



ΕΦΠΤ 1 – Μεθοδολογία Εκπαιδευτικής Έρευνας

2^η Συνάντηση:

- Φαινομενογραφία
- Ανάλυση ιχνογραφημάτων
- Χάρτες εννοιών

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Περιεχόμενα μαθήματος

- **Φαινομενογραφία**
- **Σημειωτική** ανάλυση ιχνογραφημάτων
- **Ποιοτική** και **ποσοτική** ανάλυση ιχνογραφημάτων
- Εκπαιδευτική και ερευνητική χρήση των **χαρτών εννοιών**
- **Μοντέλα αλλαγής συμπεριφοράς** (*NEP-New Environmental Paradigm, Pro-environmental behavior, Theory of Planned Behavior*)

Φαινομενογραφία

Τι είναι η φαινομενογραφία

Είναι μια ερευνητική μέθοδος αποτύπωσης των **ποιοτικά διαφορετικών τρόπων** με τους οποίους οι άνθρωποι αντιλαμβάνονται, διαμορφώνουν έννοιες (conceptualize), κατανοούν και αποκτούν εμπειρία για διάφορα φαινόμενα του κόσμου που τους περιβάλλει

Ενδιαφέρεται για τις σχέσεις ανάμεσα στα ανθρώπινα όντα και τον κόσμο γύρω τους

Σκοπός της είναι η κατασκευή ενός δομικού πλαισίου μέσα στο οποίο οι διάφορες κατηγορίες κατανόησης υπάρχουν

Για το σκοπό αυτό χρησιμοποιούνται ερωτήσεις ανοικτού τύπου

(Marton, F. 2001)

Παράδειγμα έρευνας...

Ερευνητικό Εργαλείο

Ανοικτού τύπου ερώτηση: «Τι νομίζεις ότι είναι η βιώσιμη ανάπτυξη»

Ή

Τι σημαίνει για σένα ο όρος «βιώσιμη ανάπτυξη»

Δείγμα

N=113 φοιτητές/τριες φυσικών επιστημών (students science teachers)

M=39%, **F**=61%

Τρόπος ανάλυσης...I

Analyses of Data

After collection of the completed compositions, the responses were typed into Excel and then printed out. The transcripts of these responses were exposed to phenomenographic analysis using 'mind maps' by the authors. In this analysis, we adopted the approach of Dahlgren and Fallsberg (1991). The first stage was that of *familiarisation*. At this stage, the transcriptions were read and listed. The second stage entailed the *compilation* of all respondents' answers to the main open-ended question (What is the meaning of SD?). The main task here was to show the most significant elements of each participant's answer. The third stage was the *condensation* of the answers as intended to locate the central parts of the longer answers. At this stage, a preliminary classification of descriptions was developed. The fifth stage was a preliminary *comparison* of the categories of descriptions. Some revisions to the categories were made at this stage. The final stage was the *naming* of the categories of descriptions.

Τρόπος ανάλυσης...II

Once the analysis was completed, the mind maps showing different group of descriptions and their linkages with the main theme (SD) were prepared by the two authors independently. Afterwards, the authors discussed the categories, and then overlapping categories were determined. As a result of these discussions, minor changes were made to some categories. In addition, these mind maps were explained to two experts in the educational sciences, who were asked to place each description into a suitable position on the mind maps. According to these placements, we slightly changed the original maps and attained final versions.

A. Kilinc and A. Aydin

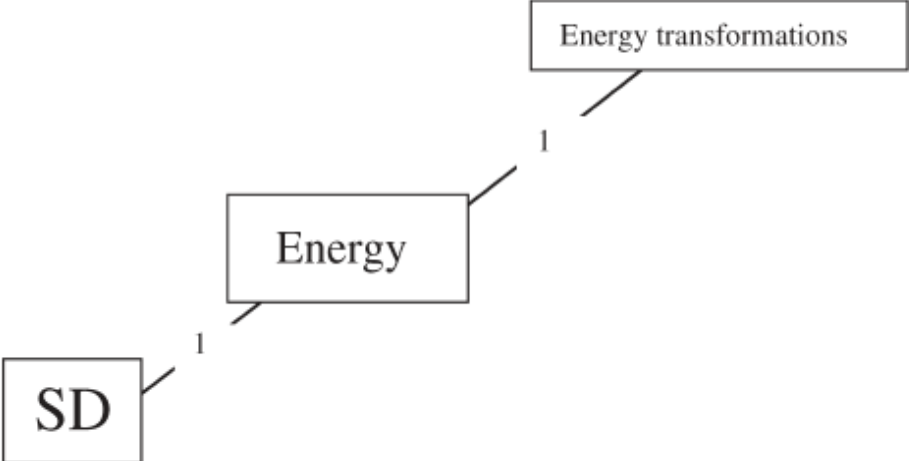
Sample composition (participant 3)	Sample mind map
<p>Transformation and conveyance are important. For instance, one energy type can be transformed into another type; as such, it will not run out but instead will be sustainable. For example, wind energy can be transferred into electricity</p>	 <pre>graph LR; SD[SD] --- 1_1[1]; Energy[Energy] --- 1_2[1]; Energy --- 1_3[1]; Energy --- ET[Energy transformations];</pre>

Figure 1. A sample of the phenomenographic analysis conducted in the present study

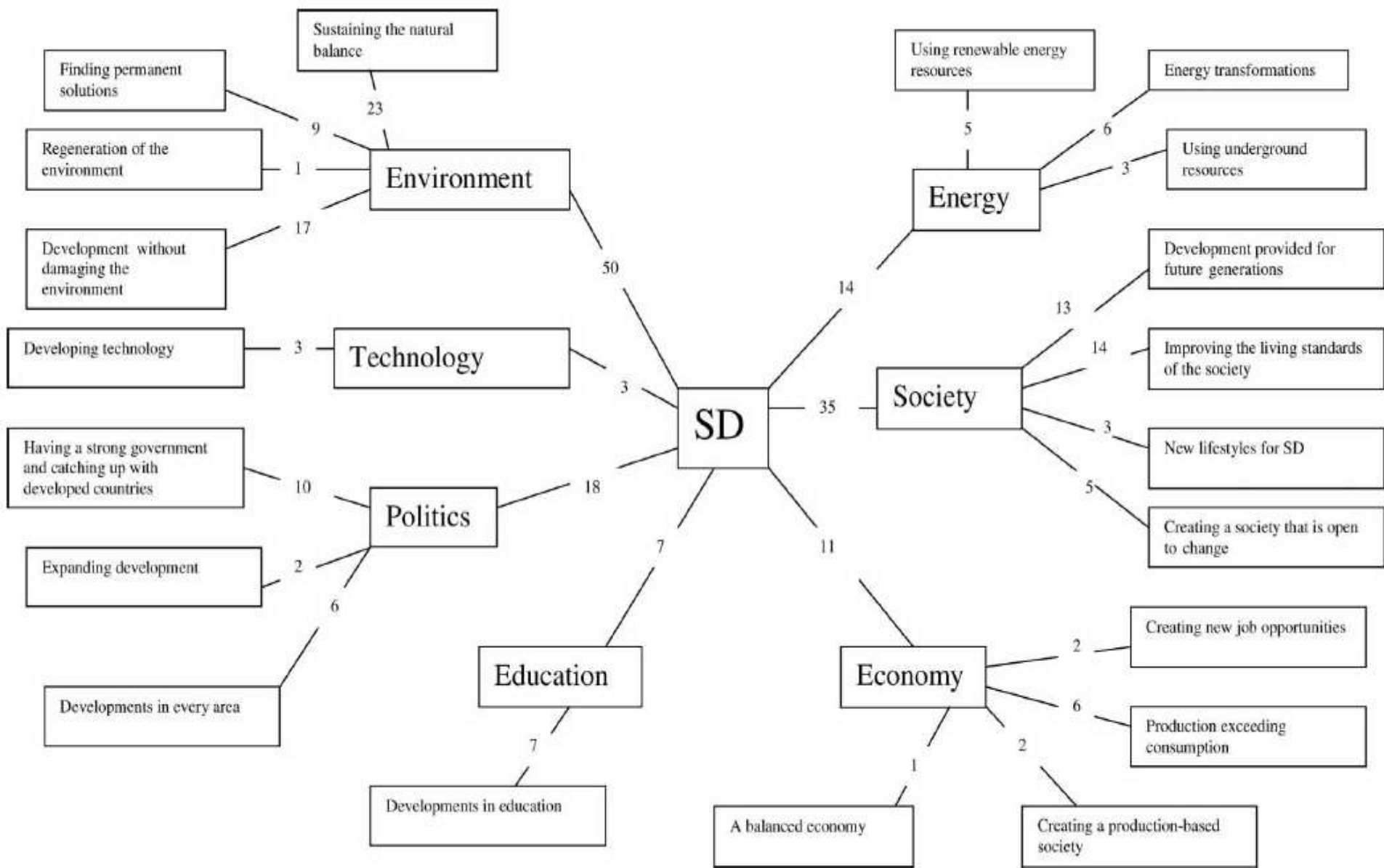


Figure 2. The distribution of the number of descriptions in accordance with the conceptual linkages

Για το λόγο ότι ένα υποκείμενο μπορεί να έδινε περισσότερες από μία διαφορετικές περιγραφές, οι αριθμοί φανερώνουν τον αριθμό των περιγραφών που δόθηκαν και όχι τον αριθμό των συμμετεχόντων που αναφέρουν τη συγκεκριμένη περιγραφή.

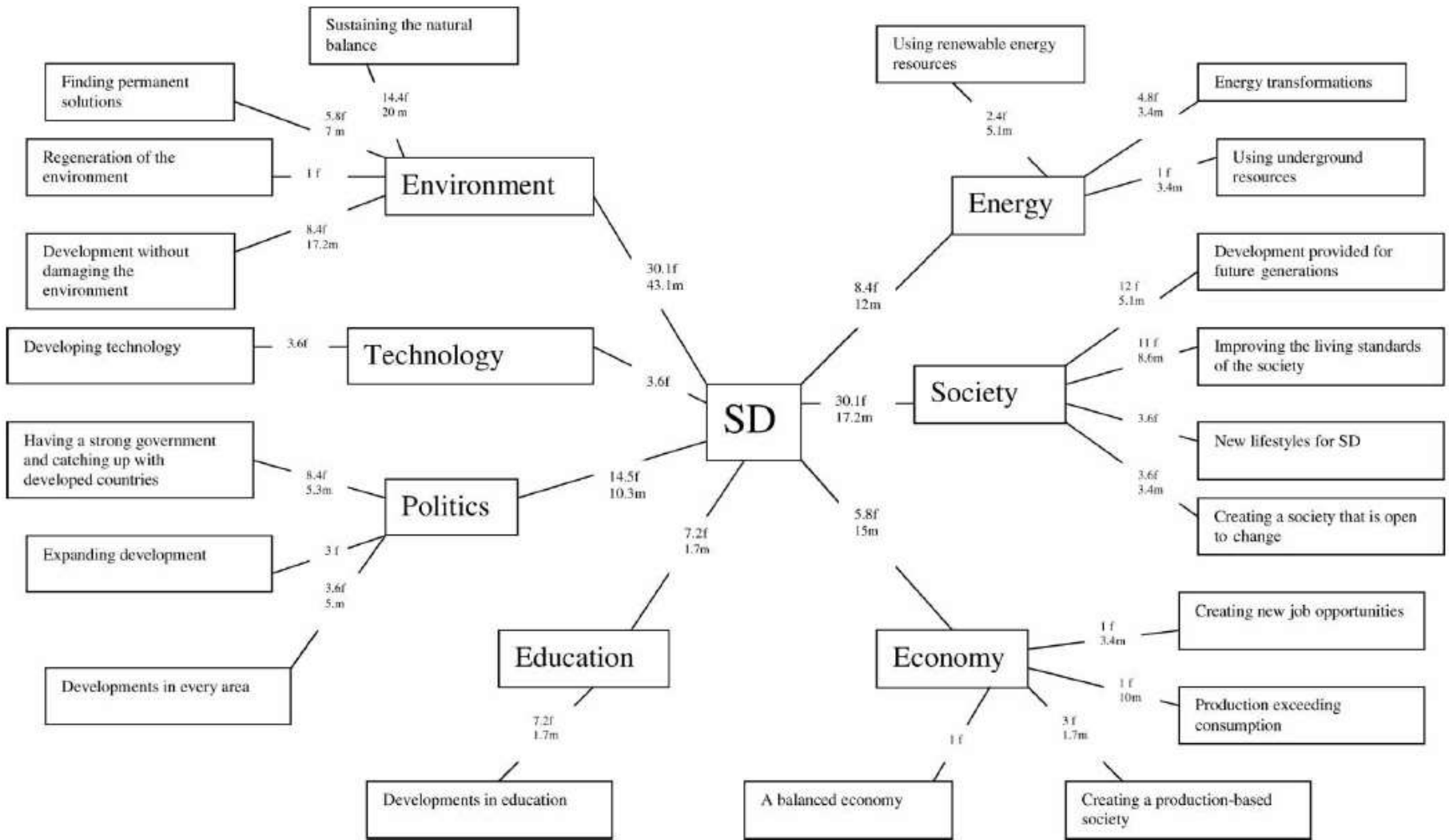


Figure 3. The distribution of the percentages for each gender in accordance with the conceptual linkages (f: female [83 definitions], m: male [58 definitions])

Ιχνογραφήματα

Παράδειγμα έρευνας...

Τίτλος:

**«The Draw-An-Environment Test Rubric (DAET-R):
exploring pre-service teachers' mental models of
the environment»**

Ερευνητικές ερωτήσεις:

- *«Είναι το DAET-R ένα έγκυρο εργαλείο για την αξιολόγηση των νοητικών μοντέλων υποψηφίων δασκάλων για το περιβάλλον;»*
- *«Ποιά είναι τα νοητικά μοντέλα που έχουν υποψήφιοι εκπαιδευτικοί για το περιβάλλον;»*

Παράδειγμα έρευνας...

Εργαλεία

- Draw-An-Environment Test (DAET)
- Αναπτύχθηκε κλείδα για την βαθμολόγηση/αξιολόγηση (scoring) του τεστ, με σκοπό την **ποιοτική** ανάλυση των δεδομένων.

Δείγμα

- N=118 προπτυχιακοί φοιτητές/τριες προσχολικής αγωγής (Νηπιαγωγείο – 4^η τάξη) από ΗΠΑ

Μέθοδος

- Αναλύθηκαν ξεχωριστά τα επεξηγηματικά κείμενα από τις ζωγραφιές (2 ξεχωριστά άρθρα...!!)

Appendix A. Draw an Environment Test (DAET)

Date: _____

ID# _____

In the space below draw a picture of what you think the environment is. Below that, please provide your definition of the environment (in words).

My drawing of the environment is:

My definition of the environment is:

Ανάλυση

Κάθε ερευνητής χρησιμοποίησε τις ίδιες οδηγίες βαθμολόγησης και βαθμολόγησε ξεχωριστά τις ζωγραφιές

Όλες οι κωδικοποιήσεις εξετάστηκαν από μια ομάδα ειδικών ώστε να συμφωνήσουν όπου υπήρχαν διαφορές **(αυτή είναι η βασική ιδέα η οποία έχει πολλές παραλλαγές...)**

Π.χ.

- Κάνουμε μερικά απο κοινού και μετά ξεχωριστά τα υπόλοιπα και μετά βλέπουμε τις διαφορές,
- Ή τα κάνει ο ένας και μετά παίρνουμε τυχαία ένα δείγμα από αυτά και τα αναλύει ένας 2^{ος} κτλ

Ανάλυση

Table 1. Pearson's product-moment correlations among all three scorers on the factors and overall rubric.

Factor	Scorer 1 with Scorer 2	Scorer 1 with Scorer 3	Scorer 2 with Scorer 3
Human	.93*	.86*	.88*
Living	.76*	.83*	.77*
Abiotic	.78*	.74*	.68*
Built or designed	.92*	.81*	.77*
Overall	.92*	.89*	.86*

Note: * $p < 0.01$.

Appendix B. Draw an Environment Test – Rubric (DAET-R)

Date: _____

ID#: _____

Factor					Score
	Present	Interactions with other factors	System interactions made explicit		
	0 Points	1 Point	2 Points	3 Points	
Human	Drawing does not contain pictures of humans.	Human(s) drawn without any apparent interaction with other factors.	Human(s) drawn interacting with other humans and/or another factor (e.g., human fishing or walking on a bridge), but without special emphasis placed on the influence of the interaction on the environment.	Humans drawn with obvious deliberate emphasis placed on interaction with one or more factors and the influence of that interaction on the environment through the use of special indicators such as conceptual labels and/or arrows.	
Living	Drawing does not contain pictures of living organisms.	Living organisms (e.g., plants and animals) drawn without any apparent interaction with other factors.	Living organisms drawn interacting with other living organisms and/or another factor (e.g., animals grazing), but without special emphasis placed on the influence of the interaction on the environment.	Living organisms drawn with obvious deliberate emphasis placed on interaction with one or more factors and the influence of that interaction on the environment through the use of special indicators such as conceptual labels and/or arrows.	
Abiotic	Drawing does not contain pictures of abiotic factors.	Abiotic items (e.g., mountains, rivers, Sun, or clouds) drawn without any apparent interaction with other factors.	Abiotic items drawn interacting with other abiotic items and/or another factor (e.g., wind blowing a palm tree), but without special emphasis placed on the influence of the interaction on the environment.	Abiotic items drawn with obvious deliberate emphasis placed on interaction with one or more factors and the influence of that interaction on the environment through the use of special indicators such as conceptual labels and/or arrows.	
Human built or designed	Drawing does not contain pictures of human built factors.	Human built or designed items (e.g., buildings, automobiles, and bridges) drawn without any apparent interaction with other factors.	Human built items drawn interacting with other human built items and/or another factor (e.g., smokestack emitting smoke into the air), but without special emphasis placed on the influence of the interaction on the environment.	Human built items drawn with obvious deliberate emphasis placed on interaction with one or more factors and the influence of that interaction on the environment through the use of special indicators such as conceptual labels and/or arrows.	
				Total possible points:	12 Total points

Αποτελέσματα I

Table 2. Participants and per cent of factors included in drawings.

