Τόμος Α
Τεύχος 3ο
ΜΑΡΤΙΟΣ 2010
Περιοδική Έκδοση ΚΕΣΕΑ-ΤΠΕ

X-RAY@εκπαίδευση

www.kesea-tpe.com

"Την τεχνολογική επανάσταση
ή την ελέγχεις ή την υφίστασαι"
Jacques Delors

Κυπριακός Επιστημονικός Σύνδεσμος Εκπαιδευτικών Αξιοποίησης των Τεχνολογιών της Πληροφορίας και των Επικοινωνιών (ΚΕΣΕΑ-ΤΠΕ)

X-RAY@εκπαίδευση

Εκπαιδευτικό Επιστημονικό Περιοδικό

ΙΔΙΟΚΤΗΤΗΣ:
Κυπριακός Επιστημονικός Σύνδεσμος Εκπαιδευτικών Αξιοποίησης των Τεχνολογιών της Πληροφορίας και των Επικοινωνιών (ΚΕΣΕΑ-ΤΠΕ)

Τηλ.: 00357-99405037
Φαξ: 00357-25387714
ΚΕΣΕΑ - ΤΠΕ
Τ.Θ. 70650
3801 Λεμεσός
Κύπρος
E-mail: info@kesea-tpe.com
http://www.kesea-tpe.com

ΕΚΤΥΠΩΣΗ / ΣΧΕΔΙΑΣΜΟΣ:
PAPERDROPS DESIGN & PRINTING
T. 25 379797, F. 25 379787,
63 Saripolou Street, 3041 Limassol,
E. info@paperdrops.com
www.paperdrops.com

περιεχόμενα

5 Computers as Mindtools for Engaging Critical Thinking and Representing Knowledge
David Jonassen

10 Engaging and Supporting Problem Solving
David Jonassen

15 Computer-based concept mapping in the learning process: an instructional and assessment tool for designing and concretizing an innovative course
Andreanna K. Koufou
Georgios Koutromanos
Marida I. Ergazaki
Vasilis I. Komis
Vasiliki P. Zogza

25 MYTecC:
Developing Teenagers Cultural competency, Social and Leadership Skills through the Application of a Virtual-Social Curriculum
Nikleia Eteokleous

32 «Η Σύγχρονη Εκπαιδευτική Τεχνολογία στην υπηρεσία της Διαπολιτισμικής Παιδαγωγικής στο Δημοτικό Σχολείο για την Υπέρβαση των Κοινωνικών Στερεοτύπων και της Προκατάληψης»
Περίληψη διδακτορικής διατριβής με επιβλέποντα τον Καθηγητή του Πανεπιστημίου Αθηνών Αριστοτέλη Ράπτη
Γεωργία Μούκα

Η Εκδοτική Επιτροπή δέχεται άρθρα για δημοσίευση σε επόμενες εκδόσεις του X-RAY@Εκπαίδευση. Πρέπει να είναι μέχρι 1500 λέξεις και να σχετίζονται κατά κύριο λόγο με την αξιοποίηση των Τ.Π.Ε. στην εκπαίδευση. Να αποστέλλονται σε ηλεκτρονική μορφή στις διευθύνσεις: k.shiakallis@cytanet.com.cy και xeandreas@hotmail.com. Σε περίπτωση που η Εκδοτική Επιτροπή κρίνει ότι κάποιο άρθρο δε συνάδει με τις αρχές του περιοδικού, έχει το δικαίωμα να μη το δημοσιεύσει.

Κυπριακός Επιστημονικός Σύνδεσμος Εκπαιδευτικών Αξιοποίησης των Τεχνολογιών της Πληροφορίας και των Επικοινωνιών (ΚΕΣΕΑ-ΤΠΕ)

Αγαπητά Μέλη,

Ο ΚΕΣΕΑ-ΤΠΕ, προχωρεί στην έκδοση του τρίτου τεύχους του επιστημονικού περιοδικού «X-RAY@Εκπαίδευση» και ευχαριστεί θερμά όσους έχουν παραχωρήσει τα άρθρα τους. Ευχαριστίες απευθύνονται και σε όλους όσους στηρίζουν το έργο του ΚΕΣΕΑ-ΤΠΕ γενικότερα.

