explicit dialogue, or make them engage the lesson thoroughly. Most of the classes involves rote learning, where students depend on memorization even if they do not understand the mathematical concept.

Long lectures and dictations entails less interaction among learners and often leave students less attentive and less engaged therefore they tend to do skipping classes and missing lessons altogether. Moreover, students in a traditional class have little opportunity to interact with their classmates and their teacher as well as the teacher focuses only on how the steps are attained in learning mathematics. Traditional teaching, as most of us have experienced, is classroom-based and consists of lectures and direct instructions conducted by the teacher. This teacher – centered method emphasizes learning through the teacher’s guidance at all times. Students are expected to listen to lectures and learn from them.

Certainly, in this method some teachers considered tests as the most significant indicator of student performance and degree of learning. Students who belong in the same class sit down and take a single set of examinations, which they should pass. Most of the examinations are taken from

fundamental resources, such as textbooks and other publications that are relevant to the subject. Moreover, teachers talk to the students about the subject matter and expect them to learn everything through the lectures held in the classroom. Likewise, traditional teaching is concerned with the teacher being the regulator of knowledge. There is only one side of the story wherein all decision always bearable in favor of the teacher. They regard students as having 'knowledge holes' that need to be filled with information. In short, the traditional teacher views that it is the teacher that causes learning to occur (Novak, 1998).

Learning is chiefly associated within the classroom and is often competitive. The lesson's content and delivery are considered to be the most important and students master knowledge through drill and practice (such as rote learning). Content need not to be learned in context (Theroux 2002, Johnson & Johnson 1991). These criticisms include: 1.) the winner takes it all while all other students must fail; 2.) it causes negative perceptions among students such as high anxiety levels, self-doubt, selfishness and even violence; 3.) may promote cheating; 4.) interferes with the capacity to solve problem (Johnson & Johnson, 1991). Meaning, this will put mathematics more complicated to learn and eventually becomes unrealistic learning.

Conventional way of teaching mathematics presents the corresponding proof and the appropriate solutions without knowing whether the learners are ready or not.

According to Harel (2002), teachers who uses traditional instructional approach in dealings with mathematical proof have the following steps:

1. Present examples of how a formula with a single positive integral variable (like the sum of the first n integers) is generalized from observations and an observed pattern;
2. Talks about why examples are not enough to prove $P(n)$ is true for all positive integers n ;
3. Demonstrates the principle of mathematical induction as a proof of technique involving two steps: Step 1. Show that $P(1)$ is true Step 2. Show $P(n)$ implies $P(n+1)$ for all n . This implies that there is no students initiated proof towards proving mathematical concepts and theorems. Meaning, mathematical statements and reasons are already given by the teachers.

Whereas, COT as a model for teaching mathematics is purely initiated by the learners in giving proof. As cited in google 2015, according Nikos, 1992 this has to be considered that, modelling must constitute one of the essential components of teaching mathematics in secondary education. This implies that students will realize that mathematics is beneficial and useful because it solves not only an ordinary problems but also an unending real life problems. Real-life problems or open problems are what mathematics teaching objectively targeted. It is everyone's goal towards better understanding of the real context of mathematics education nowadays.

This is clearly supported by Chevillard (2005) that the main concern of it is a number of inadequacies that beset mathematics education in present-day societies. It views the basic hindrances that lie in – or can be expressed in terms of – the epistemological “ regime” of the knowledge imparted by most scholastic institutions, as well as in its main social, cultural, and political

correlates. This implies that no one is the monopoly of knowledge. It has to be understood that every learner is unique and therefore must be considered at all times. Meaning, everyone has the right to access through engagement, explicit dialogue, and be respected of whatever response he/she is going to establish.

In this light, Context Orientated Teaching in Mathematics (COT-Mathematics) gave the student an ideal position on how to attack real life situations that challenges mathematical learning. As cited in google 2018, according to Basturk (2016), by nature, people are interested in the events occurring around them and therefore they often seek to find the answers to the question “ why” especially when they encounter something unexpected or unpleasant (Forsterling, 2001; Wong & Weiner, 1981). This will lead the students to make a good move to start a point of direction. In other words, Context Orientated Teaching in Mathematics is a teaching model that offers solution in the process of five activity types. These five Activity Types are introduced by “ didactical” procedure and follows the idea of “ Pre-formal Proving”.