Points on rubric	Human		Living		Abiotic		Built	
	No. of participants	%	No. of participants	%	No. of participants	%	No. of participants	%
0	71	59.6	20	16.8	43	36	27	22.7
1	37	31.1	78	66.4	70	57	73	62.2
2	5	4.2	15	12.6	2	1.7	7	5.9
3	6	5.0	5	4.2	3	4.2	11	9.2

Αποτελέσματα II

Table 3. Per cent of total scores.

Total points	Category	No. of participants (n = 118)	% of total (n = 118)
0-4	Factor present	94	79.7%
5-8	Factor interacting with one other factor	21	17.8%
9-12	Factor interacting with one or more factors with systems approach	3	2.5%

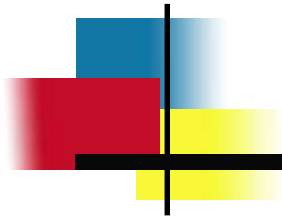
Παραδειγμα ανάλυσης



Σημειωτική ανάλυση I

Η σημειωτική ορίζεται ως ένας επιστημονικός κλάδος, που αναφέρεται στη μελέτη και στην ανάλυση των συστημάτων σημείων και των σχέσεων μεταξύ τους. Αντικείμενα μελέτης της σημειωτικής συνιστούν λέξεις, εικόνες, ήχοι, χειρονομίες, πρακτικές και αντικείμενα. Η σημειωτική ως μέθοδος ανάλυσης προσδιορίζει μια σημειακή συνάρτηση και την τυπολογία των τρόπων παραγωγής σημείων.

Ο πρώτος επίσημος καθορισμός της έννοιας και η ονομασία της θεωρίας ανήκει στον **Ferdinand de Saussure (1916)**. Σύμφωνα με τον Saussure για τους αναλυτικούς σκοπούς της σημειωτικής κάθε σημείο αποτελείται από ένα **σημαίνον (signifier)**, που είναι η μορφή που παίρνει το σήμα και ένα **σημαινόμενο (signified)**, το οποίο αποτελεί την έννοια που αναπαριστά. Σήμερα, το σημαίνον ερμηνεύεται κοινώς ως η υλική ή φυσική μορφή του σημείου, πρόκειται δηλαδή για κάτι απτό. Από την άλλη, το σημαινόμενο είναι μια νοητική κατασκευή, άρα δεν πρόκειται για υλικό αντικείμενο (Mick, 1986).



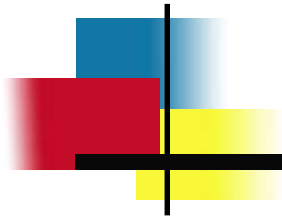
Σημειωτική ανάλυση II

Η έρευνα μελετά την εμφάνιση χαρακτηριστικών στις τρεις διαφορετικές ζώνες του κειμένου: **αριστερά – δεξιά (left – right)**, **πάνω – κάτω (top – bottom)**, **κέντρο – περιθώριο (centre – margin)** .

- Η **ζώνη αριστερά – δεξιά** καθορίζει μια σχέση δεδομένων (given) και νέων (new) στοιχείων, αντίστοιχα.
- Ό,τι βρίσκεται στα **αριστερά** της εικόνας θεωρείται αυτονόητο και οικείο στο θεατή, καθώς αυτός είναι ο τρόπος μέσω του οποίου έχουμε τείνουμε να διαβάζουμε τις εικόνες σε κοινωνίες με αριστερόστροφα συστήματα γραφής.
- Ό,τι βρίσκεται στα **δεξιά** της εικόνας θεωρείται νέα και σημαντική πληροφορία, καθώς παρατηρείται αργότερα.
- Η **ζώνη πάνω-κάτω** υποδηλώνει μια σχέση ιδανικής (ideal) έναντι πραγματικής (real) κατάστασης, αντίστοιχα.
- Στοιχεία που τοποθετούνται στην **κορυφή** της εικόνας αντιπροσωπεύουν τον κόσμο των επιθυμιών και των προσδοκιών μας,
- Στοιχεία που τοποθετούνται στο κάτω μέρος της εικόνας αντιπροσωπεύουν ό,τι συμβαίνει στον πραγματικό κόσμο.

Η ζώνη κέντρο – περιθώριο:

- Ό,τι είναι τοποθετημένο στο κέντρο θεωρείται βασική πληροφορία
- Ό,τι τεθεί στο περιθώριο θεωρείται ως περιφερειακό και λιγότερο σημαντικό



Σημειωτική ανάλυση III

Συνεπώς και σύμφωνα με τους Kress and Leeuwen (1996):

Στον οριζόντιο άξονα (δεξιά – αριστερά)

- **Το δεδομένο – αριστερά** - σημαίνει ότι η έννοια παρουσιάζεται ως κάτι γνωστό, οικείο, συμφωνημένο.
- **Το νέο - δεξιά** - σημαίνει κάτι στο οποίο ο θεατής πρέπει να δείξει ιδιαίτερη προσοχή.

Στον κατακόρυφο άξονα (πάνω – κάτω)

Το **ιδανικό - κορυφή** - είναι η υπόσχεση, η συγκινητική έκκληση, μια γενικευμένη ουσία.

Το **πραγματικό - κάτω** - σημαίνει πρακτικά, κάτω στη γη, συγκεκριμένες πληροφορίες.



Σημειωτική ανάλυση IV

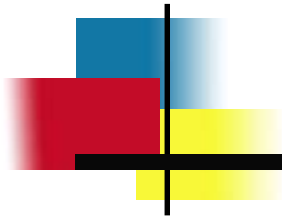
Η δομή είναι είτε:

κεντραρισμένη (centered) περιθώριο – κέντρο – περιθώριο, όπου το κέντρο είναι ο πυρήνας των πληροφοριών στον οποίο υποτάσσονται τα περιθώρια,

Είτε:

πολωμένη (polarized) στην οποία το κέντρο λειτουργεί ως μεσολαβητής μεταξύ του δεδομένου και του νέου ή του ιδανικού και του πραγματικού.

Τέλος, η **επισήμανση - salience** - δημιουργεί μια ιεραρχία σημαντικότητας μεταξύ των στοιχείων. Η επισήμανση μπορεί να επιτευχθεί με το μέγεθος, την ευκρίνεια της εστίασης, την τονική/χρωματική αντίθεση, την προοπτική, την επικάλυψη καθώς και μέσω πολιτισμικών παραγόντων.



Σημειωτική ανάλυση V

Όσον αφορά τη **θέση του ιχνογραφήματος στο φύλλο**, το οποίο χωρίζεται με τη βοήθεια ενός οριζόντιου άξονα και ενός κάθετου άξονα σε 4 μέρη, υπάρχει η εξής ερμηνεία:

- Η ζώνη του **πάνω μέρους** είναι η ζώνη της φαντασίας, των ονειροπόλων, των ιδεαλιστών. Είναι ο κόσμος της πνευματικότητας.
- **Πάνω αριστερά** είναι η ζώνη της παθητικότητας και της ζωής (δέχεται τη ζωή ως απλός θεατής).
- **Πάνω δεξιά** είναι η ζώνη της δραστηριότητας (παλεύει για τη ζωή).

Η ζώνη του **κάτω μέρους** είναι η ζώνη των αρχέγονων ενστίκτων της διατήρησης της ζωής, η ζώνη προτίμησης των κουρασμένων, των καταπιεσμένων και των παθολογικά νευρωτικών.

Το κάτω μέρος συνδέεται, επίσης, με την καθημερινή ζωή.

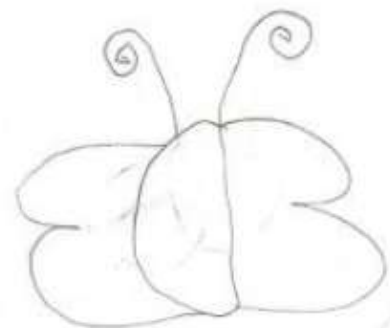
- **Κάτω αριστερά** είναι η ζώνη του ξεκινήματος των πρώτων χρόνων της ζωής,
- **Κάτω δεξιά είναι η γη και οι συγκρούσεις.**
- Η αριστερή ζώνη είναι αυτή του παρελθόντος και τα παιδιά γυρίζουν στην παιδική τους ηλικία.



1A

ΒΕΡΔΙΑ !!!
ΟΛΕ !!!

ΑΓΡΙΑ ΖΩΑ, ΠΑΝΩ ΔΕΞΙΑ



ΔΕΝΤΡΑ, ΚΑΤΩ ΔΕΞΙΑ



ΚΑΤΟΙΚΙΕΣ, ΚΑΤΩ ΑΡΙΣΤΕΡΑ



ΚΑΤΟΙΚΙΕΣ,
ΑΡΙΣΤΕΡΑ, ΔΕΞΙΑ

ΔΕΝΤΡΑ, ΚΕΝΤΡΟ, ΑΡΙΣΤΕΡΑ

ΛΟΥΛΟΥΔΙΑ,
ΚΕΝΤΡΟ

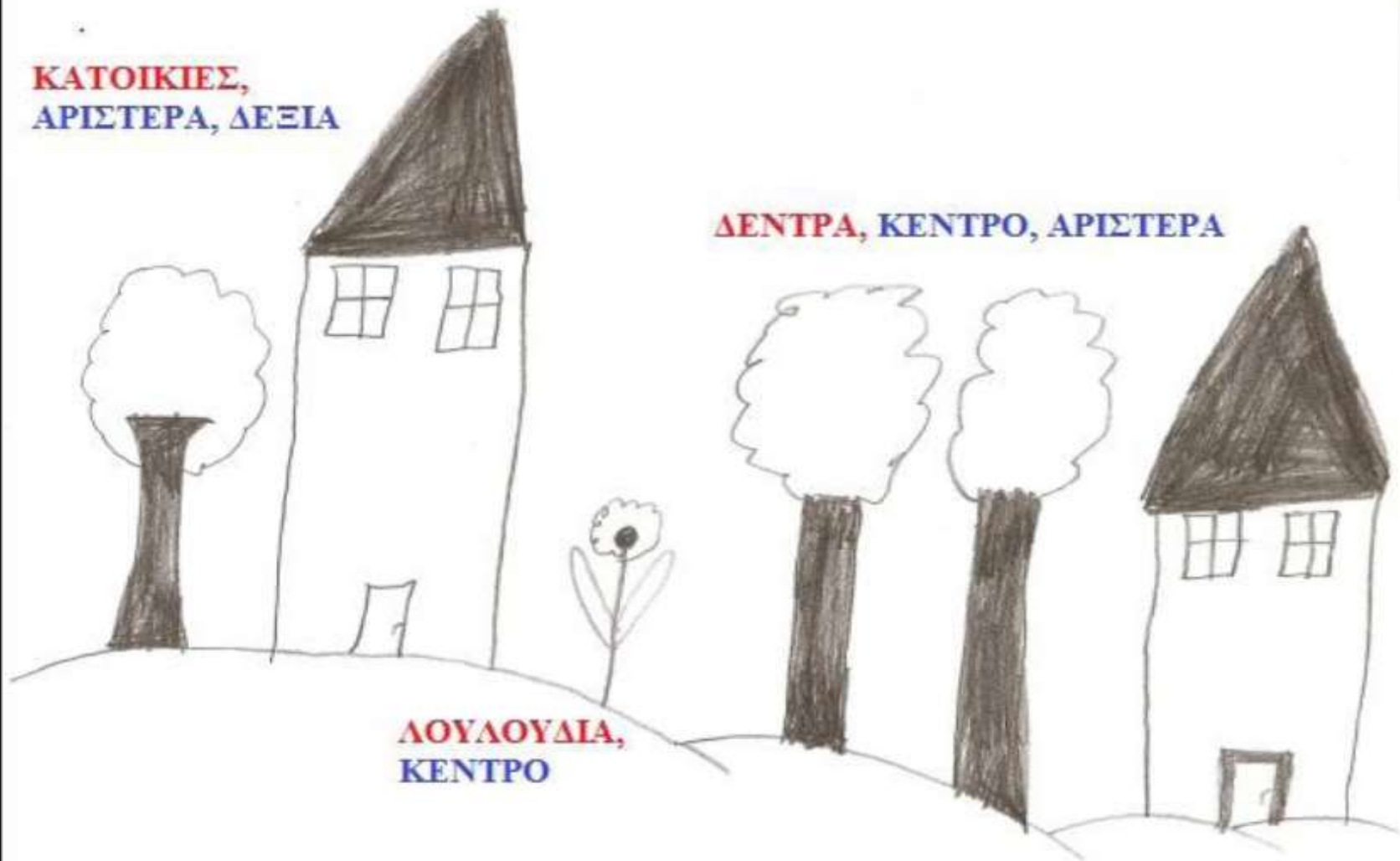


Table 1. Levels of sustainable cities' indices and their link with drawing elements

1 st level	2 nd level	3 rd level	Elements on drawings		
Environment <i>(Spiekermann and Wegener 2003; Hernandez-Moreno and De Hoyos-Martínez 2010; Shen et al. 2011)</i>	Natural environment	Sky	Sky / sun		
		Animals	Wild/non-domestic animals, domestic animals		
	Waste management <i>(Xiao, Xue and Woetzel, 2010)</i>	Plants	Plants	Trees, bushes, flowers	
			Mountains	Mountains	
		Water resources	Lakes, rivers		
		Generation of municipal solid waste	Any municipal solid waste (e.g., cans, paper packs)		
		Pollution	Wastes	Garbage bins	
			Recycling and use of waste	Any indication of recycling	
			Generation of hazardous waste	Any hazardous waste	
			Management	Garbage trucks, employee(s) in waste management	
Air pollution			Chimneys, gases from transport		
Soil pollution			Pesticides, sewage, industrial waste		
Water pollution	Industrial waste, pesticides, affected animals, sewage				
Industrial pollution	Any kind of waste emitted by industry plans				
Energy consumption	Noise pollution	From transportation means			
	Smell pollution	From transportation means			
	Renewable energy sources	Photovoltaic cells, solar water heater, solar systems, wind turbines			
	Non-renewable energy usage	Oil, natural gas, gasoline			
Economy <i>(Spiekermann and Wegener 2003; Hernandez-Moreno and De Hoyos-Martínez 2010; Shen et al. 2011)</i>	Buildings / housing	Electricity	Electricity wires, pylons of power transportation		
		Ecological houses, abandoned housing, detached houses, apartments, skyscrapers	The same as the 3 rd level		
	Local Development	Agriculture, livestock, fishing, industries	The same as the 3 rd level		

		Society <i>(Spiekermann and Wegener 2003; Hernandez-Moreno and De Hoyos-Martínez 2010; Shen et al. 2011)</i>	Infrastructure, Services and Urban Equipment	Hospitals, social security or health care buildings, schools/educational institutions, cultural institutes, swimming pools, workplaces, recreation sites, restaurant/fast-food, hotels, markets/ shopping centres, open markets, public services, churches, cemeteries, public safety, sport centres/fields, parks, gardens, playgrounds, roads, parking spaces, pedestrian areas, bike lanes, signs, traffic lights	The same as the 3 rd level
				Transportation	Buses, trucks, trains, bicycles, motorbikes, private cars, airplanes, boats, helicopters, spaceships, balloon, taxis

Indices of levels 1-3 were defined through literature review as constituent parts of all aspects of sustainability.

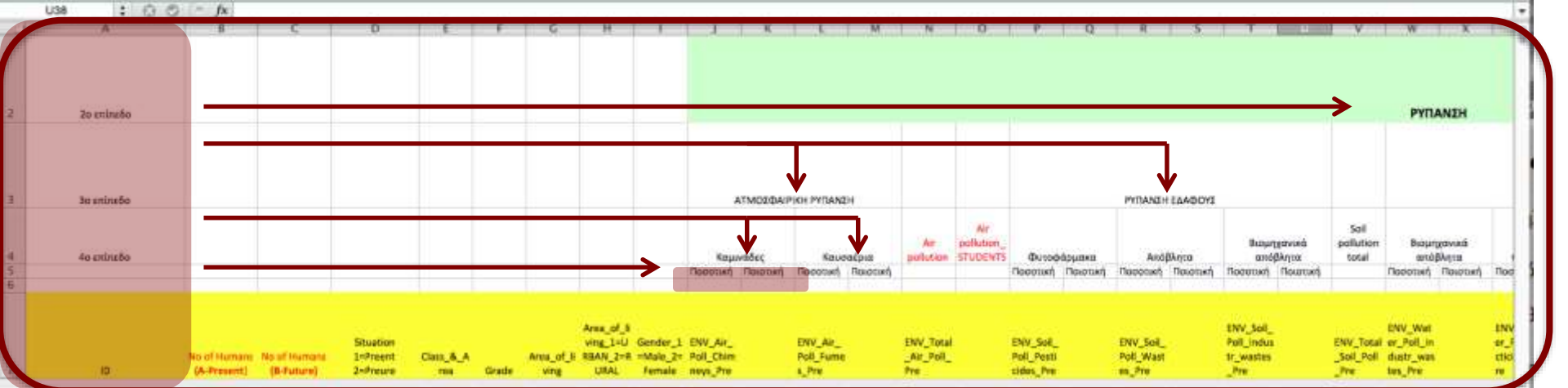
Indices of level 4 were developed and elaborated mostly during the pilot study as a link between literature and actual students' drawings.