Σε αυτό το τεύχος φιλοξενούνται δύο άρθρα του κορυφαίου επιστήμονα στην αξιοποίηση των Τεχνολογιών της Πληροφορίας και των Επικοινωνιών στην Εκπαίδευση, Καθηγητή David Jonassen, του Πανεπιστημίου του Missouri των ΗΠΑ, καθώς και άρθρα συνεργατών και φίλων του Συνδέσμου.

Το πρώτο άρθρο του Καθηγητή David Jonassen έχει τίτλο «Engaging and Supporting Problem Solving» και αναφέρεται στο ρόλο που έχουν οι εκπαιδευτικοί στη διαδικασία επίλυσης όλων των μορφών προβλημάτων που προκύπτουν στα πλαίσια της εκπαιδευτικής διαδικασίας. Το δεύτερο άρθρο έχει τίτλο «Computers as Mindtools for Engaging Critical Thinking and Representing Knowledge» και αναφέρεται στον τρόπο με τον οποίο οι Νέες Τεχνολογίες μπορούν να λειτουργήσουν ως εργαλεία οικοδόμησης της γνώσης από τους ίδιους τους μαθητές.

Το τρίτο άρθρο έχει με τίτλο «Computer-based concept mapping in the learning process: an instructional and assessment tool for designing and concretizing an innovative course» και γράφτηκε από τους Αντρεάννα Κουφού, Γεώργιο Κουτρομάνο, Μαρίτα Εργαζάκη, Βασίλη Κόμη και Βασιλική Ζώγα. Αναφέρεται στη σημασία των εννοιολογικών χαρτών που σχεδιάζονται με τη βοήθεια των Νέων Τεχνολογιών και στο ρόλο που οι χάρτες αυτοί μπορούν να έχουν ως εργαλεία αξιολόγησης του τρόπου σκέψης και εργασίας των μαθητών.

Το τέταρτο άρθρο έχει τίτλο «MYTecC:Developing Teenagers Cultural competency, Social and Leadership Skills through the Application of a Virtual-Social Curriculum» και γράφτηκε από τη Νίκλεια Ετεοκλέους, Το άρθρο εξετάζει πώς έφηβοι από διάφορες Μεσογειακές χώρες οργανώνουν δραστηριότητες μέσω του προγράμματος MYTecC και αποκτούν δεξιότητες επικοινωνίας και συνεργασίας.

Το πέμπτο άρθρο έχει τίτλο «Η Σύγχρονη Εκπαιδευτική Τεχνολογία στην υπηρεσία της Διαπολιτισμικής Παιδαγωγικής στο Δημοτικό Σχολείο για την Υπέρβαση των Κοινωνικών Στερεοτύπων και της Προκατάληψης» και γράφτηκε από τη Γεωργία Μούκα. Το άρθρο αναφέρεται στους τρόπους με τους οποίους η διαπολιτισμική εκπαίδευση και η εκπαιδευτική τεχνολογία μπορούν να συνεργαστούν και να στηρίξουν η μία την άλλη με την συνδυαστική ενεργοποίηση πολλών χαρακτηριστικών τους ώστε η παιδαγωγική διαδικασία να είναι μια διαδικασία συνεχούς αλληλεπίδρασης μεταξύ μαθητών και εκπαιδευτικού.

Στόχος του ΚΕΣΕΑ-ΤΠΕ είναι να καθιερωθεί το περιοδικό «X-Ray@Εκπαίδευση» ως ένα έγκυρο και επιστημονικό έντυπο το οποίο θα συμβάλλει στη διάχυση των γνώσεων στον τομέα των ΤΠΕ στον εκπαιδευτικό κόσμο του τόπου μας.

Από την Εκδοτική Επιτροπή

Computers as Mindtools for Engaging Critical Thinking and Representing Knowledge

David Jonassen
Professor of Education
University of Missouri Columbia
Jonassen@missouri.edu

Introduction

In this paper, I argue that technologies should not support learning by attempting to instruct the learners, but rather should be used as knowledge construction and representation tools that students learn with, not from. In this way, learners function as designers, and the computers function as Mindtools for helping learners to interpret and organize their personal knowledge.

Mindtools are computer applications that, when used by learners to represent what they know, necessarily engage them in critical thinking about the content they are studying (Jonassen, 1996). Mindtools scaffold different forms of reasoning about the conent that students are studying. That is, they require students to think about what they know in different, meaningful ways. For instance, using databases to organize students' understanding of content organization necessarily engages them in analytical reasoning, where creating an expert system rule base requires them to think about the causal relationships between ideas. Students cannot use Mindtools as learning strategies without thinking deeply about what they are studying.

