



STUDYING OF THE DEVELOPMENT OF SCIENTIFIC CONCEPTS IN CHILDREN

Katerina Plakitsi,
Full Professor
Head of the Department of Early Childhood Education
University of Ioannina, Greece
ISCAR President
E-mail: kplakits@gmail.com

8th ISCAR Summer University for PhD students
Cultural-historical psychology: interdisciplinary research perspectives & social
practices
8-13 July, 2019

Introduction

- ⦿ Education has immediate connection with science and culture not as “accomplished”, “finished” products of the past, but as processes in continuous evolution.
- ⦿ Preconceptions of the learning subject, have not a continuous smooth character, but involve in a conflictive form aesthetic, social and cultural elements, which cannot be excluded from the paedeutic practice.

Introduction

- ⦿ According to J. Piaget's position "the child must be considered, not as a purely imitative being, but as an organism who assimilates the things ... according to his proper structure". (Piaget, 2003, p. 30).
- ⦿ We also share the point of view that science, is not exhausted in a quantified rendering of sense data, but undulates between phenomenological subjectivism and ontological objectivity, aspects that are transcended if it is approached under the historical - cultural perspective.
- ⦿ There is a complexity within the social (societal-political) practice that can appear even at education in the early years. In bringing the dialectic of agency, passivity, resources, schemas to educational context, tensions may arise in the form of contradictions that need to be resolved.

Ontology, subjectivity and knowledge

- Science is much more than as a “logistic” activity, in the sense of logical positivism, deprived of any ontological substantiation, since, according to our point of view this would ignore the meditative or interpretive features salient in it.

Ontology, subjectivity and knowledge

- It must be clear that ontological interrogation is necessary for the integration of scientific knowledge and education, and also that positivistic phenomenalism having as its consort the demand of a yes/no answer, is more dogmatic than the ontological questioning, as it evolves in the history of science, education and culture.

Ontology, subjectivity and knowledge

- ⊙ An undermining of subjectivism would give emphasis to the need of an aesthetic enhancement of the world. On the other hand this would have made weaker the limits of the distinction between the interior and the exterior, the action and its effect.
- ⊙ **This diversifies our attempt for an ontological emphasis on knowledge, from the Aristotelian “contemplative life”, which was founded on firm, eternal principles.**

Ontology, subjectivity and knowledge

- ◎ We deem that the most fruitful approach in the educative context is that of J. Bruner, according to whom the “self becomes “dialogue dependent” designed as much for the recipient of our discourse, as for intrapsychic purposes” (J. Bruner, 1990, p. 101).
- ◎ *On this ground, subjectivity presupposes an aspect, which is **ontological, social and cultural***

Concepts & Scientific concepts (Blunden, 2013)

- ⦿ ‘A concept is a form of action organized around a word acting as a sign for it, which is the basic unit of a culture or project and a unit of the consciousness’.
- ⦿ An actual concept matures gradually through practical life experience. This idea of ‘concept’, as a line of development includes both mature forms and abstract, immature and undeveloped forms and is consistent with dialectical logic and with his own genetic method.

CONCEPTS OF CHAT SESSION

The development of Concepts during childhood

A concept is a form of
activity

Concepts are formed to
solve some problem.

Concepts formed in childhood
are generally not *true* concepts.



Concepts & Scientific concepts (Blunden, 2013)

- ◎ Conceptual knowledge develops through the philosophical concepts of Abstract and Concrete. The contrast between abstract and concrete does not mean the contrast between a theoretical idea and practical reality, but both words may have seemingly opposite meanings in different contexts.
- ◎ Thus the abstract concept of the whole (in terms of theoretical conceptions) becomes more and more concrete in the development of concepts into a practical and scientific theory – “a reproduction of the concrete by way of thought.”

