University of Ioannina, Greece

Cultural Historical Activity Theory (CHAT) in formal and informal teaching of Natural Sciences in the early grades

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THIS THESIS IS PART OF A RESEARCH PROJECT

and is connected with

the **A**ctivity **T**heory in **F**ormal and **I**nformal **S**cience **E**ducation (**@TFISE** project), which takes place in the University of Ioannina, Greece.


Alexandroupo
Kavá
Thessaloniki
Ioannina
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Larisa
Volos
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ATHENS
Ionian Sea
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INTRODUCTION

- Cartoons are used as method of introducing natural concepts in the early grades to provide learners with scientific knowledge presented in a familiar context
- Scientific learning in the early ages is put on cultural-historical and social basis
- CHAT is used as a theoretical framework to analyze and design natural sciences activities for the early grades and put them into practice in the school classroom

RATIONALE

- Teachers in the early grades need cultural tools that can make learning concepts meaningful

- Cartoons engage pupils in exploring a variety of scientific concepts, in experimenting, in creative thinking and providing solutions to problems

- Reforming of the curricula has led to considering learning as an ongoing process which is affected by societal conditions

OBJECTIVES

- Use Cultural Historical Activity Theory (CHAT) as a theoretical framework in order to design and analyze natural sciences education activities
- Create the learning environment so that pupils can practice in science activities that are related to their socio cultural background
- Provide early grade pupils the opportunity to obtain key competences and skills necessary to understand basic scientific concepts

RESEARCH QUESTIONS

- In what way are cartoons used as a tool in order to deal with scientific concepts in the early grades ?
- Can cartoons help pupils practice skills of the scientific method and life skills?
- Is CHAT a suitable framework for teaching natural concepts in the early grades?

METHODOLOGY

- the framework of analysis by the view of Yrjö Engeström (2005)
- the cultural- historical approach by Marilyn Fleer and Marianne Hedegaard (2008,2010) about children's development in every day practices
- the project 'The Fifth Dimension' implemented by Michael Cole and the Distributed Literacy Consortium (2006)

DESCRIPTION OF THE RESEARCH

- Action research with elements of experimental research
- Two pilot surveys in which Natural Sciences activities were designed in the laboratory courses of Teaching of Science in Early Childhood Education Department, in the University of Ioannina and put into practice in the pre-primary schools of Ioannina
- A variety of didactic strategies has been used which includes educational drama, pantomime, cartoons, games, etc. all of which follow the basic principles of CHAT

PRODUCTS OF THE THESIS

- an alternative teaching method for introducing scientific concepts in the early grades
- an innovative curriculum of scientific topics
- a cartoon series with educational material
- synergy with conferences and life-long learning programs

PILOT RESEARCH 1

Floating and sinking concepts

- The core of this study is to enable both university students and pupils to deal with basic scientific concepts in their own environments and to express themselves with their own epistemology
- Narration of the adventures of Sponge Bob Square Pants, (a popular cartoon who lives in a city under the sea) who faces unexpected problems of floating and sinking


ΥΛΙΚΑ

PILOT RESEARCH 1

Data

- Questionnaires
- Interviews
- Videos

PILOT RESEARCH 2

Light-Colours- Shadows concepts

In the university laboratory by prospective teachers:

- Narration of a story about colours connected with History of Science
- Suggestion of ideas in order to design natural sciences activities about colors connected with the story
- Creation of comics of the main points of the narration
- Development of natural sciences activities about colors for an early-grade school classroom
- Exploring about color theories, research on the contribution of Newton to color theory

PILOT RESEARCH 2

In pre-primary school classrooms pupils:

- Listen to the narration of the story about colors
- Make drawings connected to the narration and compare them with the comics or cartoons that university students have mad
- Decide on which part of the classroom they will transform to a laboratory
- Collect the materials they need to conduct the color experiments

PILOT RESEARCH 2

PILOT RESEARCH 2

Data

- Observations
- Videos
- Interviews

MAIN RESEARCH

- Review of the connection of History of Science with Science Education
- Documentation of a didactical scenario for the early grades
- Writing of a story about colours connected with History of Science
- Creation of a cartoon in the scratch program based on the narration
- Development of a natural sciences activities series about light, colors and shadows for an early-grade school classroom