Using Computers as Mindtools

Mindtools repurpose computer applications to engage learners in critical thinking. There are several classes of Mindtools, including semantic organization tools, dynamic modeling tools, information interpretation tools, knowledge construction tools, and conversation and collaboration tools (Jonassen, in press). I shall briefly describe and illustrate some of them. For a report of research on Mindtools, see Jonassen and Reeves (1996).

Semantic Organization Tools

Semantic organization tools help learners to analyze and organize what they know or what they are learning. Two of the best-known semantic organization tools are databases and semantic networking (concept mapping) tools.

Databases

Database management systems are omputerized record keeping systems that were developed originally to replace paper-based filing systems. These electronic filing cabinets allow users to store information in organized databases that facilitates retrieval. Content is broken down into records that are divided into fields that describe the kind of information in different parts of each record.

Databases can be used as tools for analyzing and organizing subject matter (i.e. Mindtools). The database shown in Figure 1 was developed by students studying cells and their functions in a biology course. The database can be searched and sorted to answer specific questions about the content or to identify interrelationships and inferences from the content, such as "Do different shaped cells have specific functions?" Constructing content databases requires learners to develop a data structure, locate relevant information, insert it in appropriate fields and records, and search and sort the database to answer content queries. A large number of critical thinking skills are required to use and construct knowledge-oriented databases

cell type	location	function	shape	related cells	specialization	tissue system	associated pr	related disea	other	growth
Astocyte	CNS	Supply	Radiating	Neurons,	Half of	Nervous			Neuroglia	No
Basal	Stratum	Produce New	Cube,	Epithelial	Mitotic	Epithelial		Cancer		Yes
Basophils	Blood	Bind Imm E	Lobed	Neutrophil,	Basic,Pos	Connectiv	Histamine,			No?
Cardiac	Heat	Pump Blood	Branched	Endomysi	Intercalate	Muscle	Actin,	Athroscler		No
Chondrobl	Cartilage	Produce	Round			Connectiv	Collagen		Chondroc	Yes
Eosinophil	Blood	Protazoans,	Two	Basophil,	Acid,	Connectiv				No
Ependyma	Line CNS	Form	Cube		Cilia	Nervous			Neuroglia	No
Erythrocyt	Blood	Transport O2,	Disc	Hemocyto	Transport	Connectiv	Hemoglobi	Sickle Cell	Reticulocyt	No
Fibroblast	Connectiv	Fiber	Flat,		Mitotic	Connectiv	Collagen,	Cancer?	Fibrocyte	yes
Goblet	Columnar	Secretion	Columnar	Columnar	Mucus	Epithelial				No
Keratinocy	Stratum	Strengthen	Round	Melanocyt		Epithelial	Keratin			No
Melanocyt	Stratum	U.V. Protection	Branched	Keratinocy	Produce	Epithelial	Melanin	Skin		Yes
Microglia	CNS	Protect	Ovoid	Neurons,	Macropha	Nervous			Neuroglia	No
Motor	CNS(Cell	Impulse Away	Long, Thin	Sensory	Multipolar,	Nervous			Efferent	No
Neutrophil	Blood	Inflammation,	Lobed	Basophils,	Phagocyto	Connectiv	Lysozyme			No
Oligodend	CNS	Insulate	Long	Neurons	Produce	Nervous		Multiple	Neuroglia	No
Osteoblast	Bone	Produce	Spider	Osteoclast	Bone	Connectiv	Collagen	Osteopor	Osteocyte	Yes
Osteoclast	Bone	Bone	Ruffled	Osteoblast	Destroy	Connectiv	Lysosomal	Osteopor		no
Pseudostr	Gland	Secretion	Varies	Goblet	Cilia	Epithelial				No
Satellite	PNS	Control	Cube	Schwann,	Chemical	Nervous			Nerogia	No
Schwann	PNS	Insulate	Cube	Neurons,	Form	Nervous		Multiple	Neuroglia	No
Sensory	PNS(Cell	Impulse to	Long, Thin	Motor	Unipolar,	Nervous	Neurotran		Afferent	No
Simple	Digestive	Secretion,	Columnar		Cilia	Epithelial				No
Simple	Kidney	Secretion,	Cube		Microvilli	Epithelial				No
Simple	Lungs,	Diffusion of	Flat	Basal,		Epithelial				No
Skeletal	Bone,	Movement,	Long	Neurons	Neuromus	Muscle	Actin,			No
Smooth	Organ	Movement	Disc	Endomysi	Gap	Muscle	Actin,			No
Stratified	Epithelial	Protection,	Columnar	Simple	Cilia	Epithelial				No
Stratified	Sweat,	Protection	Cube	Simple		Epithelial				No
Stratified	Lining	Protection	Layered	Basal		Epithelial	Keratin			No
T	Lymphoid	Cell Mediated	Round	B,T Cells	Antigen	Immune	Lymphokin	Autoimmu		No
T-	Lymphoid	Cell Mediated	Round	Helper T	Graft	Immune	Antigen,Pe	Autoimmu	Killer T	Yes
T-	Lymphoid	Cell Mediated	Round	Killer T, B	Stimulates	Immune	Lymphokin	Aids,		No
Transitiona	Uterus,	Stretches	Surface		Expansion	Epithelial				No