Concepts & Scientific concepts (Blunden, 2013)

- For Vygotsky, words are the most important mediators:

“Fundamental to the process of concept formation is the individual’s mastery of his own mental processes through the functional use of the word or sign”
(Vygotsky, 1987, p. 132)

Concepts & Scientific concepts (Blunden, 2013)

- The child or young person's actions can be understood in terms of a concept acquired by the subject which makes sense of a whole system of their actions.
- A concept is a form of activity. Although Activity Theory, was only founded by A. N. Leontyev only after Vygotsky's death, Vygotsky's concept of concept played the same role in his psychology: - that which provides the motivation for actions and allows the observer to make sense of a subject's actions.
- A concept is a cultural-historical product of the wider community, transmitted to the subject by instruction.
- Vygotsky further supports this proposal by means of occasional observations about the cultural and historical development of concepts. Concepts are in the first place units of a culture, from which they may be acquired by an individual.

CONCEPTS OF CHAT (A. BLUNDEN)

The development of Concepts during childhood

- Syncretic concepts
- Complexes
- Pseudoconcepts
-
- Potential concepts
- Pre-concepts



Concepts & Scientific concepts (Blunden, 2013)

- Artificial concepts are concepts “that are formed under experimental conditions” (Vygotsky, 1934, p. 51).
- The types of concepts whose formation can be created under laboratory conditions are potential concepts, syncretic concepts, complexes (chain complexes, diffuse complexes, collection complexes and pseudoconcepts) and pre-concepts.
- Complexes are the simplest form of ‘concept’ in which a subject abstracts empirical features from objects or situations and connects them with features abstracted from other objects or situations. Explanation Vygotsky developed the concept of complexes, or ‘complexive thinking’ by use of the method of dual stimulation applied in Leonid Sakharov’s experimental study of concept development, described in Chapter 5 of Thinking and Speech.

CONCEPTS OF CHAT (A. BLUNDEN)

Syncretic concepts

Isolate object from background and name it.

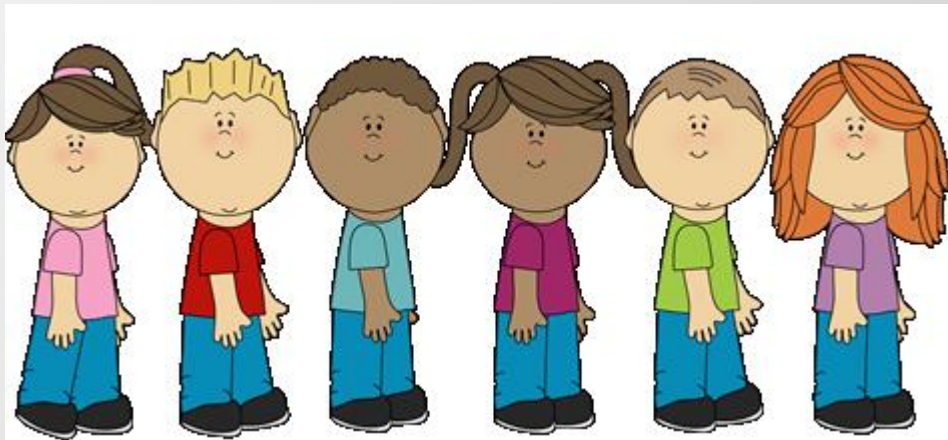


- Incoherent Heap
- Subjective series
- “Those there”

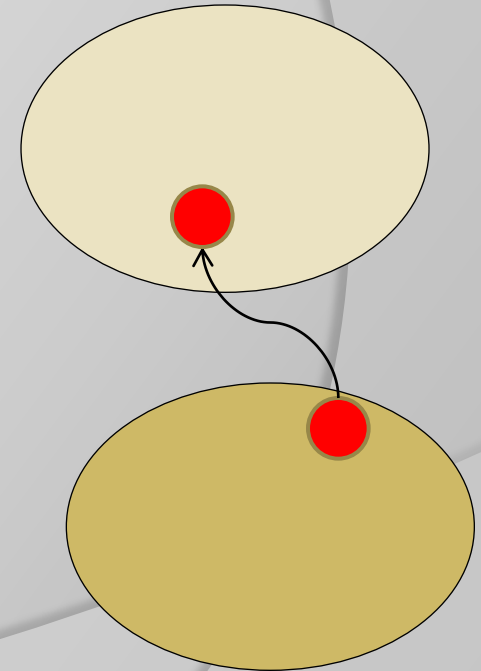
CONCEPTS OF CHAT (A. BLUNDEN)

Complexes

Abstract a feature and *group* objects according to the *same* feature.



