



University of Ioannina, Greece

# PhD thesis

Designing and analyzing activities of Science Education for pupils aged 5-9 years with the current positions of the Activity Theory (cultural-historical-activity theory) – CHAT

**PhD student: CHARIKLEIA THEODORAKI**  
[xtheodoraki@cc.uoi.gr](mailto:xtheodoraki@cc.uoi.gr)

**Supervisor: Katerina Plakitsi**  
[kplakits@cc.uoi.gr](mailto:kplakits@cc.uoi.gr)

**3d Iscar Summer University**  
**Moscow, 2-8 July 2012**



**European Union**  
European Social Fund



MINISTRY OF EDUCATION, LIFELONG LEARNING AND RELIGIOUS AFFAIRS  
MANAGING AUTHORITY

Co- financed by Greece and the European Union



# @FISE GROUP OF IOANNINA (Activity Theory in Formal and Informal Science Education) focuses on

- Applying cultural historical activity theory (CHAT) in formal and informal **science education**.
- Rethinking **scientific literacy**.
- Rethinking the role of Information and Communication **Technologies**.
- We try to use **history of science** to create useful **didactical scenarios** for the class.
- We focus on children 5-9 years old.



MANAGING AUTHORITY  
Co-financed by Greece and the European Union

# Cooperative research groups

- CHAT@Uvic- Wolff-Michael Roth: [mroth@uvic.ca](mailto:mroth@uvic.ca)
- Laboratory of Science Education, Education Research Group of Science and Biological Science- Vasiliki Zogza: [zogza@patras.gr](mailto:zogza@patras.gr)
- Provando e Riprovando. University Centre of Science Education- Prof. Olmes Bisi: [olmes.bisi@unimore.it](mailto:olmes.bisi@unimore.it)
- GEHyD-Grupo de Epistemología, Historia y Didáctica de las Ciencias Naturales (Group of Philosophy and History of Science, and Science Education)- Prof. Dr. Agustín Adúriz-Bravo: [aadurizbravo@cefiec.fcen.uba.ar](mailto:aadurizbravo@cefiec.fcen.uba.ar)



European Union  
European Social Fund



Co- financed by Greece and the European Union



# Description of the research

- Thesis is developing in the context of a research Project which is co-funded by the European Union - European Social Fund (ESF) & National Sources, in the framework of the program “**HRAKLEITOS II**” of the “Operational Programme Education and Life Long Learning” of the Hellenic Ministry of Education ,Life Long Learning and religious affairs



European Union  
European Social Fund



Co- financed by Greece and the European Union



- The hypothesis of this study is that the Cultural Historical Activity Theory - CHAT provides a fruitful framework for the analysis and design activities in science,
- aimed at scientific literacy, the ages of 5-9 years.
- The methodological framework of this study is the developmental work research (Engeström, 1987, 2005). Key elements of the method are the Design Experiment (Brown, 1992, Roth, 2005) and Plan The 5th Dimension (Cole, 2006).



European Union  
European Social Fund



Co- financed by Greece and the European Union



# Final research products

- an innovative curriculum for science education and
- material for the class (website, e-book).

<http://users.uoi.gr/reapro/index.html>



European Union  
European Social Fund



Co- financed by Greece and the European Union





# Rea Project



[Home](#) [About CV](#) [Rea Project](#) [Thesis](#) [Publications](#) [Multimedia](#) [Contact](#) [Info](#)

My name is Charikleia Theodoraki I am 25 years old and I am PhD student at the University of Ioannina in Greece. I participated to ISCAR Congress 2011 which took place in Rome with a presentation entitled "A CHAT Approach In Natural Sciences Education Laboratory Lsessions Towards Reforming Teachers Training".

My PhD Thesis entitled "Designing and analyzing activities of Science Education for pupils aged 5-9 years with the current positions of the Activity Theory (cultural-historical-activity theory β CHAT", is developing in the context of a research Project which is

Με λένε Χαρίκλεια Θεοδωράκη, είμαι 25 χρονών και είμαι υποψήφια για διδακτορικό στο Πανεπιστήμιο των Ιωαννίνων. Συμμετείχα στο συνέδριο ISCAR 2011 που έγινε στην Ρώμη με την παρουσίαση με θέμα "A CHAT Approach In Natural Sciences Education Laboratory Lsessions Towards Reforming Teachers Training".

Το διδακτορικό μου με θέμα "Σχεδιασμός και ανάλυση Δραστηριοτήτων των Φυσικών Επιστημών για μαθητές ηλικίας 5-9 ετών με τις σύγχρονες θέσεις της Θεωρίας της Δραστηριότητας (Cultural- Historical- activity- theory- CHAT)", αναπτύσσεται στα πλαίσια του προγράμματος έρευνας "Ηράκλειτος II" Επιχειρησιακό Πρόγραμμα

# Framework and Purpose

- connect Science Education with Cultural Historical Activity Theory (CHAT)
- focuses on a series of laboratory courses in Science Education which were organized by the University of Ioannina
- follows the implementation of socio-cultural education in science education (Cole, 2006, Engeström, 2005, Plakitsi, 2008).