Figure 1. Content database.

Concept Mapping

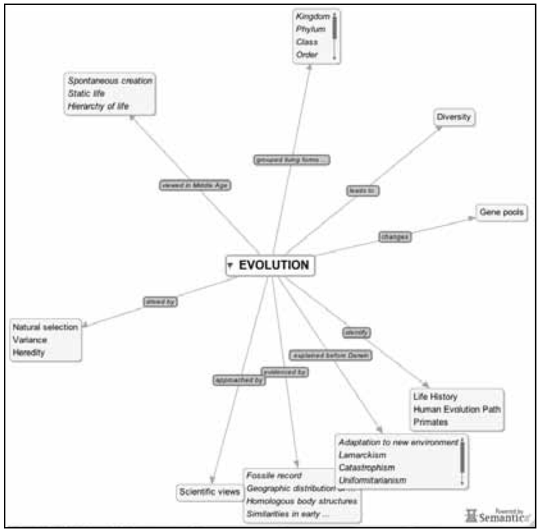
Concept mapping tools provide visual screen tools for producing concept maps. Concept mapping is a study strategy that requires learners to draw visual maps of concepts connected to each other via lines (links). These maps are spatial representations of ideas and their interrelationships that are stored in memory, i.e. structural knowledge (Jonassen, Beissner, & Yacci, 1993). Programs such as Semantica, Learning Tool, Inspriation, Mind Mapper, and many others, enable learners to interrelate the ideas that they are studying in networks of concepts, to label the relationships between those concepts, and to describe the nature of the relationships between all of the ideas in the network, such as one screen of a concept map on evolution in Figure 2.

Dynamic Modeling Tools

While semantic organization tools help learners to represent the semantic relationships among ideas, dynamic modeling tools help learners to describe the dynamic relationships among ideas. Dynamic modeling tools include spreadsheets, expert systems, systems modeling tools, and microworlds, among others.

Spreadsheets

Spreadsheets are computerized, numerical record keeping systems that were designed originally to replace paper-based, ledger accounting systems. Essentially, a spreadsheet is a grid or matrix of empty cells with columns identified by letters and rows identified by numbers. Each cell is a placeholder for values, formulas relating values in other cells, or functions that mathematically or logically manipulate values in other cells. Functions are small programmed sequences that may, for instance, match values in cells with other cells, look up a variable in a table of values, or create an index of values to be compared with other cells.



Spreadsheets were originally developed and are most commonly used to support business decision making and accounting operations. They are especially useful for answering "what if" questions, for instance, what if interest rates increased by one percent? Changes made in one cell automatically recalculate all of the affected values in other cells. Spreadsheets are also commonly used for personal accounting and budgeting. Spreadsheets can also be used to construct simulations, such as the batter simulation in Figure 3.

Expert Systems

Expert systems have evolved from research in the field of artificial intelligence. An expert system is a computer program that simulates the way human experts solve problems, that is, an artificial decision maker. They are computer-based tools that are designed to function as intelligent decision supports. For example, expert systems have been developed to help geologists decide where to drill for oil, bankers to evaluate loan application, computer sales technicians how to configure computer systems, and employees to decide among a large number of company benefits alternatives. Problems whose solutions require decision making are good candidates for expert system development.

