

**“QUADRONOMETRY”  
A NEW MATHEMATICAL CONCEPT APPLIED TO TEACHER  
EDUCATION**

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**ABSTRACT**

One of the statements in **K to 12 Curriculum Guide Mathematics (December 2013)** states that *“Critical thinking, according to Scriven and Paul (1987) is intellectually disciplined process of actively and skillfully **conceptualizing, applying, analyzing, synthesizing, and/or evaluating** information gathered from, or generated by, observation, experience, reflection, reasoning or communication, as guide to belief and action.*

We need to enhance the Mathematics here in the Philippines. This research aims to introduce the newly invented concept in mathematics known as the “Quadronometry”, whose definition is to study about four – sided figures and is applied for buildings and photography. But in this research, we will tend to figure out the concept of Quadronometry in a very different way because the researcher found out that the word was not yet found in the Merriam – Webster, even in Oxford.

According to RA 8293 or the Intellectual Property Code of the Philippines SECTION 2: *The State recognizes that an effective intellectual and industrial property system is vital to the development of domestic and creative activity, facilitates transfer of technology, attracts foreign investments, and ensures market access for our products. It shall protect and secure the exclusive rights of scientists, inventors, artists and other gifted citizens to their intellectual property and creations, particularly when beneficial to the people, for such periods as provided in this Act.*

*The use of intellectual property bears a social function. To this end, the State shall promote the diffusion of knowledge and information for the promotion of national development and progress and the common good.*

*It is also the policy of the State to streamline administrative procedures of registering patents, trademarks and copyright, to liberalize the registration on the transfer of technology, and to enhance the enforcement of intellectual property rights in the Philippines.*

Thus, we need the Quadronometry to attract investors.

**CONTEXT AND RATIONALE**

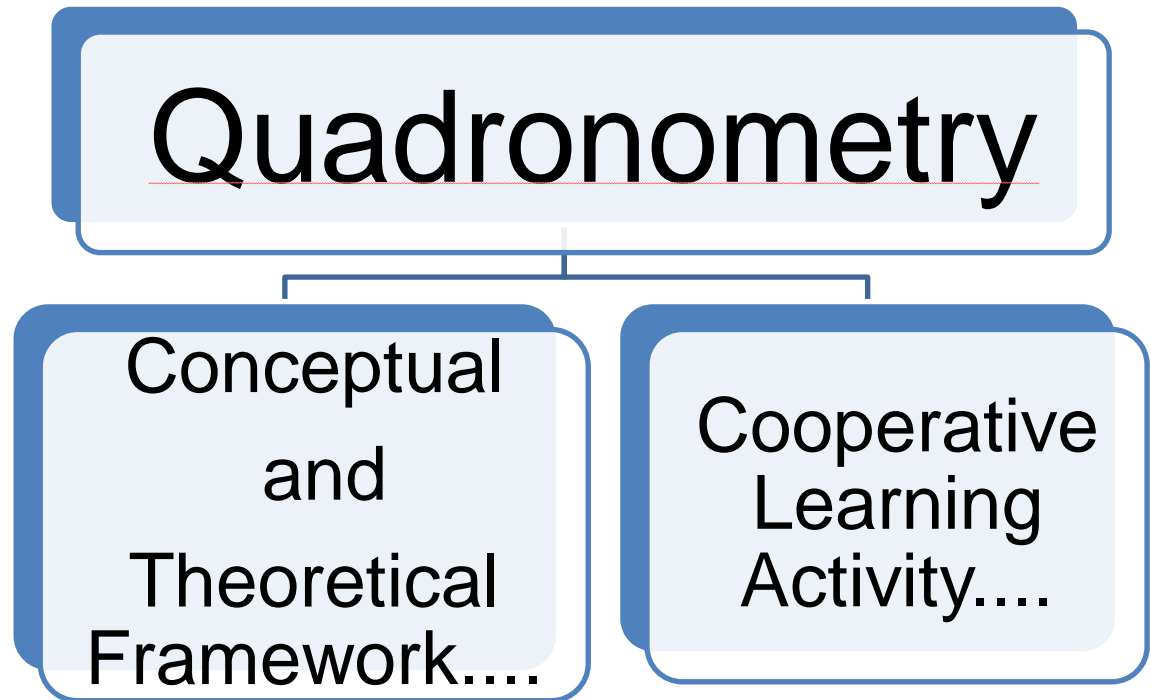
The newly invented term, the Quadronometry, according to some social media journals and websites, the newly found noun defined as a study about squares or four – sided figures according to the submitted article of Robin from Virginia, USA on January 31, 2008. Also, the word Quadronometry is a concept that is applied for architecture, photography, fine arts and other analogous applications according by John Kosmopoulos. But in this action research, we

will tend to figure out the conceptual framework of the term Quadronometry in a very different way (because when the researcher found out that the word was not yet found in the Merriam – Websters even in Oxford, it is the call for duty to construct the concept). Through the process of this action research, specifically about the content and performance assessments, Quadronometry will become very visible and interesting due to its very comprehensive principles, postulates, theorems, definition of terms, equations and applications.