Table 1. Levels of sustainable cities' indices and their link with drawing elements

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Environment <i>(Spiekermann and Wegener 2003; Hernandez-Moreno and De Hoyos-Martinez 2010; Shen et al. 2011)</i>	Natural environment	Sky	Sky / sun
		Animals	Wild/non-domestic animals, domestic animals
		Plants	Trees, bushes, flowers
	Waste management <i>(Xiao, Xue and Woetzel, 2010)</i>	Mountains	Mountains
		Water resources	Lakes, rivers
		Generation of municipal solid waste	Any municipal solid waste (e.g., cans, paper packs)
		Wastes	Garbage bins
		Recycling and use of waste	Any indication of recycling
	Pollution	Generation of hazardous waste	Any hazardous waste
		Management	Garbage trucks, employee(s) in waste management
Air pollution		Chimneys, gases from transport	
Soil pollution		Pesticides, sewage, industrial waste	
Water pollution		Industrial waste, pesticides, affected animals, sewage	
Energy consumption	Industrial pollution	Any kind of waste emitted by industry plans	
	Noise pollution	From transportation means	
	Smell pollution	From transportation means	
	Renewable energy sources	Photovoltaic cells, solar water heater, solar systems, wind turbines	
	Non-renewable energy usage	Oil, natural gas, gasoline	
	Electricity	Electricity wires, pylons of power transportation	

Από τη Βιβλιογραφία

Από τα σχέδια



ID	No of Humans (A-Present)	No of Humans (B-Future)	Situation 1=Present 2=Future	Class & Area	Grade	Area_of_Usage	Gender	ENV_Air_Poll_Chimneys_Pre	ENV_Air_Poll_Fumes_Pre	ENV_Total_Air_Poll_Pre	ENV_Soil_Poll_Pesticides_Pre	ENV_Soil_Poll_Wastes_Pre	ENV_Soil_Poll_Industrial_wastes_Pre	ENV_Total_Soil_Poll_Pre	ENV_Water_pollution_distributable_Pre	ENV_etc
87	76	3	1	6U	6	U	1	1		0	0			0		
88	77		1	6U	6	U	1	2						0		
89	78	1	1	6U	6	U	1	1		0	0			0		
90	79	3	1	6U	6	U	1	1		0	0			0		
91	80	2	1	6U	6	U	1	2		0	0			0		
92	81	1	1	6U	6	U	1	1	1 BR	3	1			0		
93	82		1	6U	6	U	1	2		0	0			0		
94	83	1	1	6U	6	U	1	1		0	0			0		
95	84	3	2	6U	6	U	1	1		0	0			0		
96	85	3	1	6U	6	U	1	1	1 BR	2	1			0		
97	86		1	6U	6	U	1	2		0	0			0		
98	87		1	6U	6	U	1	2		0	0			0		
99	88		1	6U	6	U	1	2		0	0			0		
100	89		1	6U	6	U	1	1		3	1			0		
101	90		1	6U	6	U	1	1		0	0			0		
102	91		1	6U	6	U	1	1		0	0			0		
103	92		1	6U	6	U	1	1		3	1			0		
104	93		1	6U	6	U	1	1		2	1			0		
105	94	1	1	6U	6	U	1	2		0	0			0		
106	99		2	6R	6	R	2	1		0	0			0		
107	100	1	1	6R	6	R	2	1	1 C	1	1			0		
108	101		1	6R	6	R	2	1		0	0			0		
109	102	1	2	6R	6	R	2	2		0	0			0		
110	103	1	1	6R	6	R	2	2	7 BCLR	7	1			0		
111	104		1	6R	6	R	2	1		0	0			0		

Total Sample	31.7	40.4	4 or U or Male =	50	50	94	94	50
% of children drawing at least one man -> human drawn to drawings dupl	3.8	4.4	6 or R or Female = total	54	54	104	104	54

ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΒΡΟΙΣΜΑ Ποσοτικά Αριθμητικά & ΤΑΧΗ								6	22	28	0	5	0	5	0
ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΒΡΟΙΣΜΑ Ποσοτικά Αριθμητικά & ΤΑΧΗ								55	85	140	0	0	0	0	0
ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΒΡΟΙΣΜΑ Ποσοτικά Αριθμητικά & ΤΑΧΗ								61	107	168	0	5	0	5	0

% of Children 4th grade	8.00%	12.96%								16.00%				2.00%	
% of Children 6th grade										31.48%				0.00%	
ΠΟΣΟΤΙΚΑ ΕΠΙ ΤΩ ΣΥΝΟΛΟ children total sample								10.58%	24.04%	24.04%	0.00%	0.96%	0.00%	0.96%	0.00%

Ratio of characteristics per child - 4th Grade	0.12
Ratio of characteristics per child - 6th Grade	1.02
Ratio of characteristics per child - ALL	0.59

COUNTIF	A	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD		
1	1ο επίπεδο																					
2	2ο επίπεδο	Total Pollution					Semiotics total pollution															
3	3ο επίπεδο	pollution total															ZOA	ANIMALS	ANIMALS_Students	ΥΔΑΤΙΝΟΙ ΠΟΡΟΙ		
4	4ο επίπεδο											Άγρια ζώα		Οικιακά ζώα		Λίμνες		Ποτα				
5												Ποσοτική		Ποιοτική		Ποσοτική		Ποιοτική		Ποσοτική		
6		Quantitative					qualitative															
7	ID	Ratio of characteristic appearance per drawing	ENV_Total_Pollution_Pre	ENV_Total_Pollution_Pre	Top_ENV_Poll_Pre	Bottom_ENV_Poll_Pre	Right_ENV_Poll_Pre	Left_ENV_Poll_Pre	Centr_ENV_Poll_Pre	Polar_ENV_Poll_Pre	Salient_ENV_Poll_Pre	ENV_Nat_Env_Animals_Wild_Pre	ENV_Nat_Env_Animals_Home_Pre	ENV_Nat_Env_Water_resources_Lakes_Pre	ENV_Nat_Env_Water_resources_Rivers_Pre							
99	88	0	0	0	0	0	0	0	0	0	0					0	0					
100	89	3	3	1	1	0	1	1	0	0	0					0	0					
101	90	0	0	0	0	0	0	0	0	0	0					0	0					
102	91	0	0	0	0	0	0	0	0	0	0					0	0	1 C				
103	92	3	3	1	1	1	1	1	0	1	0					0	0					
104	93	4	4	1	1	2	2	1	0	0	0					0	0	1 BLR				
105	94	0	0	0	0	0	0	0	0	0	0					1	1					
106	99	0	0	0	0	0	0	0	0	0	0					0	0					
107	100	1	1	1	0	0	0	0	1	0	0					0	0					
108	101	0	0	0	0	0	0	0	0	0	0					0	0					
109	102	0	0	0	0	0	0	0	0	0	0					0	0					
110	103	7	7	1	0	1	1	1	1	0	0					0	0					
111	104	0	0	0	0	0	0	0	0	0	0					0	0					
112																						
113	Total Sample																					
114	% of children drawing at least one man -> human drawn to drawings depicting																					
115																						
116	ΠΟΙΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΓΡΟΙΣΜΑ Χαρακτηριστικών Δ' ΤΑΞΗ	0,72	36	=SUM(A08:A057)	7	2	5	0	0	19	1	20	0	2								
117	ΠΟΙΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΓΡΟΙΣΜΑ Χαρακτηριστικών ΣΤ' ΤΑΞΗ	2,63	142	SUM(number1, (number2, ...))	9	11	19	16	10	0	13	4	17	2	0							
118	ΠΟΙΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΓΡΟΙΣΜΑ Χαρακτηριστικών TOTAL	1,71	178		14	18	26	18	15	0	32	5	37	2	2							
119																						
120	% of Children 4th grade	18.00%	4.00%	10.00%	8.00%	4.00%	6.00%	0.00%	0.00%	10.00%	2.00%	12.00%	0.00%	4.00%								
121	% of Children 6th grade	31.48%	12.96%	16.67%	24.07%	22.22%	18.52%	0.00%	0.00%	9.26%	5.56%	12.96%	3.70%	0.00%								
122	ΠΟΣΟΤΙΚΑ ΕΠΙ ΤΙΣ % of children total sample	25.00%	8.65%	13.46%	16.35%	13.46%	12.50%	0.00%	0.00%	9.62%	3.85%	12.50%	1.92%	1.92%								
123																						
124	Ratio of characteristics per child - 4th Grade	0.72																				
125	Ratio of characteristics per child - 6th Grade	2.63																				
126	Ratio of characteristics per child - ALL	1.71																				

SOCIAL - SOCIAL - S

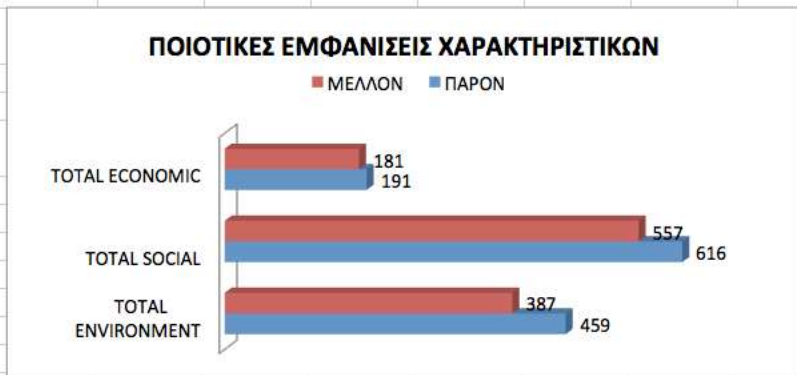
ΥΠΟΔΟΜΕΣ, ΥΠΗΡΕΣΙΕΣ ΚΑΙ ΑΣΤΙΚΟΣ ΕΞΟΠΛΙΣΜΟΣ

Επισιτιστικά - Ταχυφαγία	Ξενοδοχεία	Εμπορικά καταστήματα	Δημόσιες υπηρεσίες	outdoor markets	Εκδηλώσεις	Νεκροταφεία	Public security	Αθλητικά κέντρα γήπεδα
Ποσοτική	Ποσοτική	Ποσοτική	Ποσοτική	Ποσοτική	Ποσοτική	Ποσοτική	Ποσοτική	Ποσοτική

106	99	2	6R
107	100	2	6R
108	101	2	6R
109	102	2	6R
110	103	2	6R
111	104	2	6R
112			
113	Total Sample	U or Male	50
114		F or R or Female	54
115		total	104

116	ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΘΡΩΣΙΜΑ	Χαρακτηριστικών Δ' ΤΑΞΗ	
117	ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΘΡΩΣΙΜΑ	Χαρακτηριστικών ΣΤ' ΤΑΞΗ	
118	ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΘΡΩΣΙΜΑ	Χαρακτηριστικών TOTAL	
121	% of Children 4th grade		
122	% of Children 6th grade		
123	ΠΟΣΟΤΙΚΑ ΕΠΙ ΤΙΣ % of children total sample		
125	ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΘΡΩΣΙΜΑ Δ' ΤΑΞΗ		
126	ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΘΡΩΣΙΜΑ ΣΤ' ΤΑΞΗ		
127	ΠΟΣΟΤΙΚΑ ΑΡΙΘΜΗΤΙΚΟ ΑΘΡΩΣΙΜΑ TOTAL		
128	ΠΟΣΟΤΙΚΑ ΕΠΙ ΤΙΣ %		
129	ΠΟΣΟΤΙΚΑ ΑΠΟΛΥΤΗ ΤΙΜΗ		
130	ΠΟΙΟΤΙΚΑ	TOP=	
131		BOTTOM=	
132		RIGHT=	
133		LEFT=	
134		CENTERED=	
135		POLARIZED=	
136		SALIENT=	
138		ΣΥΝΟΛΟ=	
139	ΣΥΝΟΛΟ ΠΟΣΟΤΙΚΑ-ΠΟΙΟΤΙΚΑ		
140	ΔΩΡΕΑ ΜΑΘΗΣΗΣ	4=	50

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
59	ΠΑΡΟΝ																
	TOTAL ENVIRONMENT	TOTAL SOCIAL	TOTAL ECONOMIC														
60																	
61	459	616	191														
62	ΜΕΛΛΟΝ																
	TOTAL ENVIRONMENT	TOTAL SOCIAL	TOTAL ECONOMIC														
63																	
64	387	557	181														
65																	
66																	
67																	
68																	
69																	
70																	
		TOTAL ENVIRONM ENT	TOTAL SOCIAL	TOTAL ECONOMIC													
71	ΠΑΡΟΝ																
72	TOP																
73	BOTTOM	93	113	37													
74	RIGHT	108	136	38													
75	LEFT	115	129	56													
76	CENTERED	62	134	29													
77	POLARIZED	1	0	1													
78	SALIENT	5	10	1													
		TOTAL ENVIRONM ENT	TOTAL SOCIAL	TOTAL ECONOMIC													
79	ΜΕΛΛΟΝ																
80	TOP	77	85	21													
81	BOTTOM	78	117	40													
82	RIGHT	80	120	42													
83	LEFT	100	106	52													
84	CENTERED	52	126	26													
85	POLARIZED	0	0	0													
86	SALIENT	0	3	0													
87																	
88																	
89																	
90																	
91																	
92																	
93																	
94																	
95																	



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Figure 3.3.3. Semiotic analysis - Present

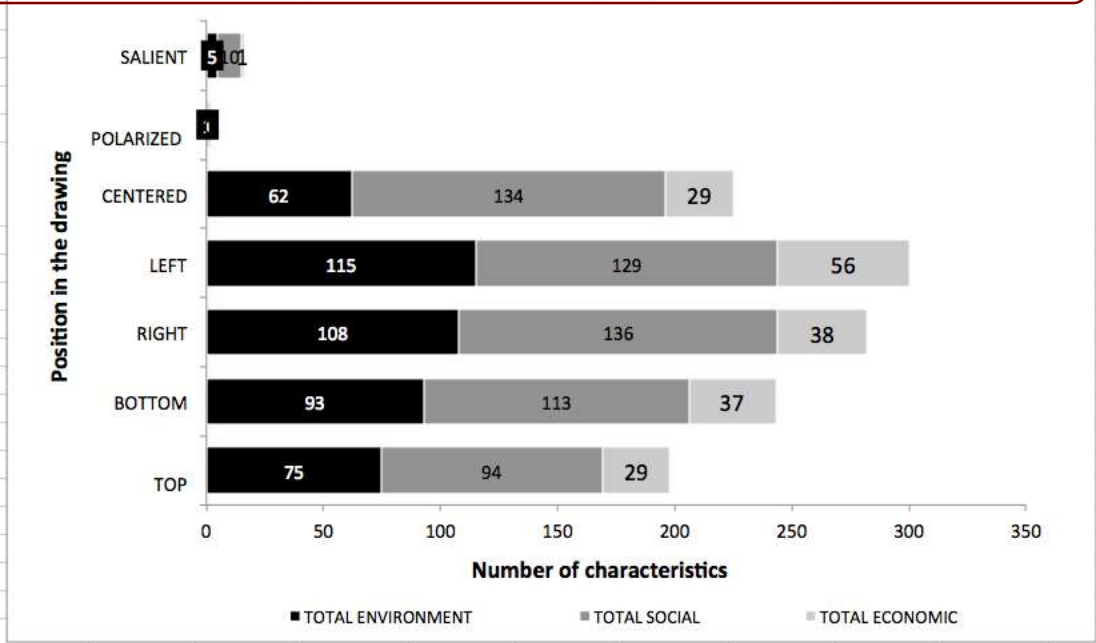



Table 2. Frequency of urban environment characteristics and percentages of children expressing them