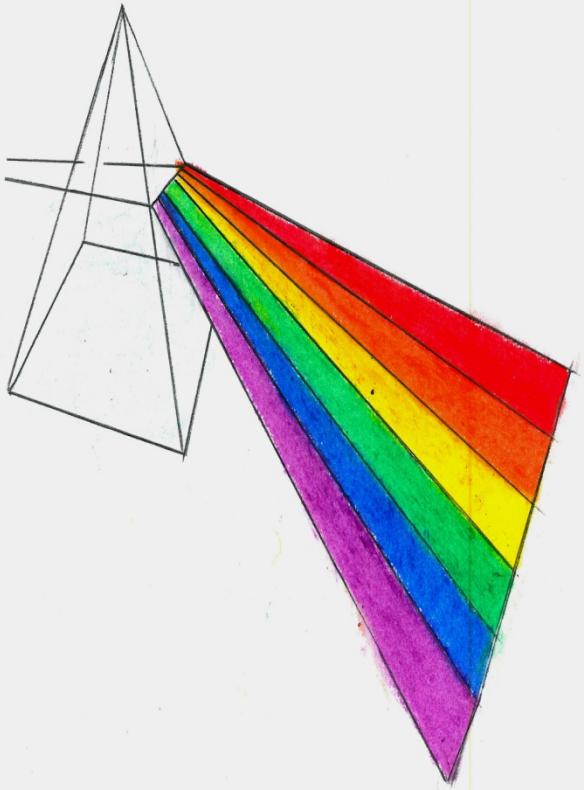
THE CARTOON:
COLOR VISIONS FROM THE PAST

In a town where colours are fading day by day...

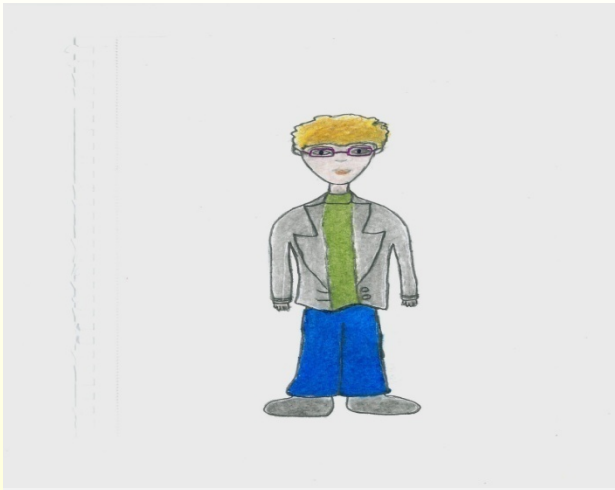
Phoebus and Iris travel in an unusual way from uncle Albert's cottage ...

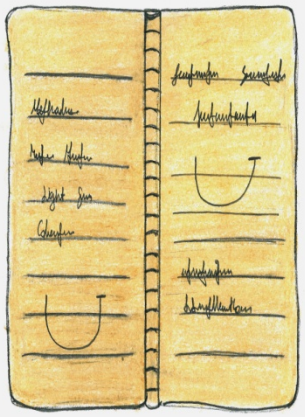
to Newton's laboratory where they are caught while overhearing part of a lecture and offer to work...

on colour experiments



When they manage to escape and travel back, they bring invaluable information to uncle Albert's lab





RESEARCH COURSE

- **Sample:** Four pre-primary school classrooms of approximately 20 pupils each

- **Lessons:** 20 lessons (30 min) in each classroom
- **Timetable:** autumn 2012, 3 lessons per week
- **Implementation:**7-8 weeks

- **Control group:** 1 pre-primary school classrooms

(floating-sinking, light-shadows-colour concepts without the use of cartoons)

- **Experimental group: 3** pre-primary school classrooms

(floating-sinking, light-shadows-colour concepts with the use of cartoons)

RESEARCH COURSE

Example of a lesson plan (30-35min.)

Aims

- To explore pupils' spontaneous ideas and about light
- To make pupils use their senses and observe in order to understand the function of light sources

Activities

- Pupils watch the first part of the cartoon and discuss about it
- Pupils express their own ideas about where light comes from and name the light sources they know
- Pupils are provided with materials that produce light and others that do not, they discuss about them and then they divide them in two categories

RESEARCH COURSE

Example of a lesson plan (30-35min.)

Evaluation

- Are the pupils able to express their opinion about light?
- Do they refer to prior experience connected with their daily life?
- In what way do they make observations?
- In what way do they develop their scientific thinking and vocabulary?
- What are their reaction towards the cartoon?