Consider this essay coming from Melanie Anne Phillips, *“Well, I’m not much of a mathematician, but twenty years ago when we first considered the relationship of a trig[onometry] to the pair relationships by function; it occurred to us that we needed an additional dimension of function to describe that relationship. We jokingly said that somebody someday was going to have to come up with “quadronometry” as an expansion to trig[onometry]. But now I’m not so sure that is far off the mark. After all, the quad includes all four dimensions – Mass, Energy, Space and Time. And if we look at it in terms of psychology (the Story Mind) we see the internal equivalents of these – Knowledge, Thought, Ability and Desire. I’ve written elsewhere about the correlations between the external and internal dimensions, so I won’t be labour it here. Point is – trig provides three dimensions and Dramatica’s function requires four.”* (Trigonometry and Dramatica posted on August 26, 2012 by Melanie Anne Philipps).

As stated from above essay, Quadronometry can only be a pre – mature terminology which has to have so many definitions or of being an ambiguous term. But in this action research, the researcher will make a design of the conceptual framework to figure out the fundamentals of understanding the word “Quadronometry” in the Philippine Education System. As an educator, let us apply the basic concept of Quadronometry in teacher education. The literary piece, the Quadronometry, has already been under the copyright ownership of the teacher – researcher (yours truly) last 2019.

## **CONCEPTUAL AND THEORETICAL FRAMEWORK**



**\*Note on the “so on” (...) symbols, which means infinity of further study in conceptual and theoretical framework of a particular research and the infinity of transfer of knowledge in a CLA Groupings.**

### **SCOPES AND LIMITATIONS**

There are two main applications of Quadronometry in teacher education:

1. Making a conceptual and theoretical framework – for making research, thesis or dissertation, it is very vital for all teacher – researchers to make an abstract summary of the full paper. Quadronometry will suggest a proposed framework on how to deal with organizing such framework.
2. Organizing a cooperative learning activities – we have so many theories involved in this transfer of knowledge strategy, Quadronometry will suggest a proposed framework on how to deal with organizing cooperative learning activity.

### **STATEMENT OF THE PROBLEM**

#### **WHY WE NEED QUADRONOMETRY MODEL?**

Quadronometry is a mathematics of infinite imagination of replicating four – sided figures, thus we need this model due to...

1. Conceptual and theoretical framework of a certain study will always be an open – ended study or having further studies in the next future, which we further that the latter study will always be connected or greater than the former study.
2. A cooperative learning activity will always be an open – ended transfer of knowledge from one person to other group of people or individual.

### **REVIEW OF RELATED LITERATURE**

**(CONCEPTUAL AND THEORETICAL FRAMEWORK)**

It is a model with a symbolic representation that helps the researcher to express abstract concepts and relationships easily, using minimal words. A model can be represented schematically or mathematically.

- Schematic Model – conveys concepts and propositions through the use of boxes, arrows or other symbols.
- Mathematical or Statistical Model – conveys concepts and propositions through the use of letters, number and mathematical symbols.

| <b>Conceptual Framework</b>  | <b>Theoretical Framework</b>                      |
|--|---|
| Narrower Scope   | Broader Scope                                     |
| Very Specific, Definite Structure, No Ambiguity in Definition                      | General, Less Structured, Loosely Defined         |
| Derived from concept, specific variables that maybe identified in the study itself | Derived from theories that already exist          |
| Provide the structure, paradigm for a research analysis                            | Provide the basic foundation for a research study |

**(ZONE OF PROXIMAL DEVELOPMENT)**

The *Zone of Proximal Development or ZPD* is the best understood as the zone of the closest, most immediate psychological development of the children that includes a wide range of their emotional, cognitive and volitional psychological processes. In contemporary educational research and practice, though, it is often interpreted as the distance between what a learner can do without help, and what they can do with support from a knowledgeable adult. The concept was introduced, but not fully developed, by psychologist Lev Vygotsky (1896 – 1934) during the last three years of his life.