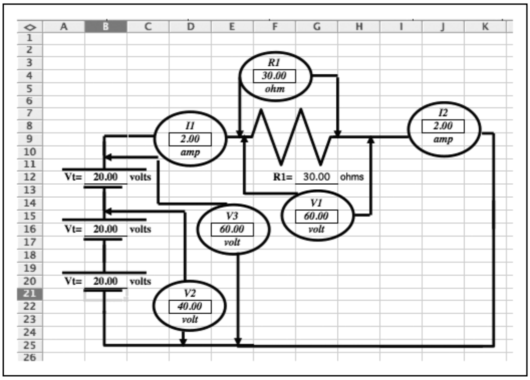


Figure 3. Spreadsheet simulation.

Most expert systems consist of several components, including the knowledge base, inference engine, and user interface. There are a variety of "shells" or editors for creating expert system knowledge bases, which is the part of the activity that engages the critical thinking. Building the knowledge base requires the learner to articulate causal knowledge.

The development of expert systems results in deeper understanding because they provide an intellectual environment that demands the refinement of domain knowledge, supports problem solving, and monitors the acquisition of knowledge. A good deal of research has focused on developing expert system advisors to help teachers identify and classify learning disabled students.

Systems Modeling Tools

Complex learning requires students to solve complex and ill-structured problems as well as simple problems. Complex learning requires that students develop complex mental representations of the phenomena they are studying. A number of tools for developing these mental representations are emerging. Stella, for instance, is a powerful and flexible tool for building simulations of dynamic systems and processes (systems with interactive and interdependent components). Stella uses a simple set of building block icons to construct a map of a process (see Fig. 4). The Stella model in Fig. 4 was developed by an English teacher in conjunction with his tenth grade students to describing how the boys' loss of hope drives the increasing power of the beast in William Golding's novel, The Lord of the Flies. The model of beast power represent the factors that contributed to the strength of the beast in the book, including fear and resistance. Each component can be opened up, so that values for each component may be stated as constants or variables. Variables can be stated as equations containing numerical relationships among any of the variables connected to it. The resulting model can be run, changing the values of faith building, fear, and memory of home experienced by the boys while assessing the effects on their belief about being rescued and the strength of the beast within them. Stella and other dynamic modeling tools, such as Model-It from the Highly Interactive Computing Group at the University of Michigan, probably provides the most complete intellectual activity that students can engage in.

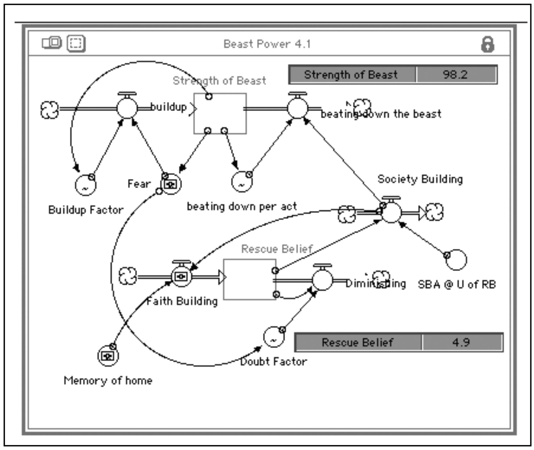


Fig. 4. Conceptual map of the Beast.

Visualization Tools

We take in more information through our visual modality than any other sensory system, yet we cannot output ideas visually, except in mental images and dreams, which cannot be shared visually except using paint/draw programs. While it is not yet possible to dump our mental images directly from our brains into a computer, a very new and growing class of visualization tools are mediating this process by providing us tools that allow us to reason visually in certain areas. Visualization tools help humans to represent and convey those mental images, usually not in the same form they are generated mentally, but as rough approximations of those mental images.