- Chain complex
- Associative complex
- Collection complex
- Diffuse complex



CONCEPTS OF CHAT (A. BLUNDEN)



Pseudoconcepts



to form complex under guidance of others' word use.

CONCEPTS OF CHAT (A. BLUNDEN)

Potential concepts

to isolate objects according to their functional significance



CONCEPTS OF CHAT (A. BLUNDEN)

Pre-concepts



to reason within a finite set of objects according to rules

Concepts & Scientific concepts (Blunden, 2013)

- Vygotsky (1987) is known for his analysis of the interplay between everyday and scientific concepts and for his account of development from collections to complexes and eventually to formal concepts. However, with regard to the mechanism of concept formation, Vygotsky's idea of double stimulation is of central importance. In the theory of double stimulation, the initial stimulus situation involves a conflict of motives. The conflict is resolved by invoking a neutral artifact as a second or auxiliary stimulus, which is turned into a mediating sign by investing it with meaning.

CONCEPTS OF CHAT (A. BLUNDEN)

Spontaneous, True and Actual Concepts



Ideal **lines** of development,
not **types** of concept



Concepts & Scientific concepts

Roth, Goulard, Plakitsi, 2013

- ⊙ The development of concepts and categories is dialectically connected with moments of change
- ⊙ The concepts and categories embody change as an inner element and as a result, they reflect difference. Thus, cannot be self-identical, they are always different.

Development of scientific concepts in the early years curriculum

- ◎ Science curriculum in early childhood education gives children the opportunity to understand their surroundings, which in fact are their lifeworlds.
- ◎ By observing the movement of the leaves in the trees, the children have a material object as a resource that provides the opportunity to:
 1. talk about their experience, which is something that they cannot directly see (e.g., air/wind), but which is present, and they can prove it and provide evidence of its presence
 2. explain the phenomenon (air/wind) and contrast it with another way of seeing the world
 3. perceive and comprehend the phenomenon, that is, now they have more resources for talking about the natural phenomenon that is part of their studying.

Development of scientific concepts in the early years curriculum

- ⦿ As a next step, emerging topics have to be studied in depth, which means that children will be involved in structured activities mediated by artifacts.
- ⦿ Artifacts provide resources to structure activities, mediate conversations, prepare and set up scenarios in which actions and conversations about scientific concepts may unfold.

Development of scientific concepts in the early years curriculum

The teacher:

- ⦿ engages in an authentic dialogue with the students
- ⦿ gives students the opportunity to experience scientific concepts through investigation
- ⦿ encourages students to share their questioning, activates their curiosity about the world while offering them space for investigating these topics together
- ⦿ looks for resources that enable teachers to improve their pedagogical practices
- ⦿ takes into account the students' point of view, that is, the way they perceive their environments
- ⦿ reinforces students' ideas as well as participative thinking