The concept of ZPD is widely used to study children’s mental development as it relates to educational context. The ZPD concept is seen as *scaffolding*, which is although Vygotsky himself never mentioned the term, but it was first mentioned and developed by Jerome Bruner, David Wood, and Gail Ross, while applying Vygotsky’s concept of ZPD to various educational contexts. Scaffolding is a process through which a teacher or more competent peer helps a student in their ZPD as necessary and tapers off this aid as it becomes unnecessary - much as workers removed a scaffold from building after they complete construction.

**(COOPERATIVE LEARNING ACTIVITY)**

An educational approach which aims to organize classroom activities into academic and social learning experiences. There is much more to cooperative learning than merely arranging students into groups, and it has been described as structuring positive interdependence. Students must work in groups to complete tasks collectively toward academic goals. Furthermore, the teacher’s role changes from giving information to facilitating students’ learning. Everyone succeeds when the group succeeds. Ross and Smyth (1995) describe successful cooperative learning tasks as intellectually demanding, creative, open – ended and involve higher order thinking tasks.

There are five essential elements are identified for the successful incorporation of cooperative learning in the classroom:

- Positive interdependence
- Individual and group accountability
- Pro – motive interaction (face to face)
- Teaching the students, the required interpersonal and small group skills
- Group processing

According to Johnson and Johnson’s meta – analysis, students in cooperative learning settings compared to those in individualistic or competitive learning settings, achieve more, reason better, gain higher self – esteem, like classmates and the learning tasks more and have more perceived social support or the theory of social interdependence theory; which exists when the outcomes of individuals are affected by their own and other’s actions. There are two types of social interdependence: positive (when actions of individuals promote the achievement of joint goals) and negative (when the actions of individuals obstruct the achievement of each other’s goals).

We have some benefits and applicability of cooperative learning:

1. Students demonstrate academic achievement.
2. Cooperative learning methods are usually equally effective for all ability levels.
3. Cooperative learning is effective for all ethnic groups.
4. Students perceptions of one another are enhanced when given the opportunity to work with one another.
5. Cooperative learning increases self – esteem and self – concept.
6. Ethnic and physically/mentally handicapped barriers are broken down allowing for positive interactions and friendships to occur.

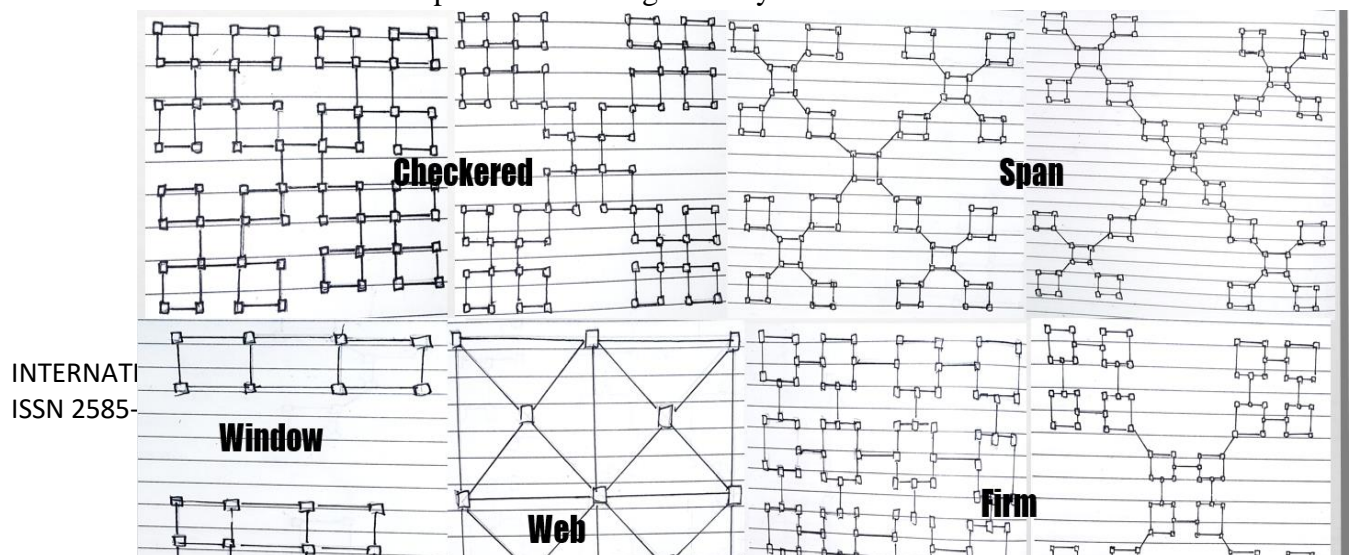
Cooperative learning results in:

1. Increased higher level reasoning.
2. Increased generation of new ideas and solutions.
3. Greater transfer of learning between situations.