Visualization tools can have two major uses, interpretive and expressive (Gordin, Edelson & Gomez, 1996). Interpretive tools help learners view and manipulate visuals, extracting meaning

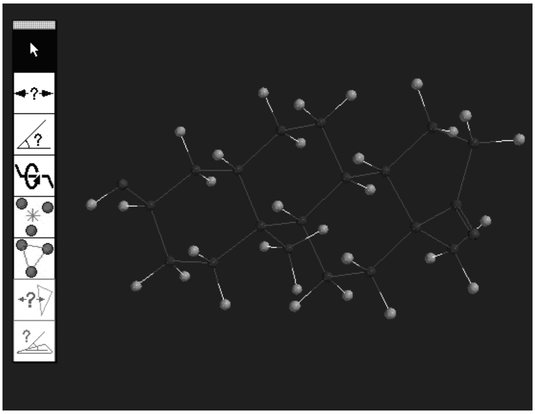


Fig 6. Tool for visualizing chemical compounds.

from the information being visualized. Interpretive illustrations help to clarify difficult-to-understand text and abstract concepts, making them more comprehensible (Levin, Anglin, & Carney, 1995). Expressive visualization helps learners to visually convey meaning in order to communicate a set of beliefs. Crayons and paper or paint and draw programs are powerful expressive tools that learners use to express themselves visually. However, they rely on graphical talent. Visualization tools go beyond paint and draw programs by scaffolding or supporting some of the expression. They help learners to visualize ideas in ways that make them more easily interpretable by other viewers. An excellent example of an expressive visualization tool is the growing number of tools for visualizing chemical compounds. Understanding chemical bonding is difficult for most people, because the complex atomic interactions are not visible. Static graphics of these bonds found in textbooks may help learners to form mental images, but those mental images are not manipulable and cannot be conveyed to others. Tools such as MacSpartan enables students to view, rotate, and measure molecules using different views (see Fig. 6) and also to modify or construct new molecules. These visualization tools make the abstract real for students, helping them to understand chemical concepts that are difficult to convey in static displays.

Rationales for Using Technology as Mindtools

Why do Mindtools work, that is, why do they engage learners in critical, higher-order thinking about content?

Learners as Designers

The people who learn the most from designing instructional materials are the designers, not the learners for whom the materials are intended. The process of articulating what we know in order to construct a knowledge base forces learners to reflect on what they are studying in new and meaningful ways. The common homily, "the quickest way to learn about something is to have to teach it," explains the effectiveness of Mindtools, because learners are teaching the computer. It is important to emphasize that Mindtools are not intended necessarily to make learning easier. Learners do not use Mindtools naturally and effortlessly. Rather, Mindtools often require learners to think harder about the subject matter domain being studied while generating thoughts that would be impossible without the tool. While they are thinking harder, learners are also thinking more meaningfully as they construct their own realities by designing their own knowledge bases.

Knowledge Construction, Not Reproduction

Mindtools represent a constructivist use of technology. Constructivism is concerned with the process of how we construct knowledge. When students develop databases, for instance, they are constructing their own conceptualization of the organization of a content domain. How we construct knowledge depends upon we already know, which depends on the kinds of experiences that we have had, how we have organized those experiences into knowledge structures, and what we believe about what we know. So, the meaning that each of us makes for an experience resides in the mind of each knower. This does not mean that we can comprehend only our own interpretation of reality. Rather, learners are able to comprehend a variety of interpretations and to use each in constructing personal knowledge.

Constructivist approaches to learning strive to create environments where learners actively participate in the environment in ways that are intended to help them construct their own knowledge, rather than having the teacher interpret the world and insure that students understand the world as they have told them. In constructivist environments, like Mindtools, learners are actively engaged in interpreting the external world and reflecting on their interpretations. This is not "active" in the sense that learners actively listen and then mirror the one correct view of reality, but rather "active" in the sense that learners must participate and interact with the surrounding environment in order to create their own view of the subject. Mindtools function as formalisms for guiding learners in the organization and representation of what they know.

Learning with Technology

The primary distinction between computers as tutors and computers as Mindtools is best expressed by Salomon, Perkins, and Globerson (1991) as the effects of technology versus the effects with computer technology. Learning with computers refers to the learner entering an intellectual partnership with the computer. Learning with Mindtools depends "on the mindful engagement of learners in the tasks afforded by these tools and that there is the possibility of qualitatively upgrading the performance of the joint system of learner plus technology." In other words, when students work with computer technologies, instead of being controlled by them, they enhance the capabilities of the computer, and the computer enhances their thinking and learning. The result of an intellectual partnership with the computer is that the whole of learning becomes greater than the sum of its parts. Electronics specialists use their tools to solve problems. The tools do not control the specialist. Neither should computers control learning. Rather, computers should be used as tools that help learners to build knowledge.