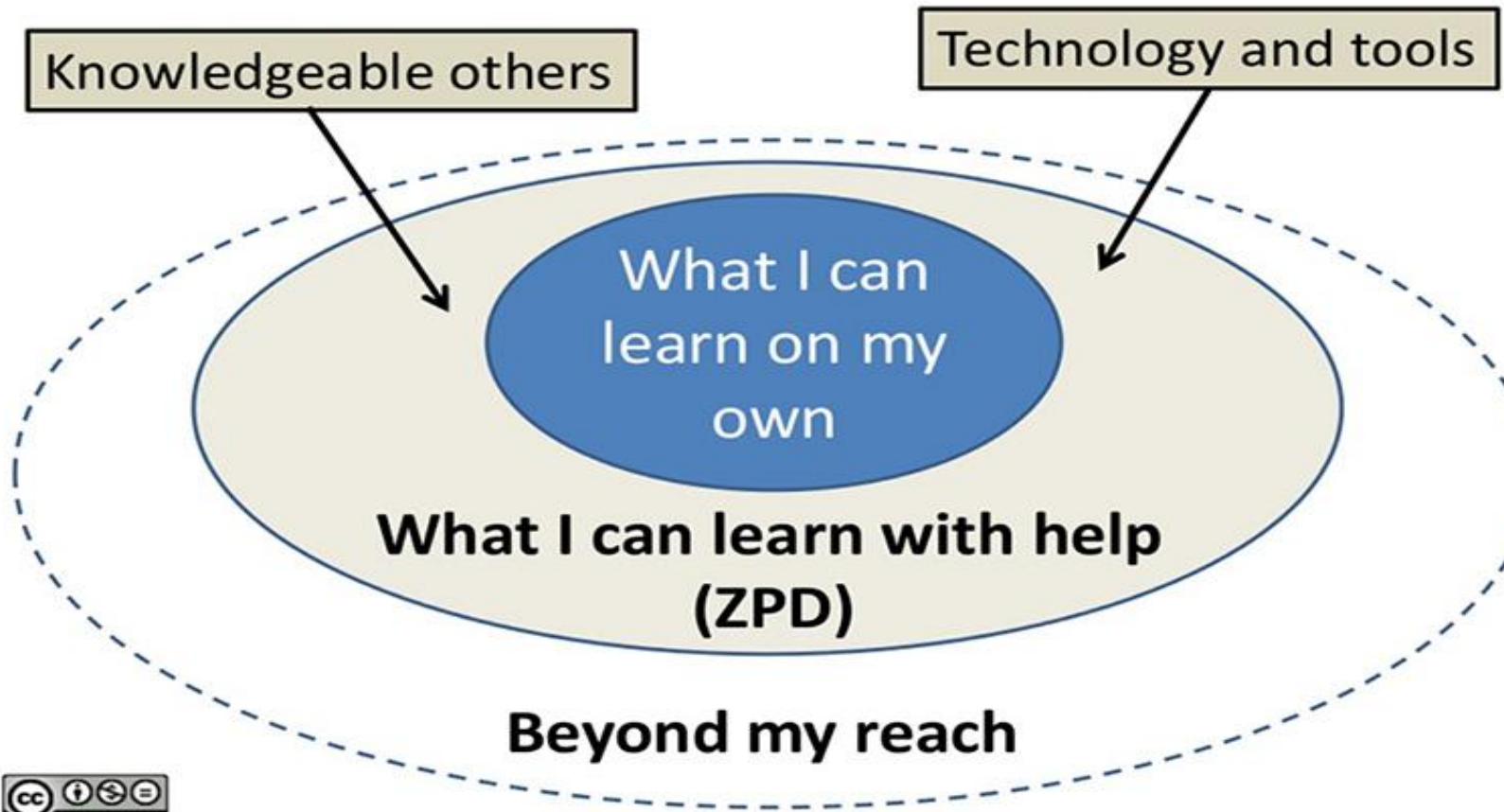
Cultural Historical Activity Theory framework in Science Education

- ⦿ can expand the borders of pedagogical knowledge
- ⦿ can be more **liberating** and more **motivating**