Indices	Total		4 th		6 th	
	Present	Future	Present	Future	Present	Future
Environment	74.1% ^a (1080 ^b)	72.1% (1017)	68.0% (423)	70.0% (404)	79.6% (657)	74.1% (613)
Natural Environment ¹	65.4% (622)	66.4% (958)	64.0% (340)	60.0% (374)	66.7% (282)	72.2% (584 ^{*P-F})
<i>Sky and sun</i> ^c	18.3% (20)	27.9% (29)	14.0% (8)	20.0% (10)	22.2% (12)	35.2% ^{*P-F} (19)
<i>Animals</i>	12.5% (37)	19.2% (71)	12.0% (20)	14.0% (17)	12.9% (17)	24.1% (54 ^{*P-F, *4th-6th})
Wastes and management ²	15.4% (280 ^{*P-F})	12.5% (34)	12.0% (47)	8.0% (11)	18.5% (233 ^{*P-F})	16.7% (23)
<i>Generation of wastes</i>	13.5% ^{*P-F} (238)	2.9% (7)	10.0% (34)	4.0% (6)	16.7% ^{*P-F} (204)	1.9% (1)
Pollution ³	25% ^{*P-F} (178 ^{*P-F})	10.6% (25)	18.0% (36)	16.0% (19)	31.5% ^{*P-F} (142 ^{*P-F})	5.6% (6)
<i>Air</i>	24.1% ^{*P-F} (168 ^{*P-F})	10.6% (25)	16.0% (28)	16.0% (19)	31.5% ^{**P-F} (140 ^{*P-F})	5.6% (6)
<i>Energy</i>	-	-	-	-	-	-
Economy	59.6% (602)	62.5% (676)	56.0% (273)	72.0% ^{*4th-6th, *P-F} (412)	63.9% ^{*4th-6th, *P-F} (329)	53.7% (264)
Buildings ⁴	58.7% (586)	62.5% (675)	54.0% (271)	72.0% ^{*4th-6th, *P-F} (412)	62.9% ^{*4th-6th, *P-F} (315)	53.7% (263)
<i>Single houses</i>	38.5% (465)	46.2% (480)	36.0% (244)	50.0% ^{*P-F} (209)	40.7% ^{*4th-6th} (221)	42.6% (236 ^{*4th-6th})
<i>Apartments</i>	29.8% (121)	25.0% (195)	24.0% (27)	34.0% ^{*4th-6th} (168)	35.2% ^{*P-F} (94)	16.7% (27)
Local development ⁵	7.7% ^{*P-F} (16)	0.9% (1)	4.0% (2)	0% (0)	11.1% ^{*4th-6th, *P-F} (14)	1.9% (1)
Society	90.4% ^{*P-F} (527)	80.8% (503)	94.0% ^{*P-F} (180)	78.0% (194)	87.1% (347 ^{*4th-6th})	83.3% (309)
Infrastructure ⁶	85.6% ^{*P-F} (377)	74.0% (314)	92.0% ^{*P-F} (114)	66.0% (135)	79.6% (263 ^{*4th-6th})	81.5% ^{*4th-6th} (179)
<i>Roads</i>	60.6% ^{*P-F} (135)	46.1% (110)	66.0% (42)	46.0% (52 ^{*P-F})	55.6% (93 ^{**4th-6th})	46.3% (58)
<i>Parks and playgrounds</i>	33.7% (42)	34.6% (53)	20.0% (13)	24.0% (16)	46.3% ^{*4th-6th} (29)	44.4% (37)
<i>Sports centres</i>	25.9% (37)	18.3% (32)	26.0% ^{*P-F} (20)	10.0% (8)	25.9% (17)	25.9% ^{*4th-6th} (24)
<i>Educational Institutions</i>	24.9% ^{*P-F} (27)	13.5% (4)	16.0% (8)	8.0% (4)	35.2% ^{*P-F, *4th-6th} (19)	18.5% (10)
<i>Religious places</i>	17.3% ^{*P-F} (18)	7.7% (8)	18.0% (9)	12.0% (6)	16.7% ^{*P-F} (9)	3.7% (2)
<i>Stores</i>	16.4% (38)	9.6% (28)	8.0% (8)	14.0% (23)	24.1% ^{*P-F, *4th-6th} (30)	5.6% (5)
<i>Public services</i>	16.4% ^{**P-F} (19)	3.9% (4)	6.0% (3)	-	25.9% ^{*P-F, *4th-6th} (16)	7.4% (4)
<i>Pavements</i>	4.8% (25)	7.7% (17)	2.0% (1)	8.0% (13 ^{*4th-6th})	7.4% (24)	7.4% (4)
<i>Traffic management</i>	5.8% (9)	3.9% (7)	-	2.0% (1)	11.1% ^{*4th-6th} (9 ^{*4th-6th})	5.6% (6)
<i>Parking places</i>	1.9% (3)	5.8% (8)	2.0% (2)	4.0% (2)	1.9% (1)	7.4% (4 ^{*4th-6th})
<i>Bike lanes</i>	-	7.7% ^{*P-F} (15)	-	2.0% (1)	-	12.9% ^{*P-F, *4th-6th} (14)
Transportation ⁷	50.9% (150)	49.1% (189)	52.0% (66)	50.0% (59)	50% (84)	48.2% (130)
<i>Bikes</i>	3.8% (4)	13.5% ^{*P-F} (70)	-	4.0% (2)	7.4% (4)	22.2% ^{*P-F, *4th-6th} (68)


^a Percentage (%) of students expressing the particular characteristic. Significant differences based on Mann-Whitney.

^b Absolute number of appearance of the particular characteristic. Significant differences based on Mann-Whitney, Wilcoxon and McNemar test.

^c From the 3rd level of indices only those where significant differences were detected are presented.



Εκπαιδευτική και
ερευνητική χρήση
χαρτών εννοιών





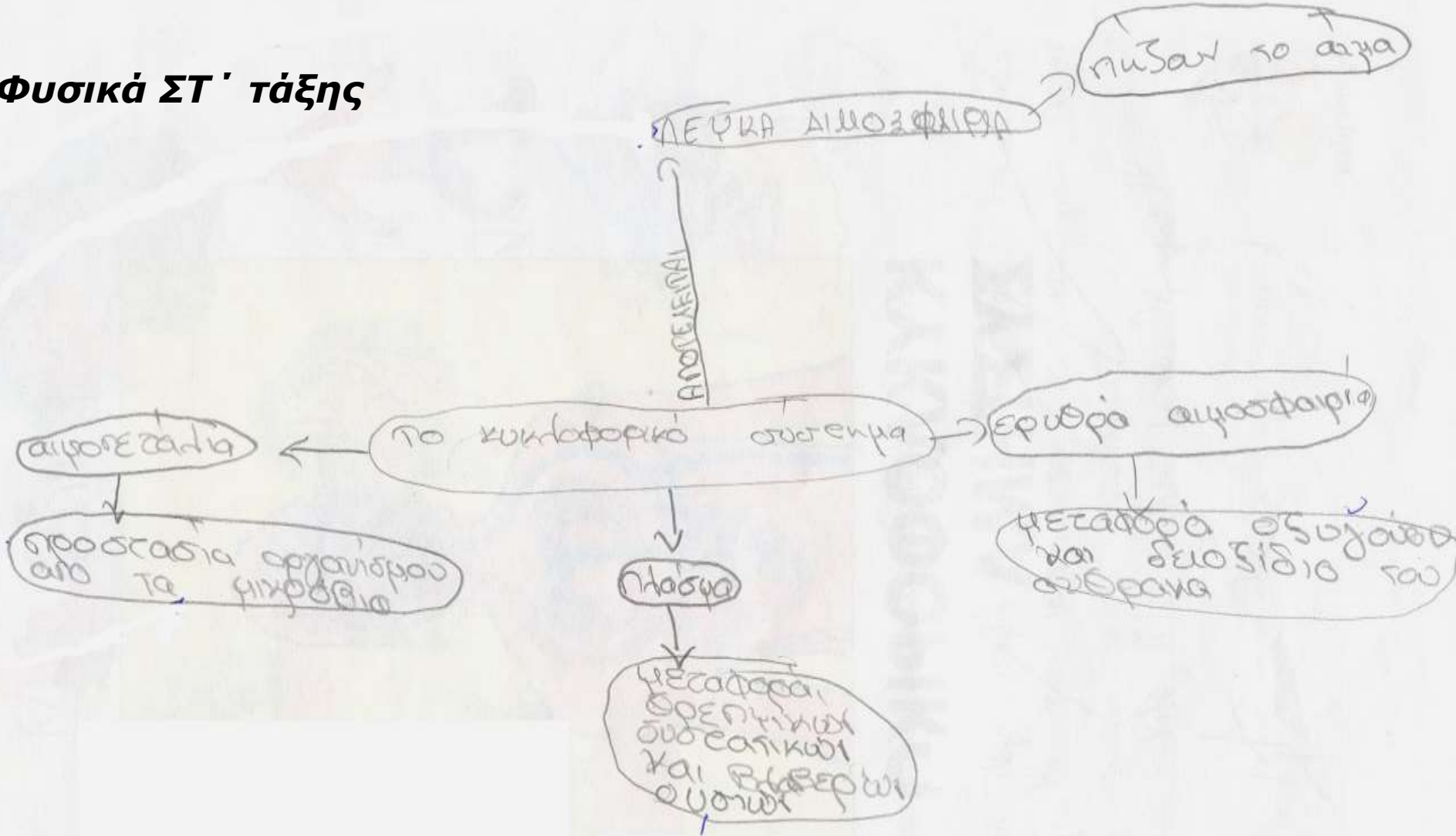
Χρήση χαρτών εννοιών

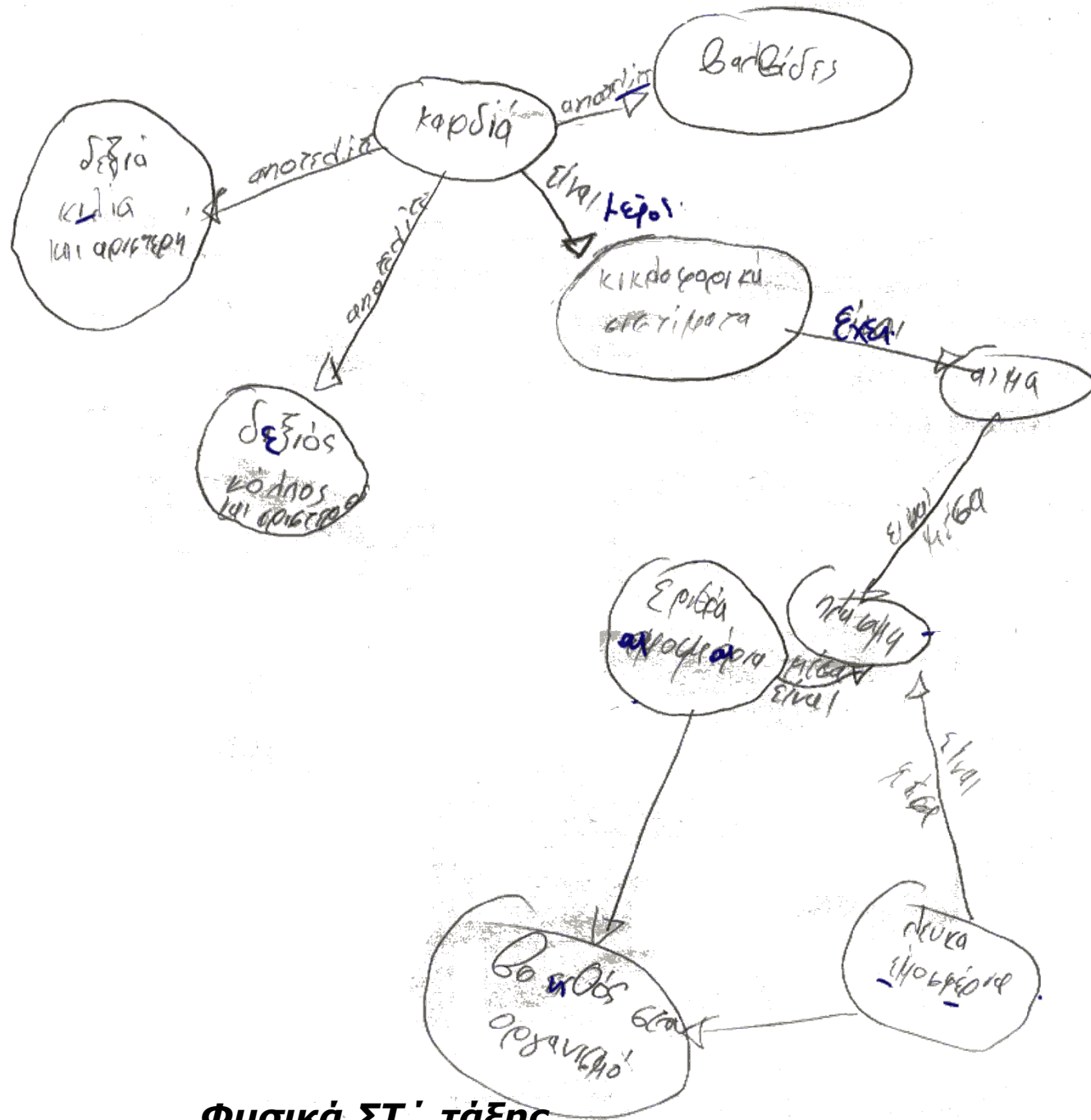
- Τρόπος εκμαίευσης ιδεών
- Διδασκαλία *(Ατομική και Ομαδική κατασκευή της νέας γνώσης)*
- Αξιολόγηση
- Έρευνα