- **diffusion** of cultural, historical activity theory (CHAT) in Science Education in Europe.
- review of **scientific literacy** (Roth, W. M., Lee, S., 2004)
- to bridge the gap between **science education** and **social sciences**



European Union  
European Social Fund



Co- financed by Greece and the European Union



# The research objectives of this thesis are:

- **Designing activities** for effective science education learning with the aim of **scientific literacy**.
- **Activities analysis** using CHAT.



European Union  
European Social Fund



Co- financed by Greece and the European Union



# 6 basic categorical variables of an activity:

- the **subject** of an activity (eg teachers, students)
- the **object** of the activity,
- The **tools** (eg the history of science, computer, animation, etc.)
- operating **rules** of learning communities,
- the roles of **community** members and learning
- the **division of labor**.



European Union  
European Social Fund



Co- financed by Greece and the European Union



# Pilot reserch (magnetism) (Mwanza, 2001)

- 1. Activity of interest:** Students modified the sort of activity in which they are interested in.
- 2. Objective of activity:** Students modified the reason of why the activity takes place.
- 3. Subject in this activity:** They discussed about who were involved in activity (students, teachers, parents).



European Union  
European Social Fund



Co- financed by Greece and the European Union



**4. *Tools mediating activity:*** Books and other materials were the tools by which the subjects (students) carried out the activity.

**5. *Rules and regulations mediating the activity:***  
They collectively accepted rules to follow during the activity:

- a) Each pair of students works together to explore the strength of the magnet.
- b) They record their findings in their datasheet.
- c) When students have completed their experimentation, bring the class together to discuss their findings.
- d) Teacher evaluates student responses

## 6. *Division of labour* mediating the activity:

**Teacher:** 1) demonstrate how to set up the experiment (without actually demonstrating the results), 2) Bring the class together for discussion (What happened? Were our hypotheses correct? What conclusions can we make?) (Unlike poles attract, while like poles repel).

**Students:** 1) work in pairs. 2) experiment with a partner to determine the magnetic and the non magnetic objects. 3) Students should be given enough time to experiment with their objects and magnets.



- 7. Community in which activity is conducted:**  
we define the environment in which the activity is carried out (the class with Greek students).
- 8. Outcomes:** we presume the effectiveness of Activity Theory in our Lab Lessons



European Union  
European Social Fund



Co- financed by Greece and the European Union



# Plan of the thesis

- ❑ Planning and Organization of Thesis / Monitoring / Evaluation

**Natural sciences activities (magnetism, sound and the principle of buoyancy of Archimedes)**

- ❑ Design activities of Science Education based on Activity Theory
- ❑ Literature search, data collection

**Videotaped materials, observations, interviews**



European Union  
European Social Fund



Co- financed by Greece and the European Union



- Implementation
  - **Sample:** Four pre-primary school classrooms of approximately 20 pupils each
  - **Lessons:** 15 lessons (5 for magnetism, 5 for sound, 5 for principle of buoyancy of Archimedes (30 min) in each classroom
  - **duration:** 6 weeks
- Analysis of the survey

## Activity analysis using CHAT

- Results- Writing the Thesis - Diffusion of Thesis



European Union  
European Social Fund



Co- financed by Greece and the European Union



# Research carried out

- Kolokouri E., Theodoraki C. (2011). **A CHAT approach in natural Science Education Laboratory lessons Towards reforming teachers training.** Paper presented at the ISCAR Congress 2011. Rome.
- Theodoraki X., Plakitsi K. (2011). **Archimedes discovers the principle of buoyancy. A didactical scenario of Science Education for students 5-9 years old by using Activity Theory and learning in Science Education laboratory lessons.** Paper presented at the 11th International (IHPST) and the 6th National Congress of History, Philosophy and Science Teaching Physical Science and Culture: promise, challenges and requirements. Thessaloniki



Co-financed by Greece and the European Union

- Theodoraki C., Plakisti K. (2010). **Analyzing activities in the course of Science Education, according Activity Theory. The case of sound.** Paper presented at the 6th Pan-Hellenic Conference on Science in Early Childhood Education. (Forthcoming in the conference after evaluation).
- Theodoraki C., Kaldrymidou M. (2009). **The contemporary socio-cultural approaches of science education for developing new curricula and textbooks.** Paper presented at the XIII International Conference on Educational Society. Curriculum and textbooks: Greek reality and international experience.