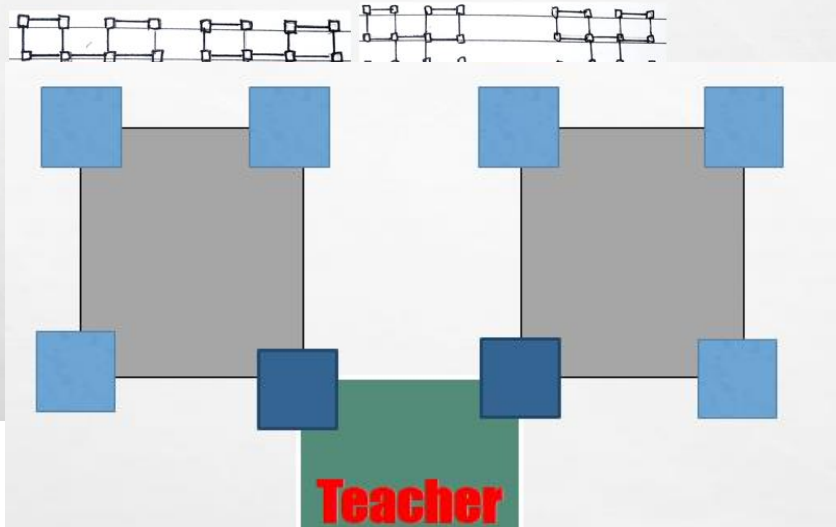
## METHODOLOGY AND RESEARCH DESIGN

This research will make use of a literature review and documentary analysis – a system of a qualitative research where in based on the expert opinions of some proponents of educational theories with the foregoing process of thematic analysis of application of Quadronometry. The form of data analysis will be a transcript related literature whose justified defining focus are:

1. The proposed diagram model of conceptual and theoretical framework, and cooperative learning activity organization based on the Quadronometry’s Replicating Features.
2. Theories involved in Cooperative Learning Activity.



# ORGANIZING A COOPERATIVE LEARNING ACTIVITIES



This complex diagram illustrates the conceptual and theoretical framework modeling of cooperative learning activity organization. It is divided into several sections:

- Face-to-Face Promotive Interaction:** A large green semi-circle containing the text "Social Skills", "Cooperative", and "Group Process".
- Zone of proximal development (Learner can do with guidance):** A purple semi-circle with a line pointing to the text "LEV VYGOTSKY'S THEORY". Below it, the text "COINED BY BRUNER, WOOD AND ROSS" is visible.
- R-research study:** A grid of nodes connected by lines, with the letter "R" placed in various nodes.
- E-students:** A grid of nodes connected by lines, with the letter "E" placed in various nodes.

At the bottom, there are two main sections:

- CONCEPTUAL AND THEORETICAL FRAMEWORK MODELING**
- COOPERATIVE LEARNING ACTIVITY ORGANIZATION**

Small text at the bottom right of the second section reads: "Go to Settings to activate Windows."

theoretical framework for a certain research that needs further study. Thus, we might help those future researchers to find more purposive problems since they can make some relations from the previous studies since we can make some theories or concepts be in wider scopes especially for those who are looking for thesis titles.

- Quadronometry is a mathematics of infinite replication which can be applied to the never – ending process of organizing a cooperative learning activity with the aid of some theories involved like the zone of proximal development and the social interdependence. Thus, we can apply this in a broader set up, meaning not just only inside the classroom but also in school set up, with cooperation with the school management personnel.

### RECOMMENDATIONS

I highly recommend the following endeavors:

1. To conduct seminars and trainings on how to fully grasp this Quadronometry concept; preferably, the resource speaker is the proponent himself.
2. To write a modular book for the Quadronometry concept applied to teacher education.

### REFERENCES

- K TO 12 Curriculum Guide Mathematics (December 2013)
- [http://wordcentral.com/byod/byod\\_browse.php?term=Qu&type=alpha&offset=10](http://wordcentral.com/byod/byod_browse.php?term=Qu&type=alpha&offset=10), submitted by: Robin from Virginia, USA on January 31, 2008
- <https://silverzonephotography.com/galleries/architecture/> by John Kosmopoulos
- Trigonometry and Dramatica Posted on August 26, 2012 by Melanie Anne Philipps
- <https://www.simplypsychology.org>
- <https://www.researchgate.net>
- Macpherson, Alice; Cooperative Learning Group Activities for College Courses (A Guide for Instructors); pages 87 – 97
- Quadronometry by John Austin B. Mendoza