Τρόποι εκμείευσης των ιδεών

↗ Χάρτες εννοιών

Φυσικά ΣΤ' τάξης

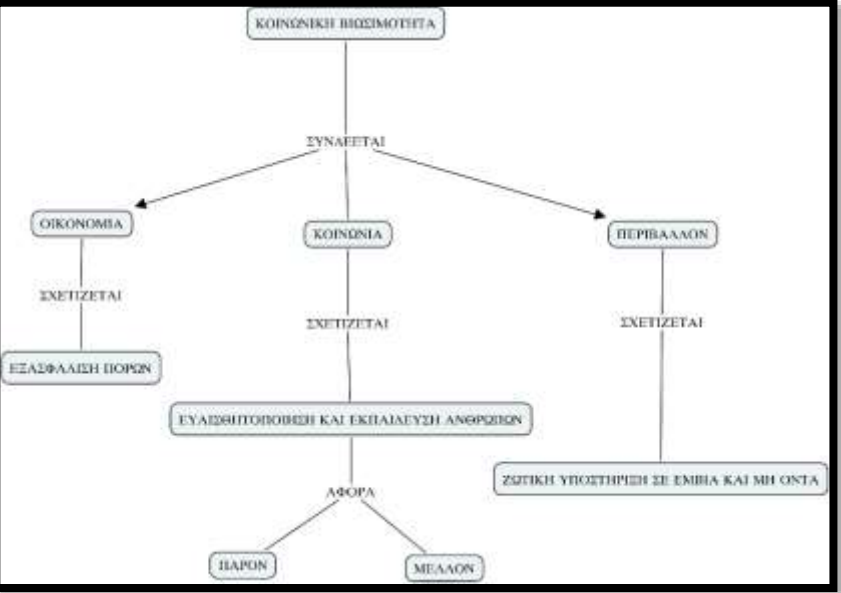




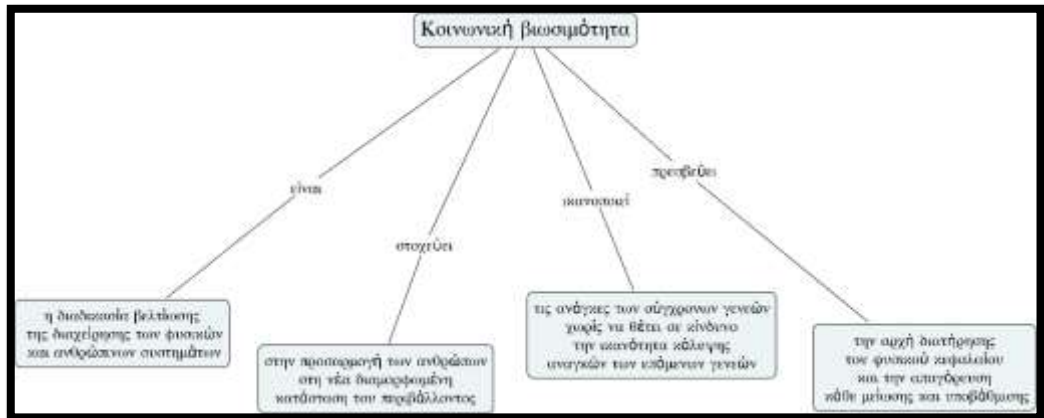
Φυσικά ΣΤ' τάξης



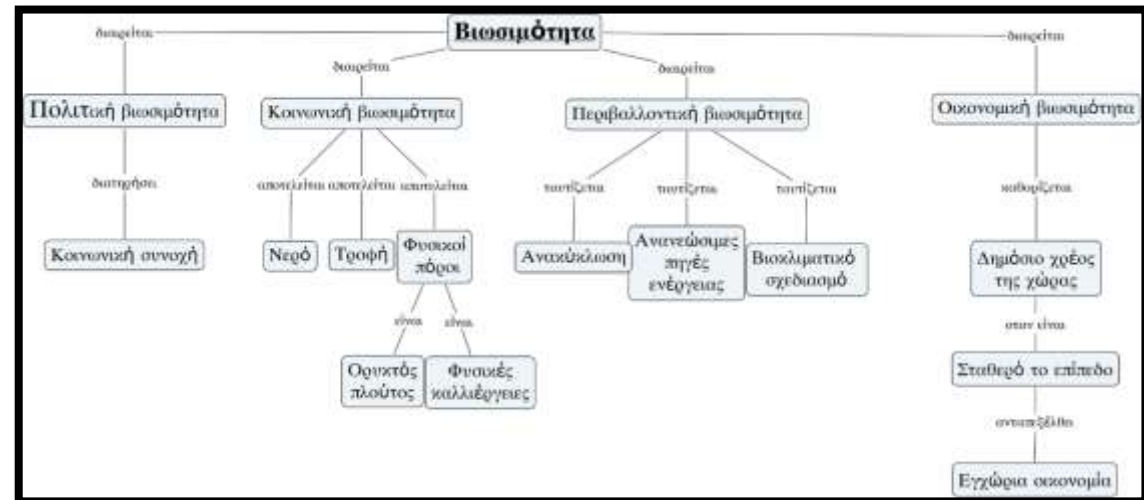
Διδασκαλία και Μάθηση



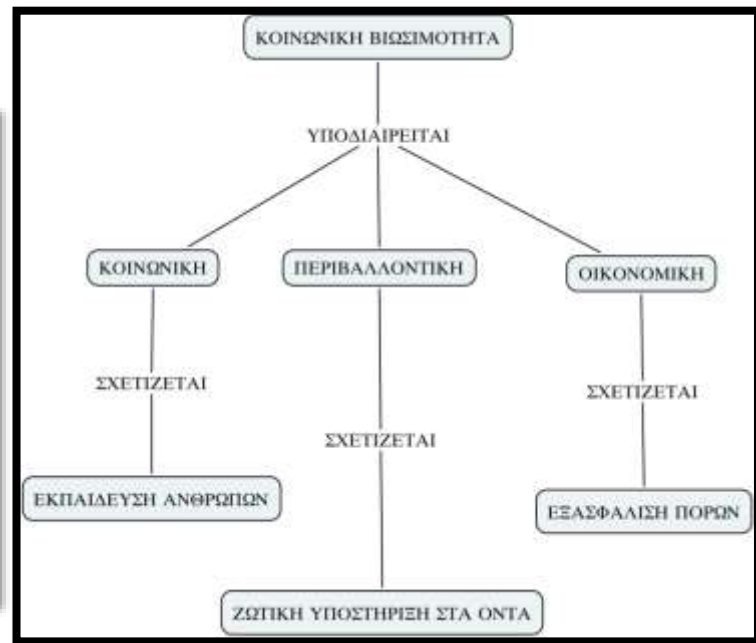
Φοιτήτρια 4



Φοιτήτρια 1

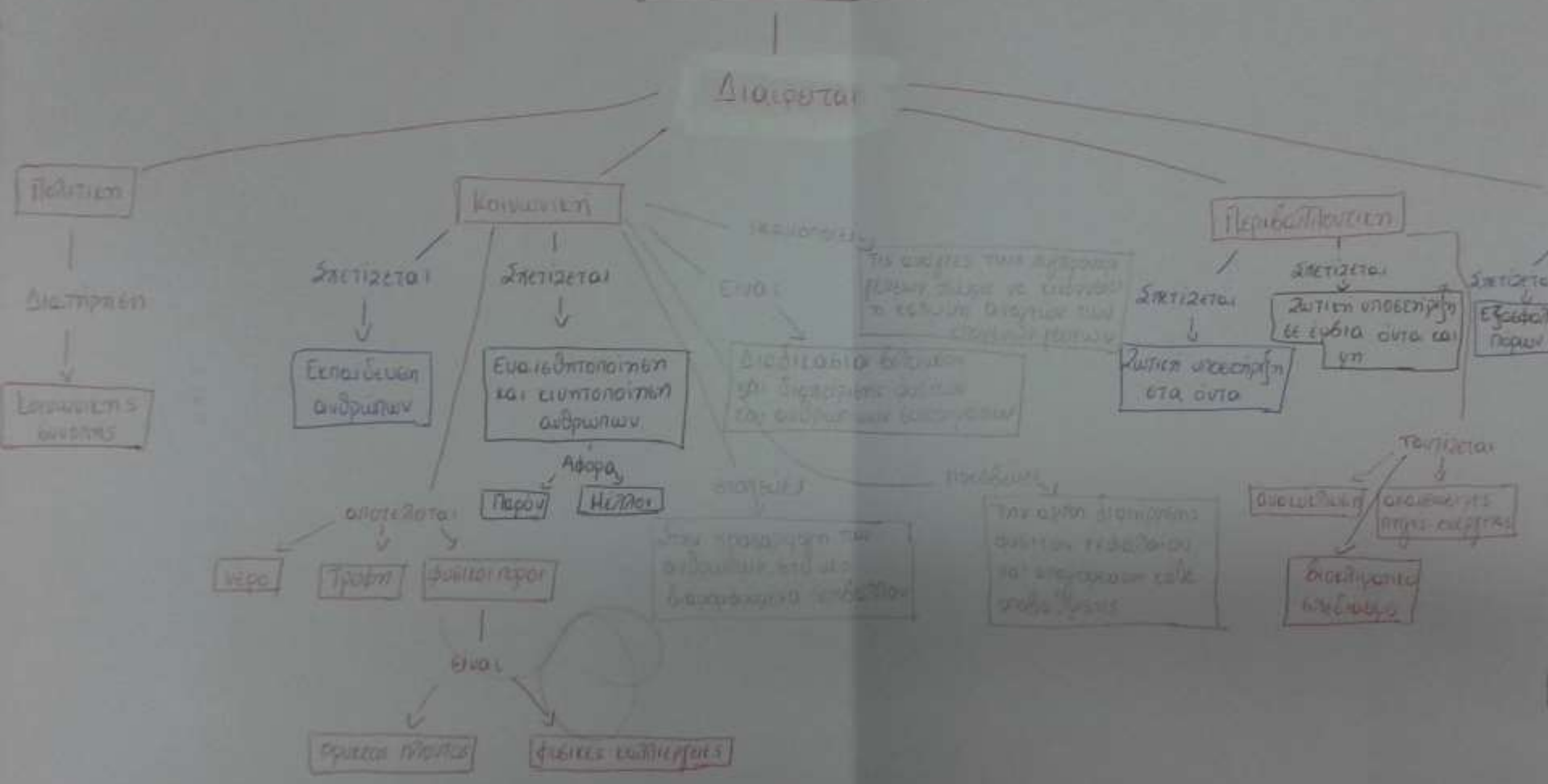


Φοιτήτρια 2



Φοιτήτρια 3

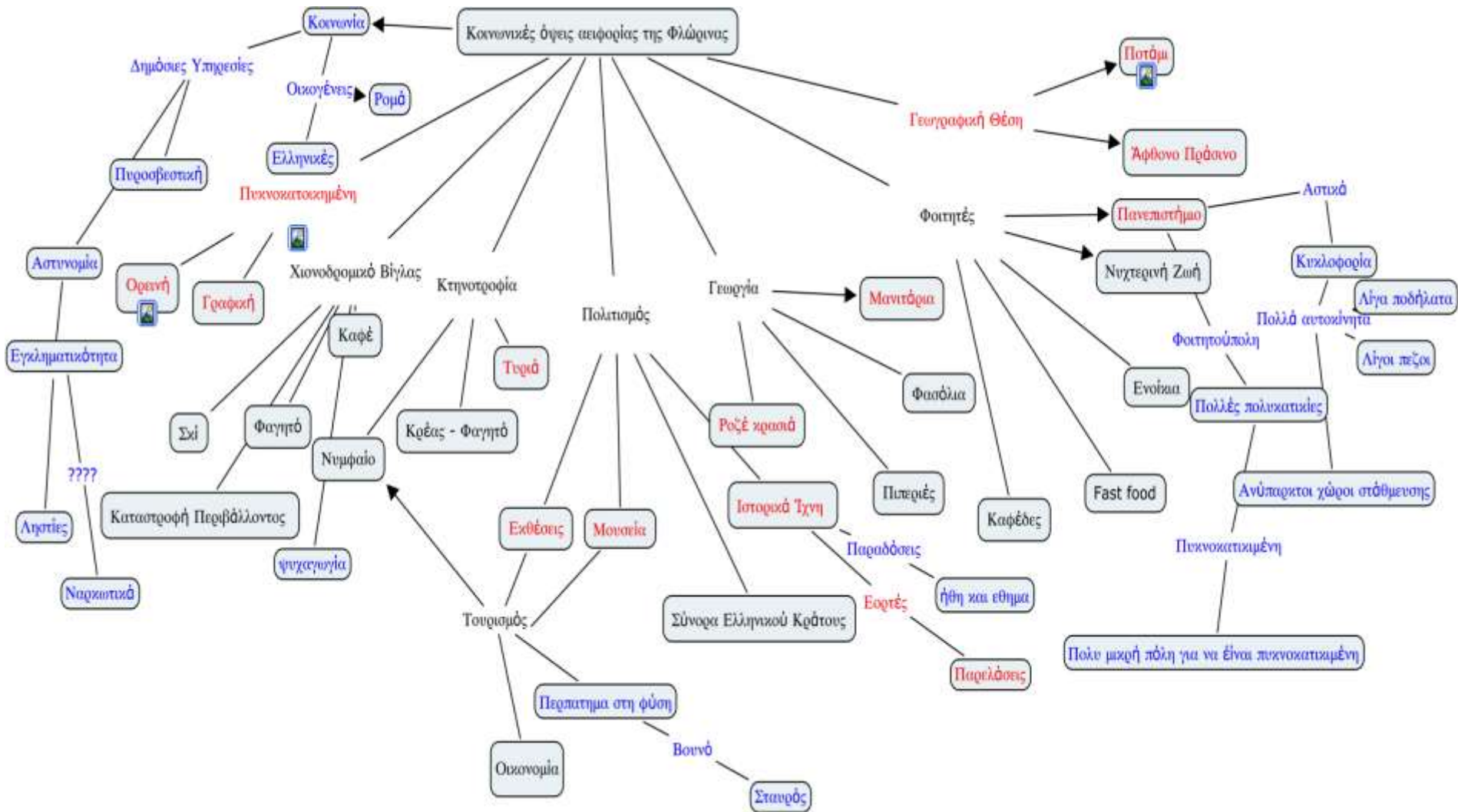
ΒΙΟΣΦΑΙΝΟΤΗΤΑ



Φοιτήτρια 1
Φοιτήτρια 2
Φοιτήτρια 3
Φοιτήτρια 4

Σύνθεση 4 αρχικών, ατομικών εννοιών, σε ένα ενιαίο ομαδικό

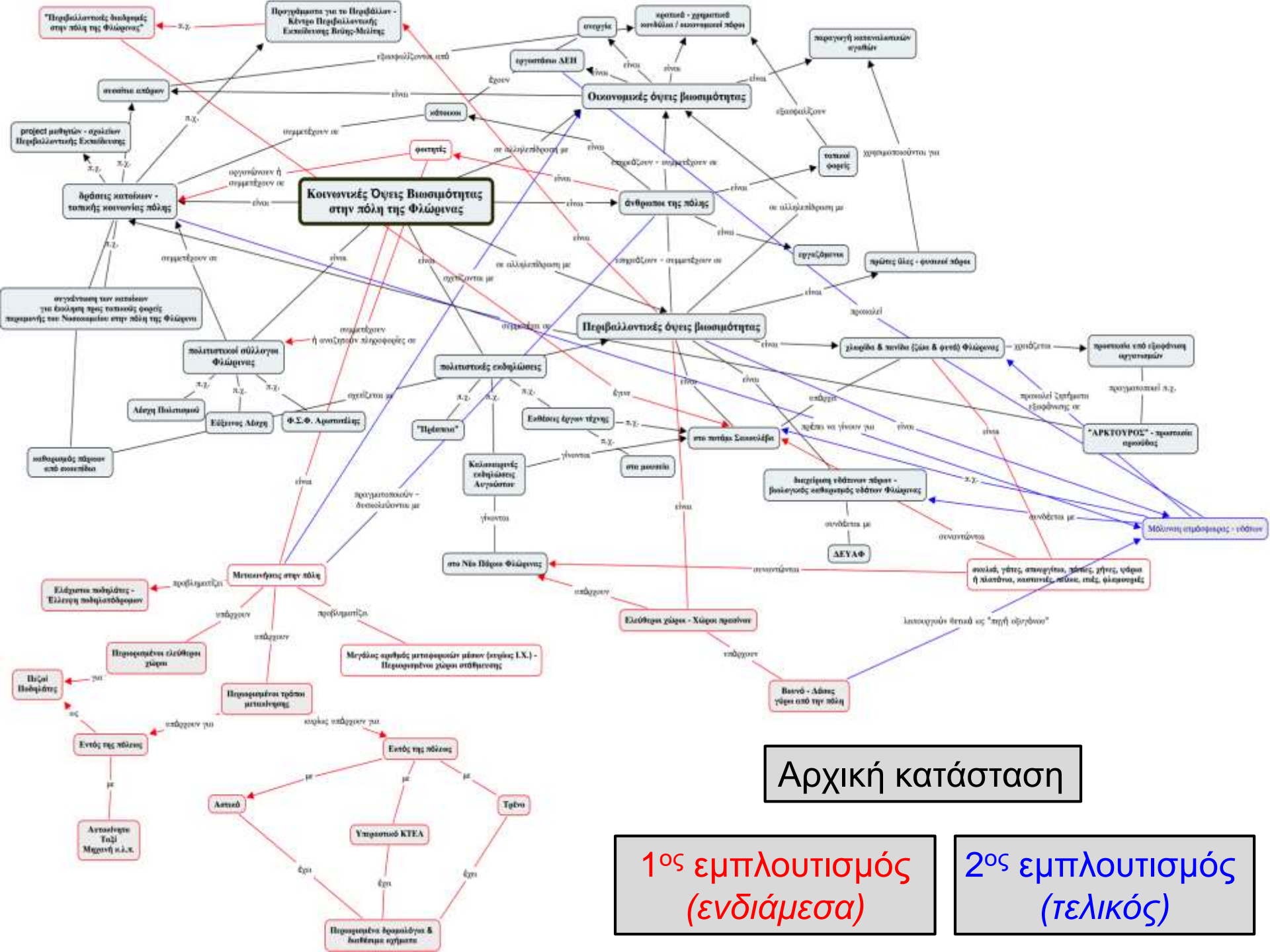
Διαχρονική εξέλιξη κατανόησης του ίδιου υποκειμένου



Αρχική κατάσταση

1^{ος} εμπλουτισμός
(ενδιάμεσα)

2^{ος} εμπλουτισμός
(τελικός)



Κοινωνικές Όψεις βιωσιμότητας στην πόλη της Φλώρινας

Οικονομικές όψεις βιωσιμότητας

Περιβαλλοντικές όψεις βιωσιμότητας

Μεταστροφή στην πόλη

Ελεύθεροι χώροι - Χώροι προϊόντων

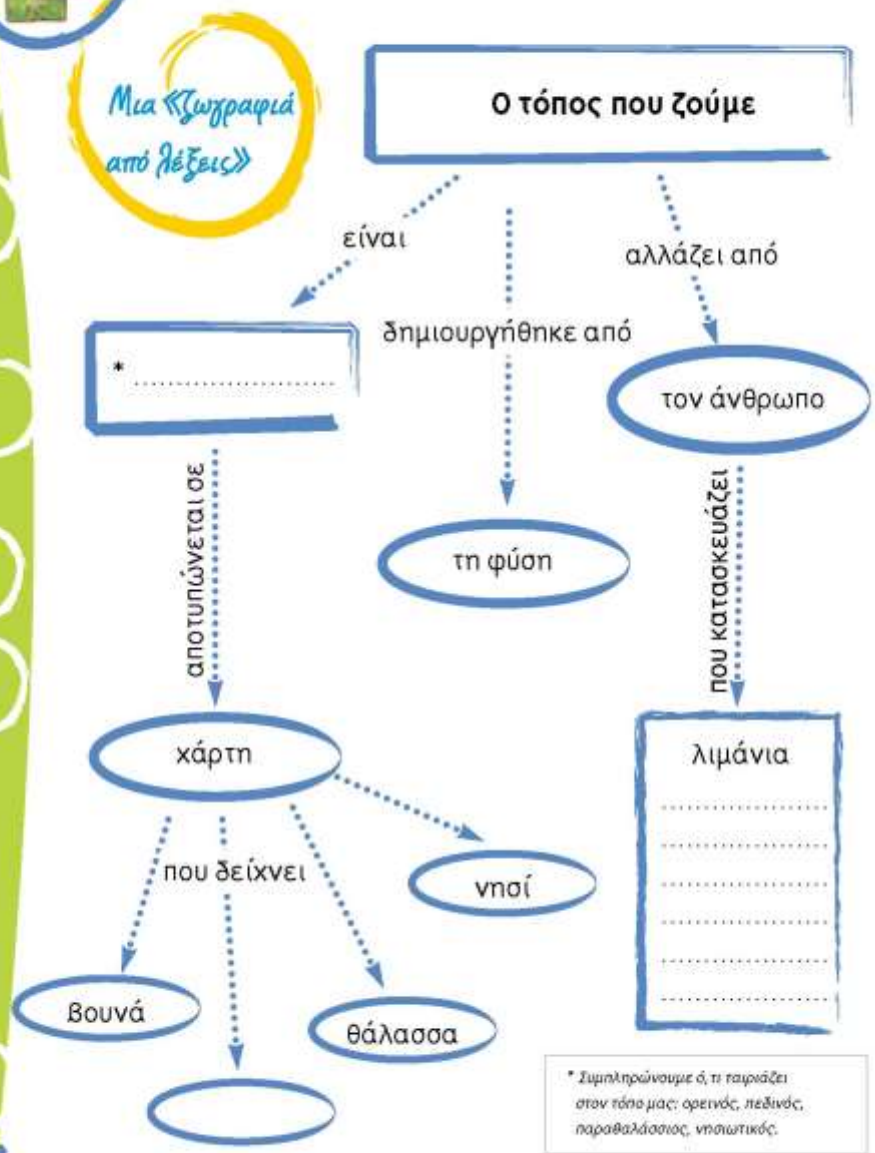
Αρχική κατάσταση

1ος εμπλουτισμός (ενδιάμεσα)

2ος εμπλουτισμός (τελικός)