Culture becomes structure

Zone of Proximal Development

ZPD and scaffolding



The development of scientific concepts in praxis





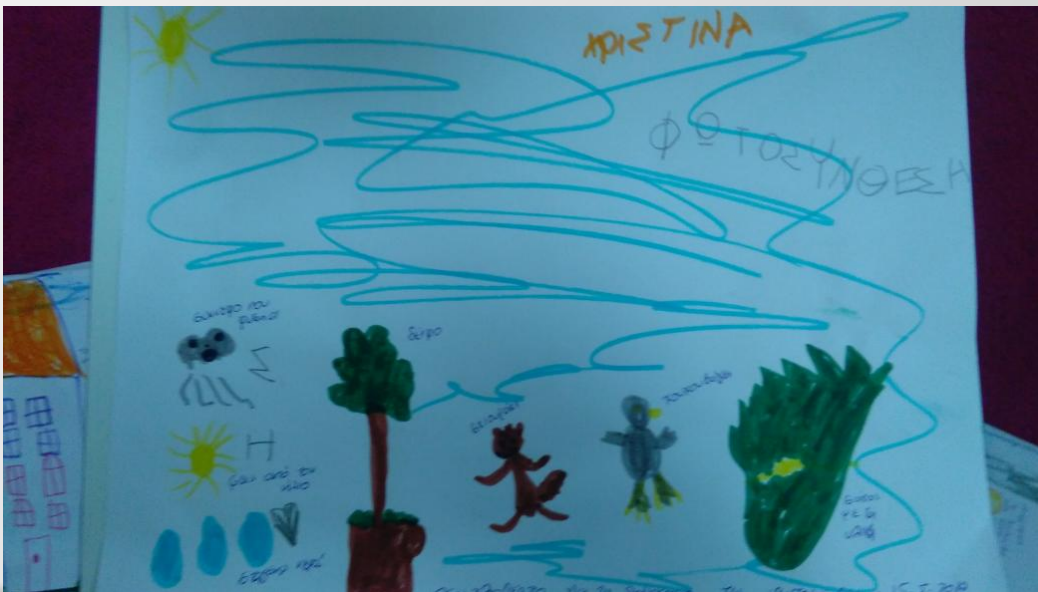
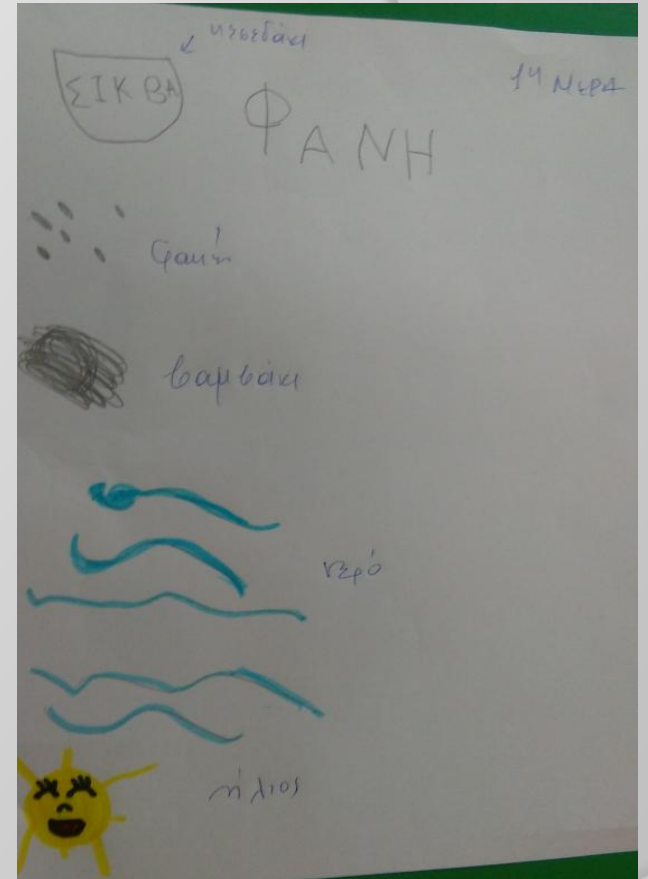