RESEARCH COURSE

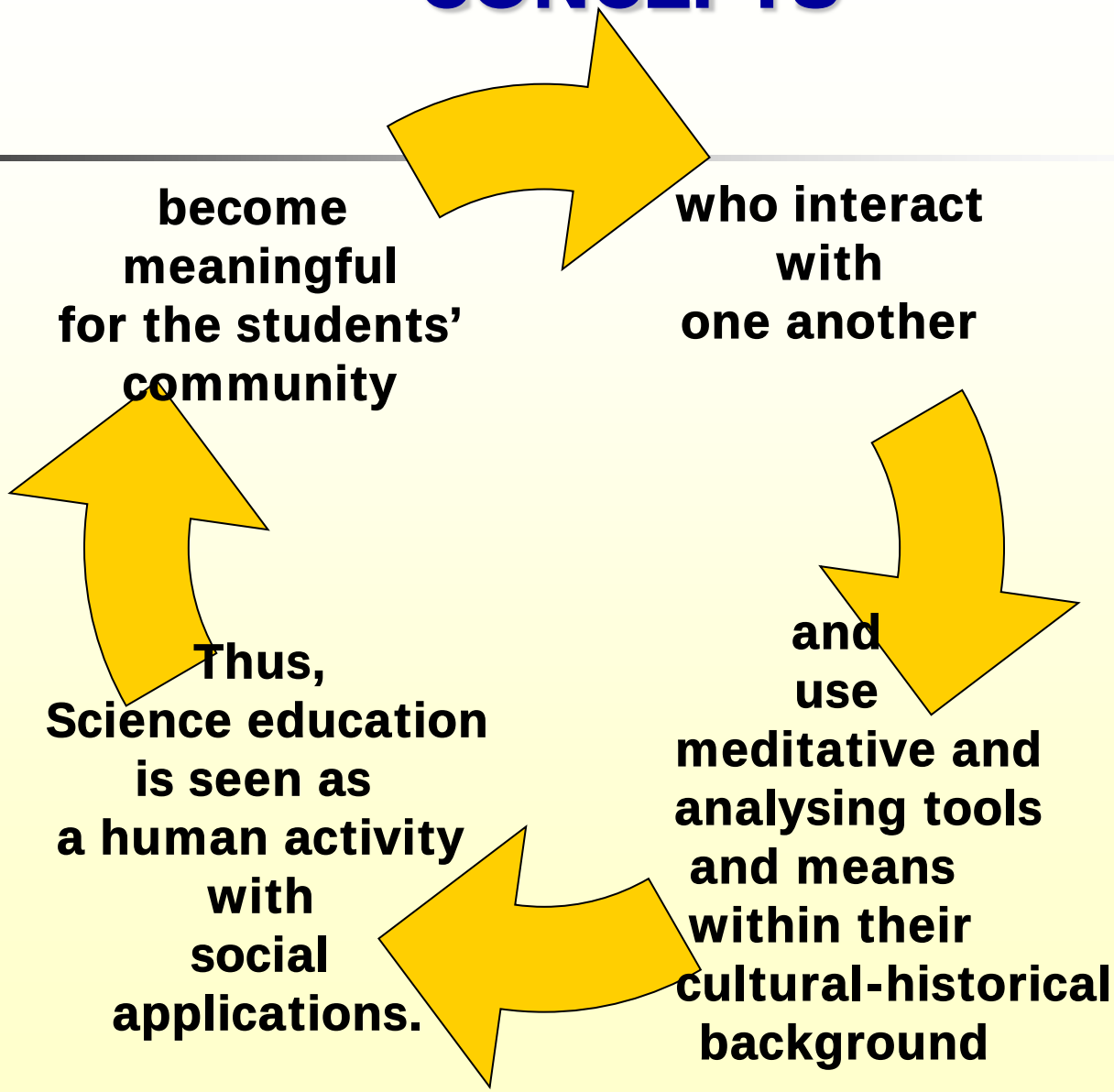
After watching each part of the cartoon pupils:

- express their own ideas about scientists
- play the roles of the characters of the cartoon
- deal with scientific concepts in order to work like the scientists of the story
- transform a part of the classroom to a laboratory, in which they experiment on colors
- organize the experiments in class; they set rules and use the materials in order to conduct the experiments
- participate in a problem solving situations and interact with each other as well as with the teacher

DATA ANALYSIS

- Video Analysis
- Interviews with pupils
- Pre and post ideas of the pupils about the scientific concepts
- Development of scientific vocabulary to describe the scientific concepts
- Analysis of the drawings of pupils

IN THIS SENSE SCIENTIFIC CONCEPTS



Благодарю вас за внимание!

Thank you for your attention!

Communication

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