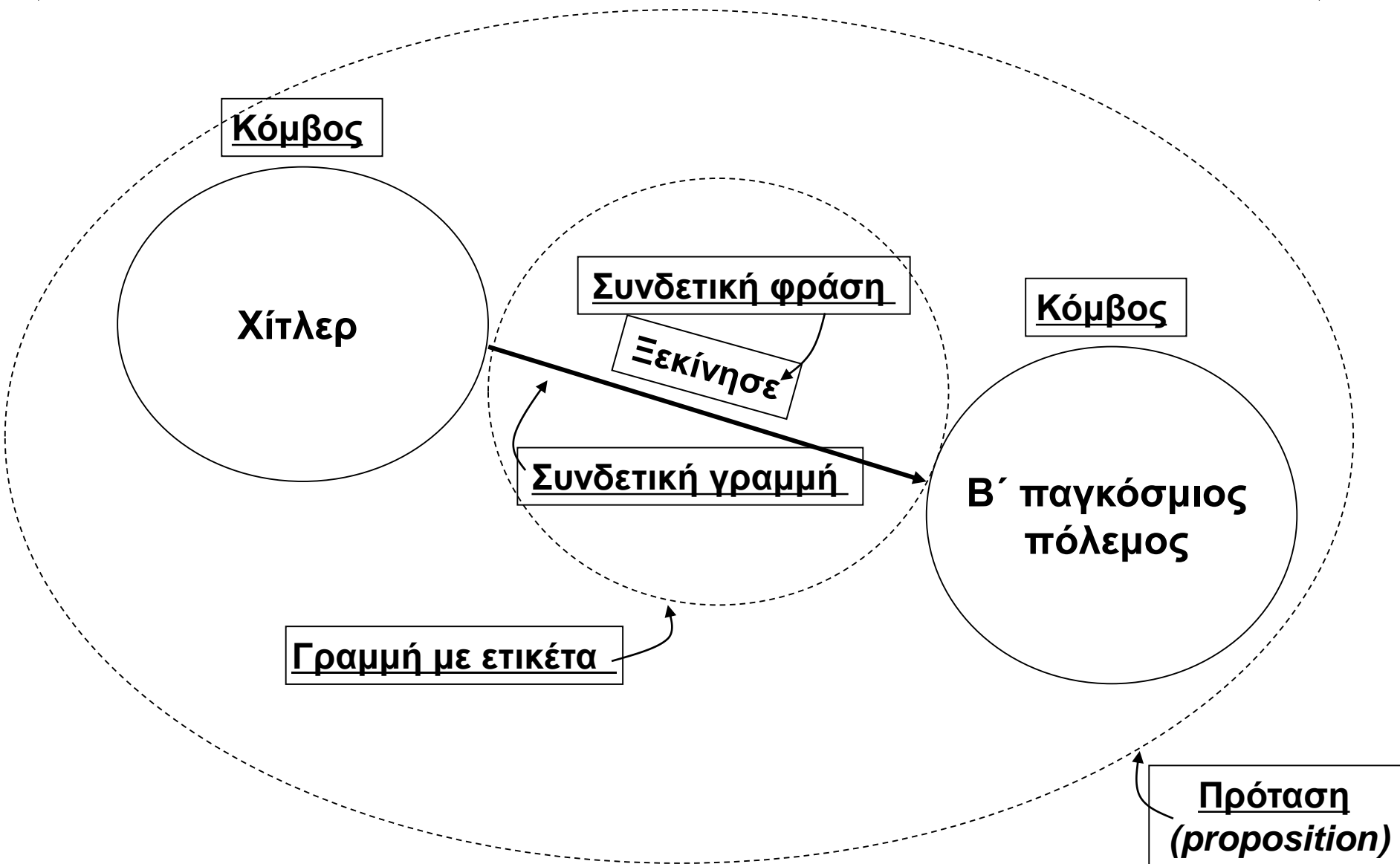
Γ' τάξη Βιβλίο μαθητή



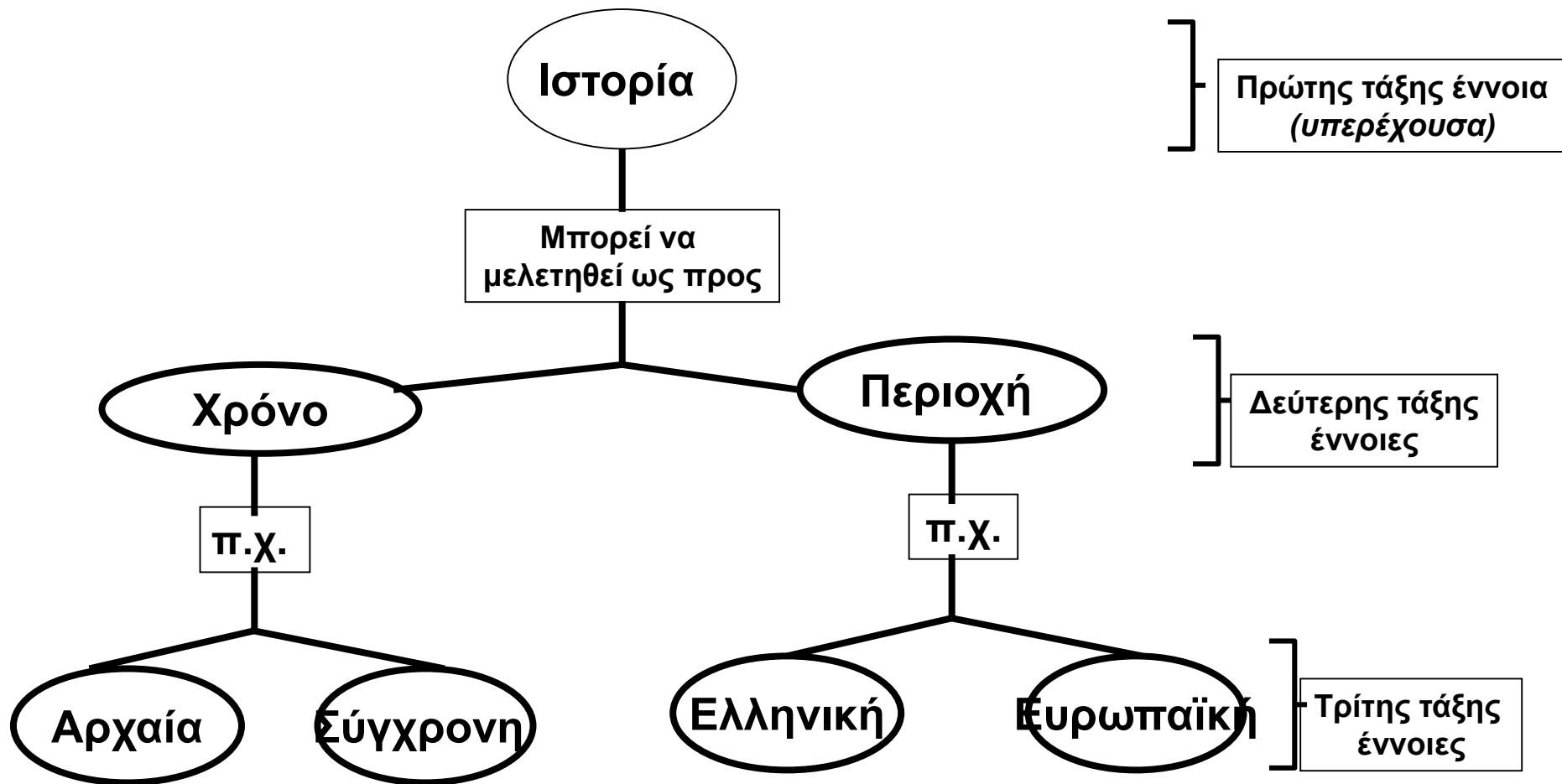


Έρευνα

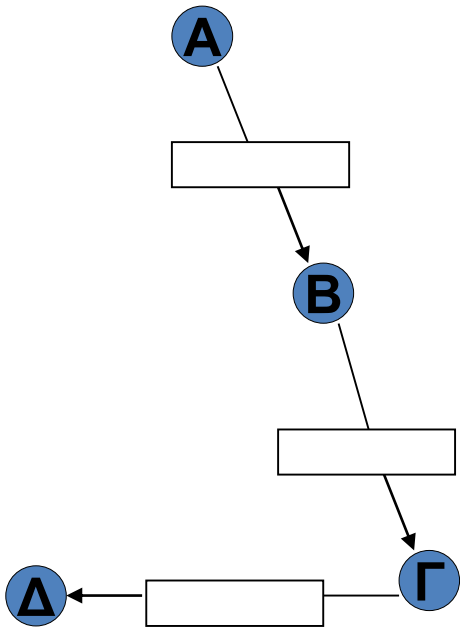
Παράδειγμα



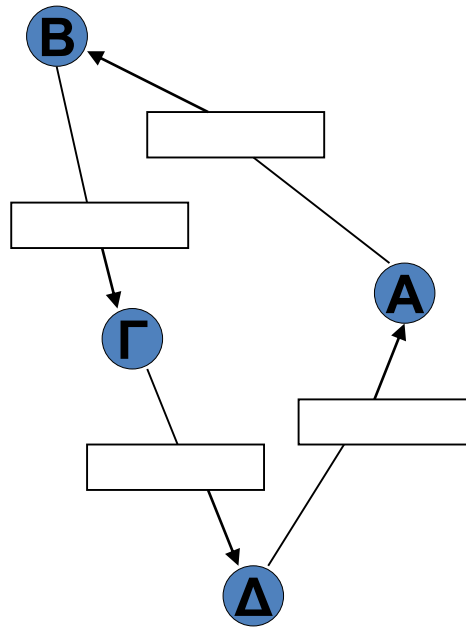
Επίπεδα εννοιών



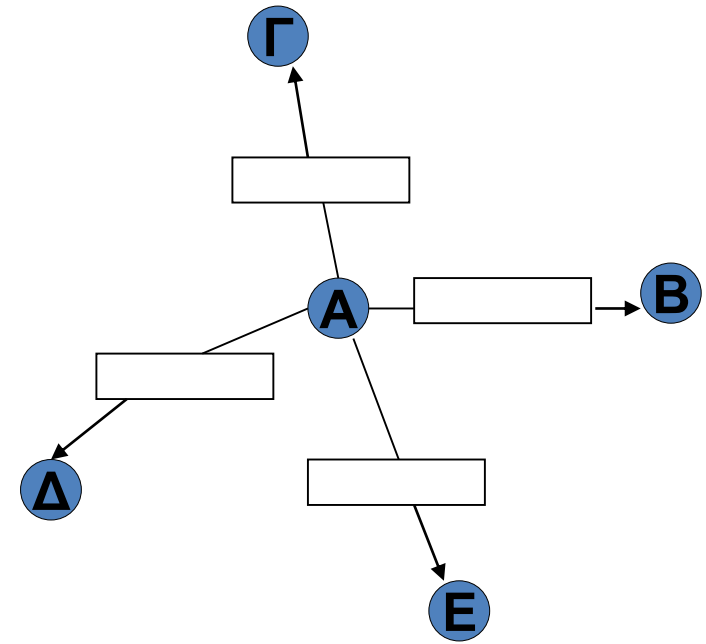
Μορφές δομής χαρτών Ι



Γραμμική




Κυκλική

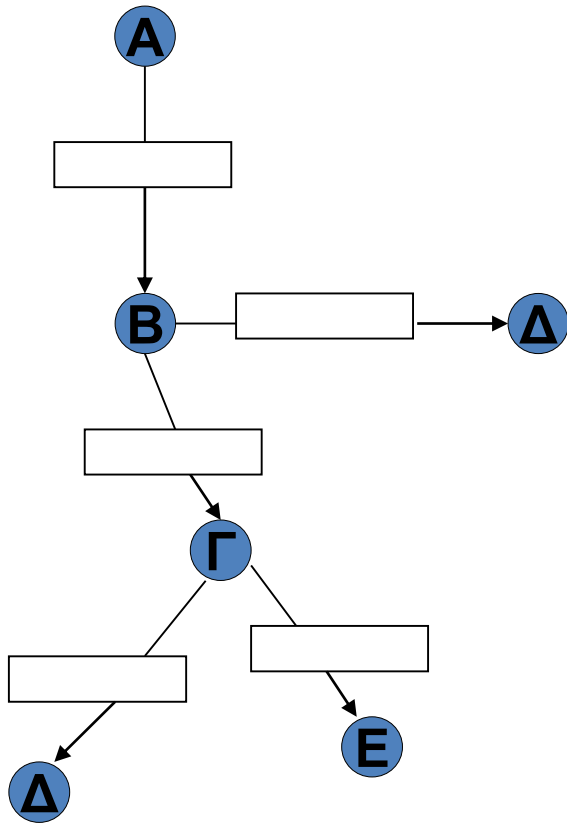


Κέντρο / ακτίνες

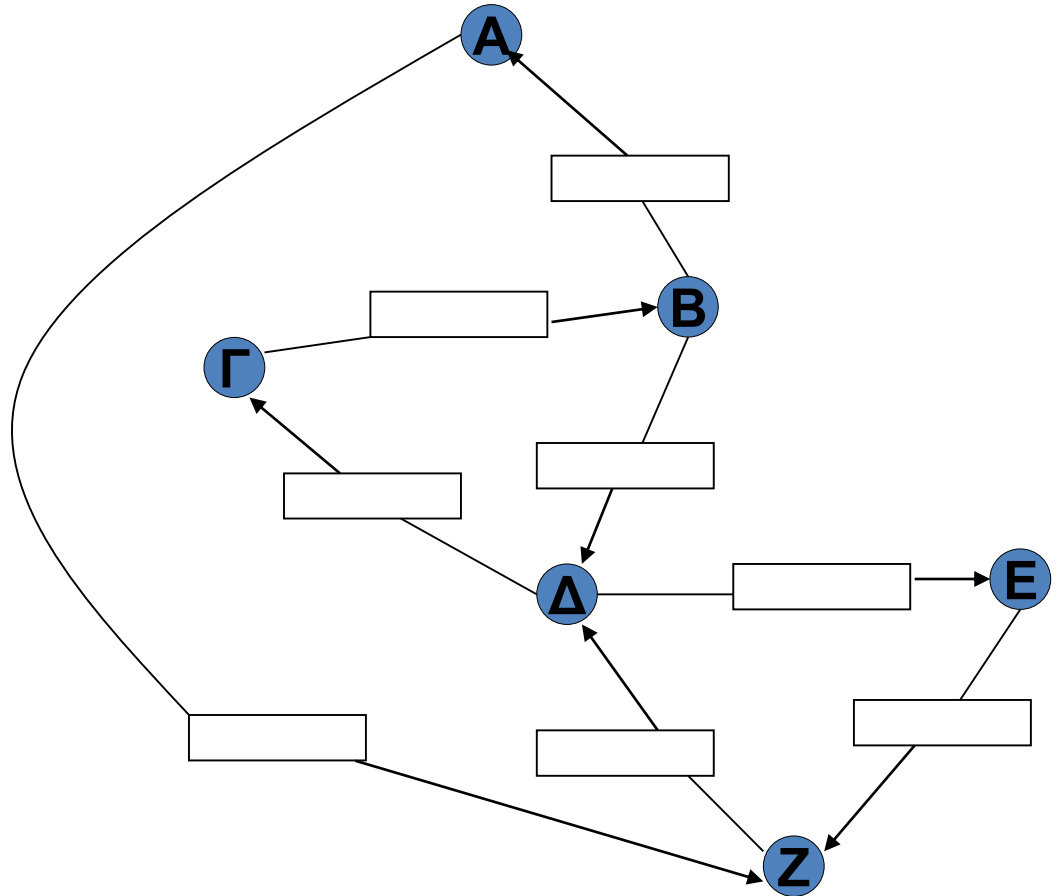
 = συνδετική Φράση

 = έννοια

Μορφές δομής χαρτών II



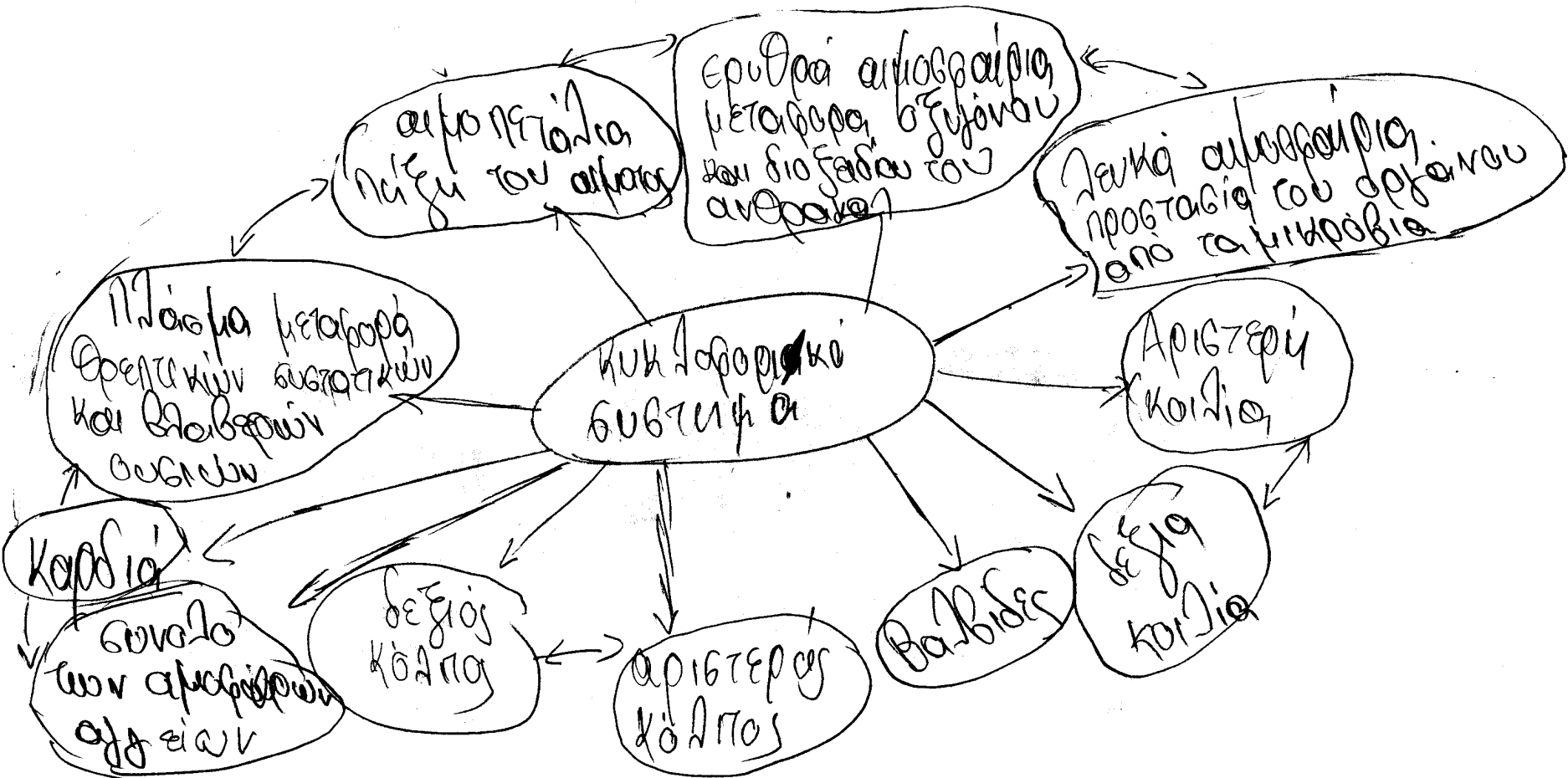
Δέντρο



Δίκτυο

Το κυκλοφορικό σύστημα

Φυσικά ΣΤ' τάξης



Μεταβλητές αξιολόγησης I

ΠΟΣΟΤΙΚΕΣ

Ακρίβεια / ποιότητα
(*accuracy / quality*)