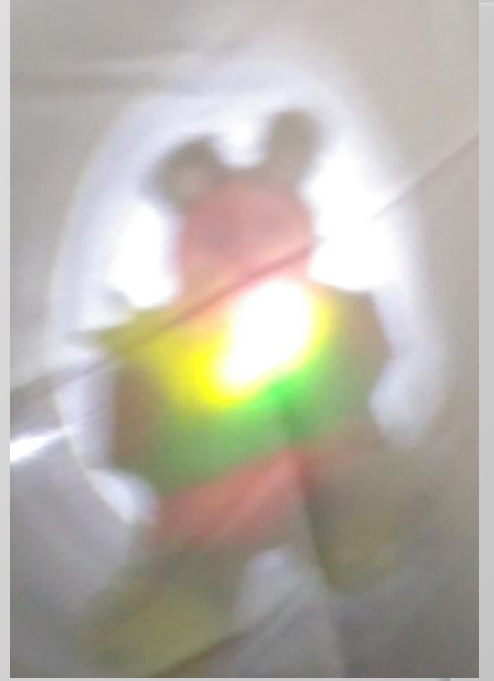


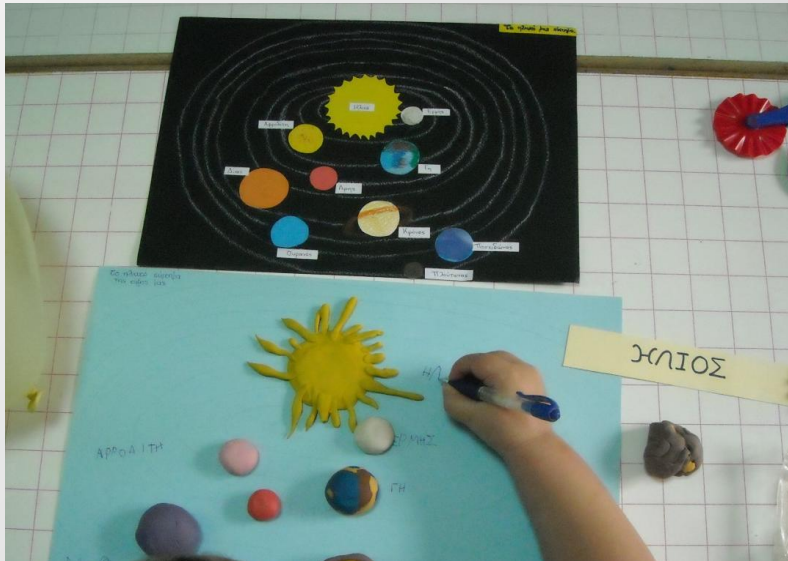




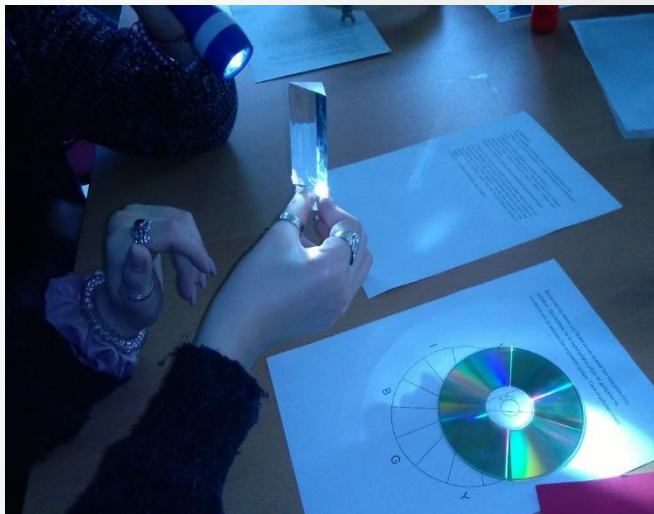


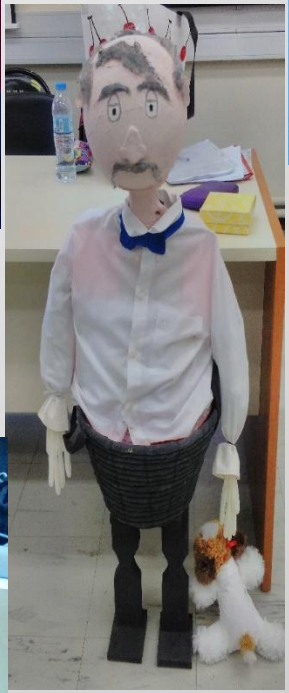






UOI Lab lessons and Internship








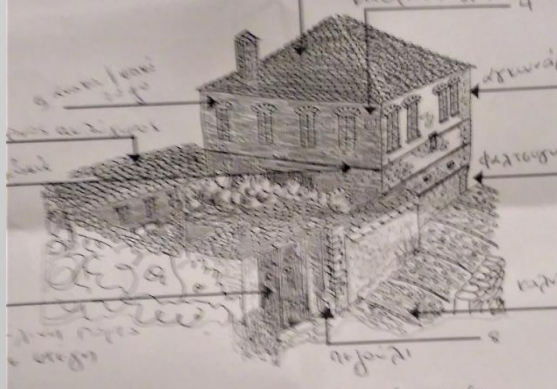
Expanding the learning community

Όνομα: Έλενα - Παρασκευή Πίσηπα

Όνομασία βοτάνου	Λεβάντα
Περιγραφή	Η λεβάντα είναι ένα δικοτύλο γένος που ανήκει στο γένος λαντανόλας το οποίο περιλαμβάνει 28 είδη φυτών. Είναι πολύ αειθαλή και ιδιαίτερα αρωματικό. Έχει αβερσοειδή διάταξη των άνθων της ενώ η κωνίδα τα φύλλα της είναι γραμμωτά. Η ανθοφορία ξεκινά όταν τελειώνουν οι κρύες του καλοκαιριού.
Το συναντάμε	Τη συναντάμε στη Μεσόγειο σε βραχώδεις και αβρσοειδείς περιοχές. Επίσης εκτιμάται στη Βόρεια Αφρική, την Ευρώπη και την Δυτική Ασία.
Χρησιμότητα	Η χρήση της είναι καλλυπτική και φαρμακευτική γιατί έχει δραστικές ιδιότητες. Είναι έντονα αρωματικό, η λαντανόλα εκθέλει ποσότητες αιθέριου έλαιου, φαινόλη, πιπερίνη.
Ζωγραφίζω το βότανο	



Αναγνωρίστε στοιχεία αρχιτεκτονικής ενός τοπικού στυλίου της περιοχής



Τοποθετήστε τα παρακάτω αρχιτεκτονικά στοιχεία στο κατάλληλο σημείο της εικόνας:

1. Ξύλινη πόρτα με στέγη
2. Φαλτσογωνιά
3. Πέτρινος ανλόγωνος
4. Κεραμοκρή επιγραφή
5. Στέγη με σχιστοσίλικα
6. Ξυλοδεσιά
7. Λγκωνάρια
8. Πεζούλα
9. Ανακουφιστικό τόξο
10. Καλντερίμι

Discussion

- Early childhood education involves a complexity of a social (societal-political) practice that is possible even with the youngest of children. Motivation includes challenge in order to satisfy the need for achievement, choice and independence in students' learning, expansion of learning community through out of school activities as well as support and encouragement by the family, the peer group and the teachers.
- The modern learning environments constitute multicultural learning communities, in which learners are asked to work effectively within different groups – learning communities. This process emphasizes on the importance of the cultural behavior of tools, being supported by the analysis of human activities

Discussion

- ⦿ What is required for the teacher and the students to achieve the complex activity of learning?
- ⦿ How does a teacher consciously and unconsciously conduct her/himself in and toward this trajectory?
- ⦿ What are the conditions that permit the emergence of a curriculum based on scientific concepts?
- ⦿ If we consider concept formation as crucially dependent on cultural mediation what is the role of cultural artifacts, including signs?

Благодарю вас за внимание!
Thank you for your attention!
Ευχαριστώ για την προσοχή σας!