Co-financed by Greece and the European Union

- Theodoraki C., Plakitsi K. (2009). **Activity Theory and learning in Science Education laboratory lessons. The case of magnetism.** ESERA 2009 Conference, Istanbul, Turkey.



**European Union**  
European Social Fund



Co- financed by Greece and the European Union





- Theodoraki C., Plakitsi K. (in publish).  
University science teaching programs. What's new in lab activities from CHAT context? The case of magnetism. In K. Plakitsi (Ed.). *Cultural perspectives in science education: Research dialogs. Activity theory in formal and informal education*. Sence Publishers.



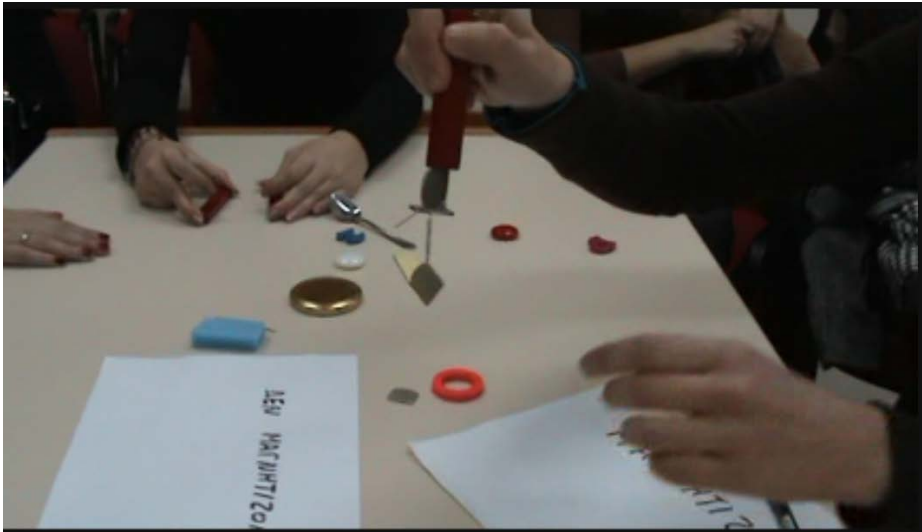
European Union  
European Social Fund



Co- financed by Greece and the European Union

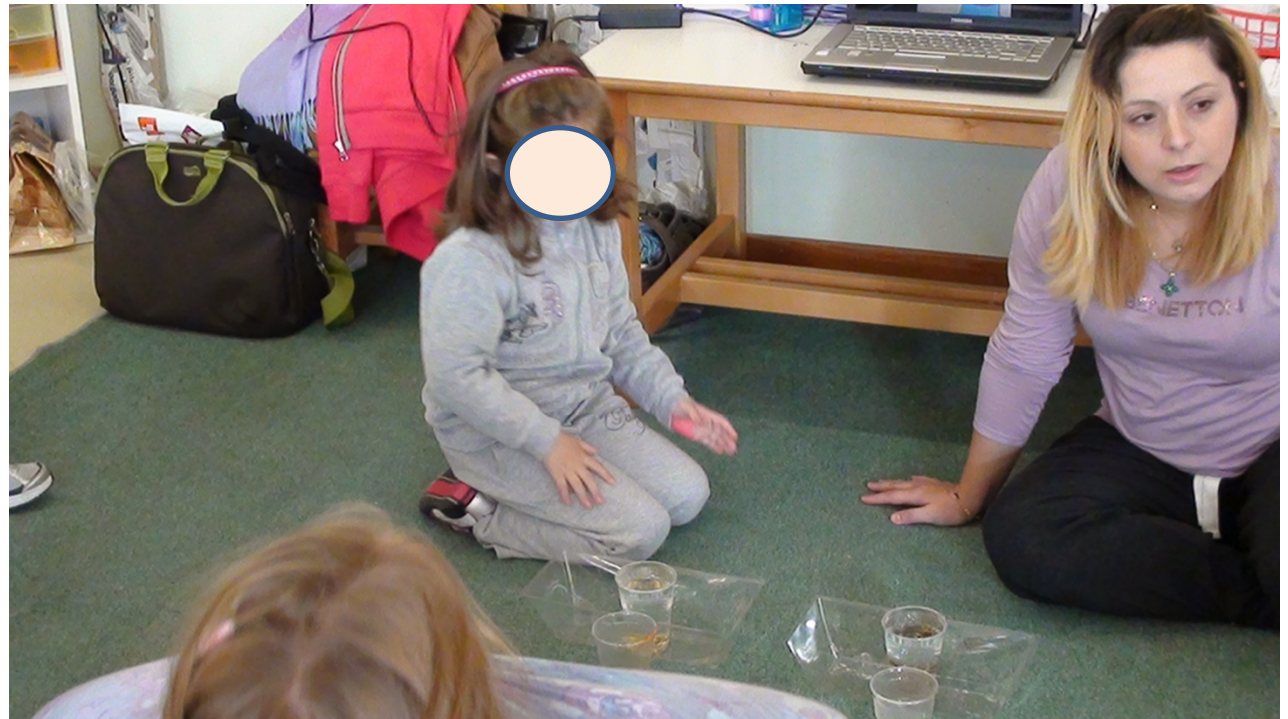


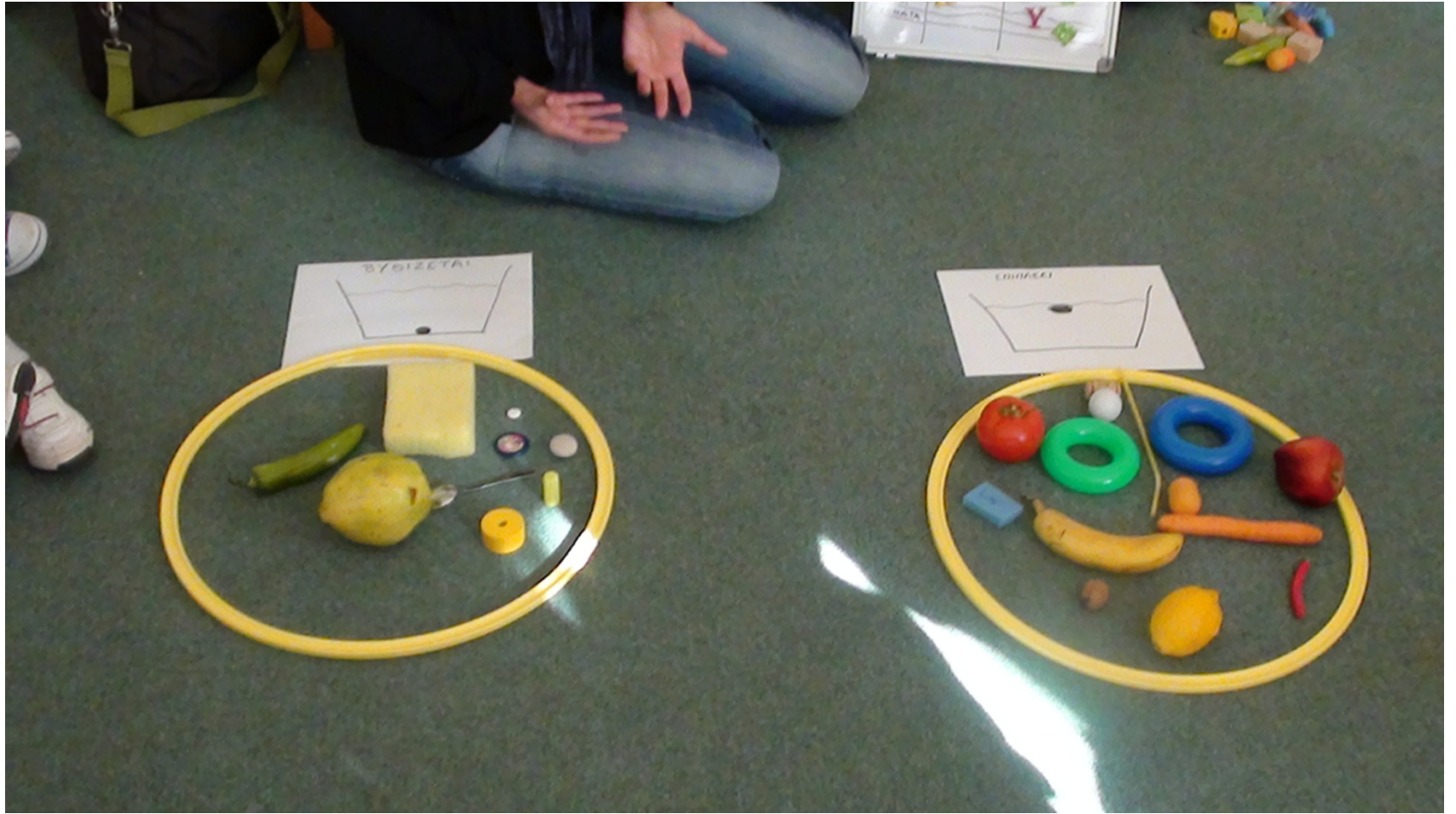
# Some photos of our research











# Questions and difficulties

- Is it effective to examine all six variables in a dissertation or is it better to focus on one?
- How can I use the method of riddles that were mentioned in Pentti's presentation yesterday?
- CHAT is a new method for Greece.





***Thank you  
for your attention!!!***