- 1: Επιστημονικά έγκυρες**
«το γραμ. είναι μια μονάδα μέτρησης της μάζας»
- 2: Κοινή γνώση**
«το γραμ. μετράει μάζα»
- 3: Λανθασμένες προτάσεις**
«το γραμ. είναι μια μορφή μάζας»
- 4: Συναισθηματικές προτάσεις**
«το δάσος είναι καλό»

Βάθος εξήγησης
(*depth of explanation*)

- 1: Βασική Περιγραφή** - 'τι είναι'
- 2: Ανώτερης τάξης περιγραφή**
- 'πώς'/^γιατί'

ΠΟΙΟΤΙΚΕΣ

Πολυπλοκότητα
(*complexity*)

- 1: Απλή πρόταση**
- 2: Σύνθετη πρόταση,**
με 1 ή περισσότερες εξαρτημένες προτάσεις

Μεταβλητές αξιολόγησης II

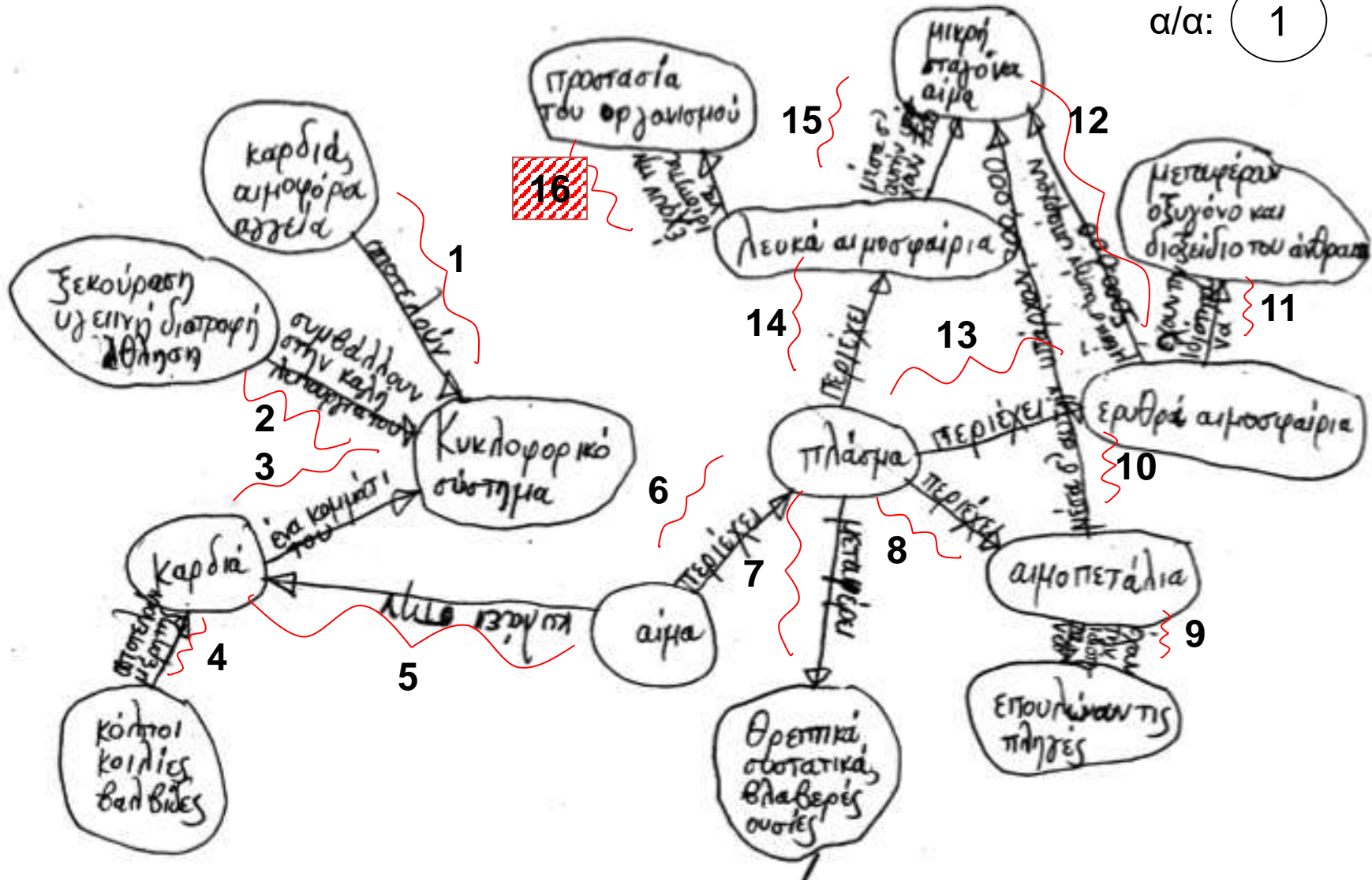
Συνολική ακρίβεια προτάσεων
(total proposition accuracy) = Το συνολικό άθροισμα των βαθμών ποιότητας κάθε πρότασης από το χάρτη του μαθητή/τριας

Βαθμός σύγκλισης
(convergence score) =
$$\frac{\text{Οι σωστές προτάσεις κάθε μαθητή/τριας στο χάρτη του}}{\text{Συνολικός αριθμός των δυνατών σωστών προτάσεων}}$$

Βαθμός προβολής / προεξοχής
(salience score) =
$$\frac{\text{Οι σωστές προτάσεις κάθε μαθητή/τριας στο χάρτη του}}{\text{Συνολικός αριθμός των προτάσεων στο χάρτη αυτό}}$$

Παράδειγμα - Φυσικά ΣΤ'

α/α: 1



Ανάλυση – βαθμολόγηση

α/α παιδιών	Αριθμός προτάσεων	Συνολική ακρίβεια	Πολυπλοκότητα	Βάθος εξήγησης	Βαθμός σύγκλισης	Βαθμός προβολής
1	8	$\left. \begin{array}{l} 5 * 3 \\ 2 * 2 \\ 0 * 1 \\ 1 * 0 \end{array} \right\} = 20$	$\left. \begin{array}{l} 5 * 2 \\ 3 * 1 \end{array} \right\} = 18$	$\left. \begin{array}{l} 6 * 1 \\ 2 * 2 \end{array} \right\} = 10$	$5/15 = 0,33$	$5/8 = 0,625$
...						
16						
...						
25						
...						
Π.χ. 167						



Ανάλυση χαρτών εννοιών

- ✓ Με βάση
- ✓ Τον αριθμό των εννοιών
- ✓ Τον αριθμό των συνδέσεών τους
- ✓ Την οργάνωσή τους στο χάρτη

✓ *(Assaraf, O. B.-Z., Dodick, J., & Tripto, J., 2011)*

Level A: Analysis of System Components

Characteristic # 1: *Identifying components and processes in the human body system.*
Characterizing system thinking at the components and processes level requires the following steps:

- a) Selecting a suitable characteristic into which all the concepts written by the population may be pooled. In this study we chose ‘hierarchy in nature.’
- b) Dividing this ‘master-characteristic’ into the categories—‘Structure’ and ‘Process’
- c) Further dividing each of these into the sub-categories of ‘Microscopic’ and ‘Macroscopic’ levels.
- d) Sorting the concepts written by the students into each of the categories now present under the master-characteristic ‘hierarchy in nature.’
- e) Counting all of the concepts provided by the population to arrive at an overall amount of concepts.
- f) Counting the number of concepts in each category.
- g) Calculating distributions for the estimation of the students’ relative ability to represent system components vs. system processes.

Level B: Synthesis of System Components

Characteristic # 2: *Identifying simple relationships between system components.* Evidence in concepts maps of relationships between system components can be gathered by identifying both the concepts in the students' body of knowledge, and the manner of their organization into meaningful connections. To do this one must:

- a) Analyze the connections and translate them into statements.
- b) Identify statements that address relationships between components, i.e. statements that address the effect of element 'x' upon element 'y'.

Characteristic # 3: *Identifying dynamic relationships in systems.* This ability can be measured by the examination of the connection a student has formed between two concepts.

- a) Analyze connections and translate them into statements.
- b) Identify statements that express dynamism—i.e. statements in which the student refers to the transmission of a certain substance within the human body system.

Characteristic # 4: *Organizing components and processes within a framework of relationships.* Students' ability to connect a single component to a large number of other components can be assessed by examining the number of junctions on their concept map. A 'junction' is a concept that has connections to at least three other concepts on the map. The number of junctions students mark between their concepts provides insight into the level of knowledge integration they have undergone. For this reason, the junctions in each map are to be counted.

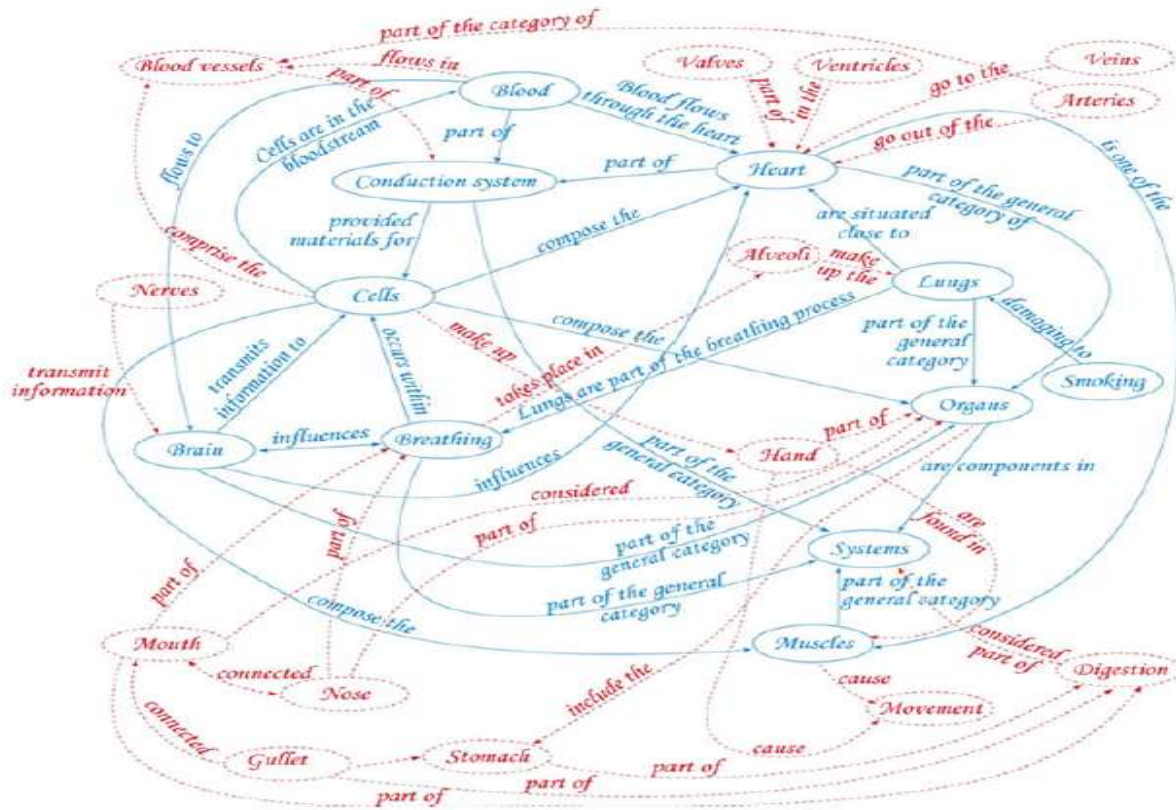
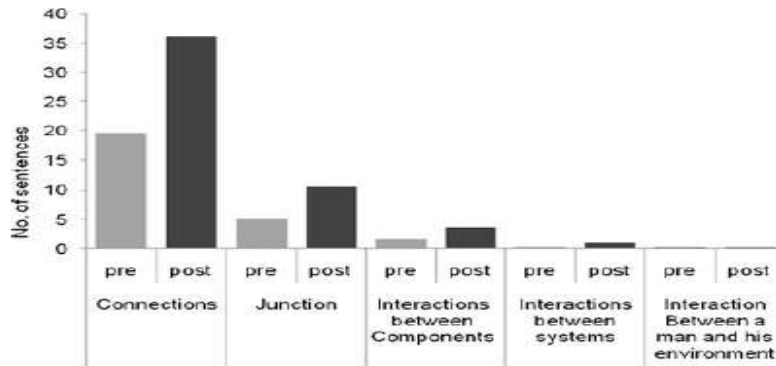


Fig. 2 Eli post-test mediation concept map

Fig. 3 Distribution of the students' ability in synthesizing system components as identified by the concept map task



Παράδειγμα από έρευνα ...

JOURNAL OF RESEARCH IN SCIENCE TEACHING

VOL. 42, NO. 2, PP. 166–184 (2005)

Comparison of Two Concept-Mapping Techniques: Implications for Scoring, Interpretation, and Use

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Received 12 May 2003; Accepted 8 June 2004

Abstract: We examine the equivalence of two construct-a-concept-map techniques: construct-a-map with created linking phrases (C), and construct-a-map with selected linking phrases (S). The former places few constraints on the respondent and has been considered the gold standard; the latter is cost and time efficient. Both their products and processes are compared quantitatively and qualitatively as to total accuracy score, individual proposition scores, proposition choice, map structure complexity, proposition generation rate, and proposition generation procedures. We conclude that the two mapping techniques are not equivalent: The C technique is better than the S technique in capturing students' partial knowledge, even though the S can be scored more efficiently than C. Based on their characteristics, if used as an assessment tool, the C technique is more suitable for formative assessment while the S technique is a better fit for large-scale assessments. © 2005 Wiley Periodicals, Inc. *J Res Sci Teach* 42: 166–184, 2005

A decorative graphic consisting of two horizontal black lines, one above and one below the text. On the right side of the top line, there is a vertical black line intersecting it, with a yellow square above and a blue square below. On the left side of the bottom line, there is a vertical black line intersecting it, with a red square above and a yellow square below. The text "New Environmental Paradigm" is centered between the two horizontal lines.

New Environmental Paradigm

Table 2 NEP items with frequency, mean, and standard deviation of responses


NEP facets	Scale items	Responses (%) ^c			Mean	SD
		A	D	U		
Reality of limits to growth	We are approaching the limit of the number of people the earth can support	27.3	45.9	26.8	2.66	1.22
	The earth has plenty of natural resources if we just learn how to develop them ^a	91.8	5.4	2.8	1.55	0.92
	The earth has only limited room and resources	29	57.8	13.2	2.50	1.26
Anti-anthropocentrism	Humans have a right to modify the natural environment to suit their needs ^a	74.3	19.2	6.5	2.28	1.18
	Humans were meant to rule over the rest of the nature ^a	79	13	8	2.03	1.11
	Plants and animals do not have equal rights as humans to exist ^b	37	52	11	2.76	1.41
Fragility of nature's balance	When humans interfere with nature, it often produces disastrous consequences	64	23	14	3.54	1.14
	The balance of nature is strong enough to cope with the impacts of modern industrial development ^{a,b}	32	39	29	3.08	1.10
	The balance of nature is very delicate and easily upset	62	14	24	3.57	1.02
Rejection of exceptionalism	Human intelligence will ensure that we don't make the earth unlivable ^{a,b}	46	23	31	2.85	1.20
	Despite our special abilities, humans are still subject to the laws of nature	89	7	4	4.14	0.93
	Humans will eventually learn enough about how nature works to be able to control it ^a	63.9	17.4	18.6	2.43	1.11
Possibility of an eco-crisis	Humans are severely abusing the environment	78.4	14.9	7.6	3.81	1.08
	Human destruction of the environment has been greatly exaggerated ^a	48.2	33.3	18.5	3.18	1.21
	If things continue going as they presently are, we will soon experience a major ecological disaster ^b	74.2	12.1	13.7	3.89	1.08
	Overall index				44.27	5.18
	Mean total NEP score				2.95	0.35

^a Reverse coded


^b Modified to improve comprehensibility

^c A agree, D disagree, U undecided

1 = strongly disagree
 2 = disagree
 3 = not sure
 4 = agree
 5 = strongly agree



Άλλα ποσοτικά
παραδείγματα



Themes	Items about the <i>Believed Usefulness of Action</i>	Items about the <i>Degree of Willingness to Act</i>
<i>Direct actions</i>		
Transport (use)	If people didn't use their cars so much, global warming would be reduced	Even if it took me longer and was more inconvenient, I would try to use buses and trains instead of a car
Transport (type)	If people had smaller cars that used less petrol or diesel, global warming would be reduced	Even if it was not as fast or luxurious, I would try to get a car that uses less petrol or diesel
Power generation (renewable)	If more of our energy was produced from the wind, waves and sun, global warming would be reduced	Providing more of our energy was produced from the wind and waves and sun, I would be willing to pay more for electricity
Power generation (nuclear)	If more of our energy was produced from nuclear power stations, global warming would be reduced	Providing more of our energy was produced from nuclear power stations, I would be willing to pay more for electricity
The home (electricity use)	If people used less electricity in their homes, global warming would be reduced	To save electricity, I would switch things off at home when I didn't need them
The home (insulation)	If people got their homes insulated better, global warming would be reduced	Even though it cost me money, I would get extra insulation for my home
The home (consumer durables)	If people got things for their homes (like fridges and washing machines) that used less energy, global warming would be reduced	Even if it cost me more, I would buy things for my home (like fridges and washing machines) that use less energy
The home (consumables)	If people were prepared to buy fewer new things and make do with the old ones, global warming would be reduced	Even if it meant that I didn't always have the latest 'gear' or fashion, I would be prepared to buy new things less often
Environmentally-friendly (trees)	If more trees were planted in the world, global warming would be reduced	Even if I had to pay more taxes, I think there should be more trees planted in the world
Environmentally-friendly (recycle)	If people recycled things more, global warming would be reduced	Even if it was more trouble for me, I would recycle things rather than just throw them away
Food (Reducing meat)	If people eat less meat, global warming would be reduced	Even if I really liked meat, I would eat fewer meals with meat in them
Food (Reducing artificial fertilizers)	If farmers stopped using artificial fertilisers with nitrogen in them, global warming would be reduced	Even if it was more expensive, I would buy food grown without the use of artificial fertilisers
<i>Indirect actions</i>		
Environmental legislation	If politicians made the right kind of new laws, global warming would be reduced	I would vote for a politician who said they would bring in laws to reduce global warming, even though it would stop me doing some of the things I enjoy
Environmental taxation	If politicians made people pay more tax and spent the money on the right kind of things, global warming would be reduced	I would vote for a politician who said they would increase taxes to pay for reducing global warming, even though it meant me having less money to spend
Environmental education	If people were taught more about it, global warming would be reduced	I would like to learn more about global warming, even though it would mean extra work for me
Environmental international cooperation	If there could be more agreement between different countries about not putting certain gases into the air, global warming would be reduced	Even though it might mean some inconvenience to me (like changing my job), I would vote for a politician who said they would sign agreements with other countries on global warming

Figure 2. Wording of the questionnaire items.

Note: The items of the questionnaire are displayed so that the 'pairing' of the items can be seen. In the actual questionnaire, the items were in random order, and paired items were in different orders in the two main sections.

Boyes, Edward, and Martin Stanisstreet. "Environmental Education for Behaviour Change: Which Actions Should Be Targeted?" *International Journal of Science Education* 34, no. 10 (July 2012): 1591–1614. doi:10.1080/09500693.2011.584079.

<i>Believed Usefulness of Action</i> If I thought an action would help global warming by...	Score	<i>Degree of Willingness to Act</i> then I would...	Score
by quite a lot	1.00	definitely do it	1.00
by a fair amount	0.75	almost certainly do it	0.75
by a small but useful amount	0.50	probably do it	0.50
by a very small amount – hardly noticeable	0.25	perhaps do it	0.25
by nothing at all really	0.00	probably not do it	0.00

Figure 3. Wording of the permissible responses to the two sets of items.

Note: The wording of the permissible responses is displayed ‘matched’. This ‘matching’ suggests the minimum action (‘then I would’) that might reasonably be expected for a given belief about the usefulness of that action. The figures show the scores assigned to the different responses; these enabled various coefficients to be constructed.

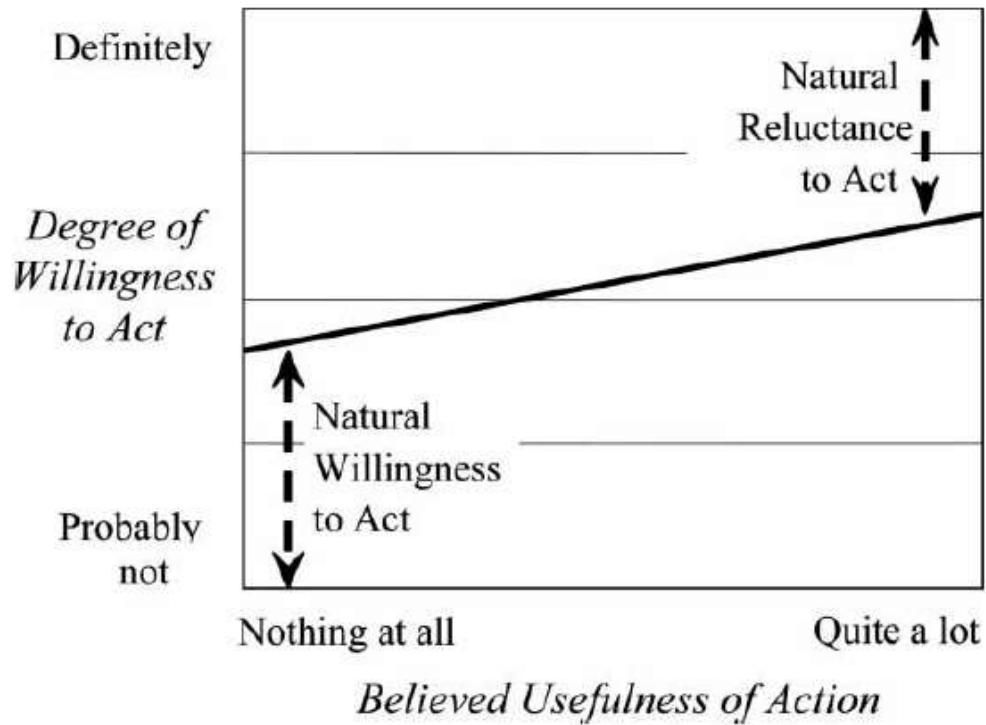


Figure 4. Annotated graph to show relationship between the *Degree of Willingness to Act* and the *Believed Usefulness of Action*

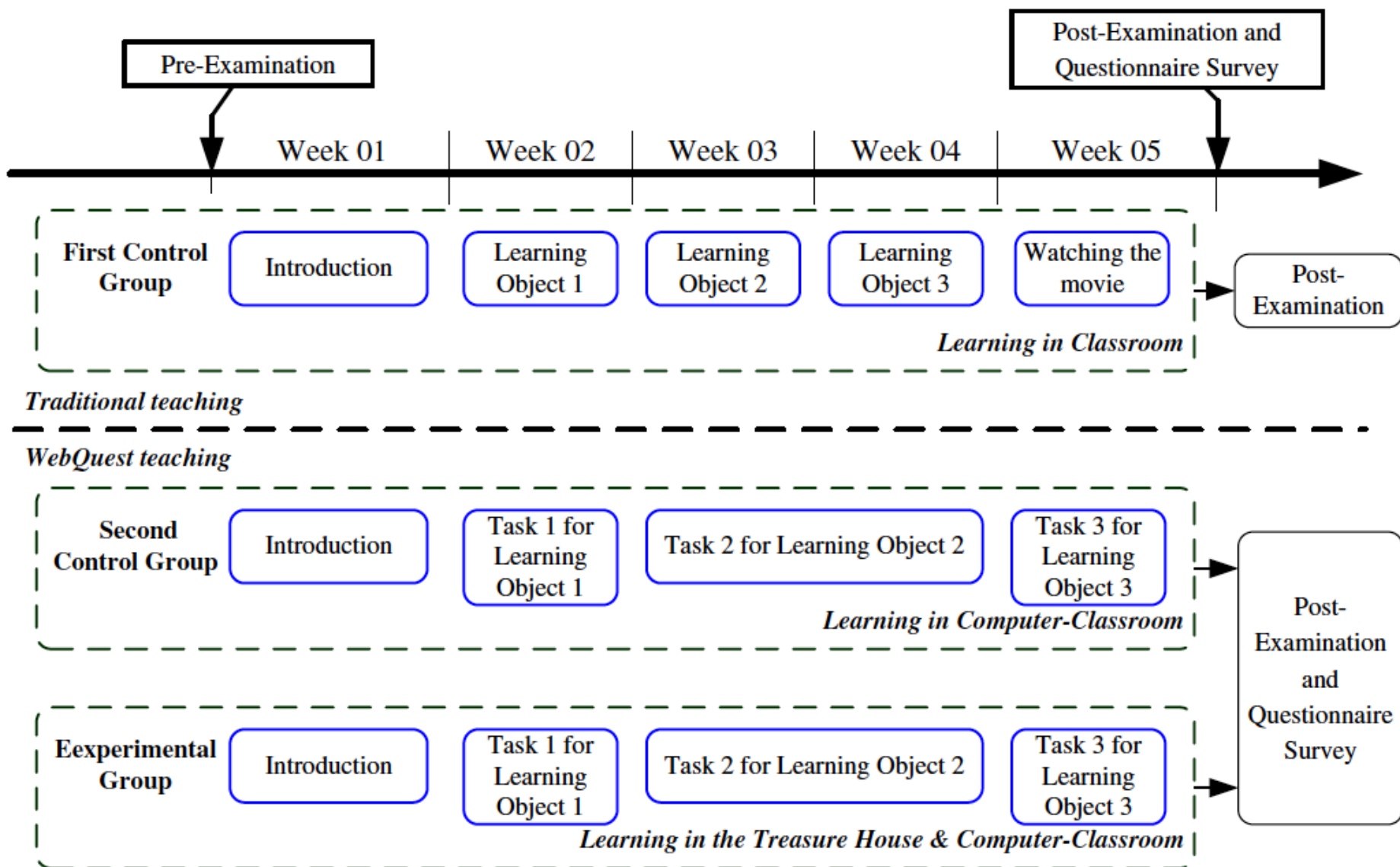


Fig. 1. Experimental design processes of two control groups and experimental group.

Table 1

The teaching goals and learning contents for the three experimental groups.

Learning objects	Teaching goals	Learning contents
Object 1	Let students know that the use of natural resources can improve quality of life but also destroys the natural landscape and brings about environmental pollution at the same time.	<ol style="list-style-type: none">1. Animals and plants offer a source of food to people, and energy and minerals supply food, clothing, transportation, etc. for people's daily lives.2. Natural resources are not abundant and overuse will exhaust them.
Object 2	Let students learn the concept of resource recovery so they can form habits of resource recovery and classification.	<ol style="list-style-type: none">1. Realizing rubbish decrement and resource recovery so it can be utilized again2. Realizing the signs of resource recovery, the items of classification and the channel of resource recovery.
Object 3	Let students understand that the earth's resources are limited. In addition to classifying resources, encourage them to defend their beautiful home with concrete action.	<ol style="list-style-type: none">1. Exploring why there are environmental problems produced and how to reduce these problems.2. Teaching students how to become green consumers and discussing the green consumption principle.

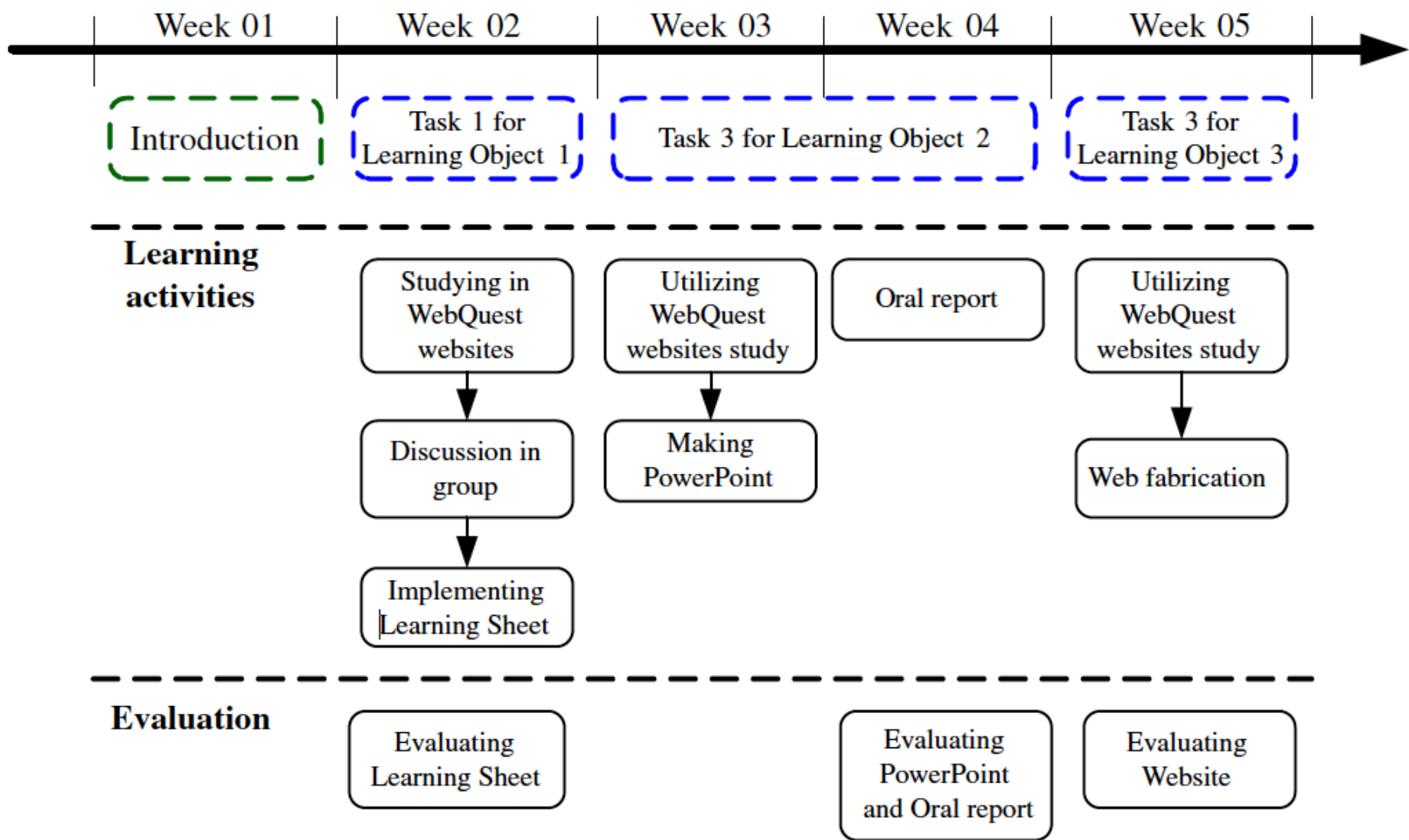


Fig. 3. The procedures of the WebQuest experiments in two groups.

1. Evaluation of whether the website content and learning activity of WebQuest satisfied the participants' needs
2. Examining whether the usage of computers and e-learning captured the participants' attention and enhanced their learning interest.

(5-point Likert scale was used to from “1” being “strongly disagree” to “5” being “strongly agree”)

3. 3 rating scales used as the performance indicators to evaluate the participants' performance in three tasks, as depicted in Table 2. These indicators, revealed:
 - 3.1. results of students' learning
 - 3.2. processes in each task, were regarded as their learning portfolios and
 - 3.3. their participating levels.

(“1” being “very poor” to “5” being “very good”)

Table 2
The performance indicators for rating scales.

Rating scales	Performance indicators	Description
<i>Rating for learning sheet</i> (total score: 25)	The appearance of content (100%)	To evaluate the level of the learning sheet, this study estimated the content of the learning sheet because each group only answered some of the questions by searching for the information on the WebQuest website.
<i>Rating for briefing</i> (total score: 50)	The appearance of content (40%) The skill of design and completion (30%) The presentation of oral report (30%)	To evaluate the level of the briefing, this study estimated it based on three performance indicators because the briefing was an individual learning activity and each student differed in his/her ability to collect and arrange information, design and refine the PowerPoint, and present the oral report.
<i>Rating for website fabrication</i> (total score: 50)	The appearance of content (60%) The skill of design and completion (40%)	To evaluate the level of the website, this study estimated it from two indicators because the briefing was an individual learning activity and each student differed in his/her ability to collect and arrange the information, and design and refine the website.

Table 3

ANCOVA results for assessment of post-examination achievement.

Teaching strategies	Number of students	Estimated marginal mean	SD	F-Value (p-value)	Pairwise comparison
WebQuest with Outdoor Instruction	35	72.346	1.294	22.764 ^a (.000)	(1) > (3) ^a (2) > (3) ^a
WebQuest with Traditional Instruction	34	67.930	1.316		
Traditional Instruction	34	60.006	1.312		

^a * $\rho < .05$, ** $\rho < .01$, *** $\rho < .001$.**Table 4**

The T-test results of the performance indicators of different tasks.

Rating scales	Performance indicators	Groups	Mean	SD	T-Value (p-value)
Rating for Learning Sheet	The appearance of content	Exp	18.29	1.775	2.106 ^a (.040)
		Sec	17.06	2.912	
Rating for Briefing	The appearance of content	Exp	10.60	3.574	.658 (.513)
		Sec	10.89	2.832	
	The skill of design and completion	Exp	8.91	2.811	.859 (.393)
		Sec	8.38	2.296	
The presentation of oral report	Exp	8.83	2.905	.348 (.729)	
	Sec	8.62	2.074		
Rating for Website Fabrication	The appearance of the content	Exp	14.00	5.83	.155 (.877)
		Sec	13.79	5.139	
	The skill of design and completion	Exp	10.03	3.585	.653 (.516)
		Sec	9.50	3.116	

^a * $\rho < .05$, ** $\rho < .01$, *** $\rho < .001$.



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A decorative graphic consisting of two horizontal black lines, one above and one below the text. On the right side of the top line, there is a vertical black line intersecting it, with a yellow square above and a blue square below. On the left side of the bottom line, there is a vertical black line intersecting it, with a red square above and a yellow square below. The text "Ευχαριστώ..." is centered between the two horizontal lines.

Ευχαριστώ...