Cost and Effort Beneficial

Mindtools are personal knowledge construction tools that can be applied to any subject matter domain. For the most part, Mindtools software is readily available and affordable. Many computers come bundled with the software described in this paper. Most other applications are in the public domain or available for less than $100. Mindtools are also reasonably easy to learn. The level of skill needed to use Mindtools often requires limited study. Most can be mastered within a couple of hours. Because they can be used to construct knowledge in nearly any course, the cost and learning effort are even more reasonable.

Summary

Computers can most effectively support meaningful learning and knowledge construction in higher education as cognitive amplification tools for reflecting on what students have learned and what they know. Rather than using the power of computer technologies to disseminate information, they should be used in all subject domains as tools for engaging learners in reflective, critical thinking about the ideas they are studying. Using computers as Mindtools by employing software applications as knowledge representation formalisms will facilitate meaning making more readily and more completely than the computer-based instruction now available. This paper has introduced the concept of Mindtools and provided brief descriptions and some examples. More information and examples are available on the World Wide Web (http://www.ed.psu.edu/~mindtools/).

References

Carver, S.M., Lehrer, R., Connell, T., _ Ericksen, J. (1992). Learning by hypermedia design: Issues of assessment and implementation. Educational Psychologist, 27 (3), 385-404.

Derry, S.J., _ LaJoie, S.P. (1993). A middle camp for (un)intelligent instructional computing: An introduction. In S.P. LaJoie & S.J. Derry (Eds.), Computers as cognitive tools (pp. 1-14). Hillsdale, NJ: Lawrence Erlbaum Associates.

Gordin, D. N., Edelson, D. C., _ Gomez, L. (July, 1996). Scientific visualization as an interpretive and expressive medium. In. D. Edelson & E. Domeshek (Eds.), Proceedings of the Second International Conference on the learning Sciences (pp. 409-414). Charlottesville, VA: Association for the Advancement of Computers in Education.

Harris, J. (1995, February). Organizing and facilitating telecollaborative projects. The Computing Teacher, 22 (5), 66-69. [Online document: http://www.ed.uiuc.edu/Mining/February95-TCT.html]

Jonassen, D.H. (1996). Computers in the classroom: Mindtools for critical thinking. Columbus, OH: Merrill/Prentice-Hall.

Jonassen, D.H. (in press). Mindtools for engaging critical thinking in the classroom, 2nd Ed. Columbus, OH: Prentice-Hall.

Jonassen, D.H., Beissner, K., _ Yacci, M.A.

(1993). Structural knowledge: Techniques for representing, assessing, and acquiring structural knowledge. Hillsdale, NJ: Lawrence Erlbaum Associates.

Jonassen, D.H., Peck, K.L., _ Wilson, B.G. (1998). Learning WITH technology: A constructivist perspective. Columbus, OH: Prentice-Hall.

Jonassen, D.H., _ Reeves, T. C. (1996). Learning with technology: Using computers as cognitive tools. In D.H. Jonassen (Ed.), Handbook of research for educational communications and technology (pp. 693-719). New York: Macmillan.

O'Neill, D. K., _ Gomez, L. M. (1992). The Collaboratory notebook: A distributed knowledge building environment for project learning. Proceedings of ED MEDIA, 94. Vancouver B. C., Canada.

Perkins, D.N. (1986). Knowledge as design. Hillsdale, NJ: Lawrence Erlbaum.

Salomon, G. , Perkins, D.N., _ Globerson, T. (1991). Partners in cognition: Extending human intelligence with intelligent technologies. Educational Researcher, 20(3), 2-9.

Yerulshamy, M., _ Schwartz, J. (1986). The geometric supposer: Promoting thinking and learning. Mathematics Teacher, 79, 418-422.

Engaging and Supporting Problem Solving

David Jonassen
Curators' Professor
University of Missouri
Jonassen@missouri.edu

Problems are everywhere. Our personal and professional lives are filled with problems to solve. For example, teachers are problem solvers. How do I get my students to be more interested in what I teach? How do I control students' behavior? How shall I teach this lesson? How to I get the technology to work? Which is the best route to drive to school? How do I prevent the principal from criticizing me? What shall we make for supper this evening? What do I have to do in order to attract recognition from the principal? We are deluged with problems every day. In his book of essays, Karl Popper (1999) averred, "All life is problem solving." Unfortunately, we have rarely been taught how to solve problems, especially the kinds of problems that are encountered in daily and professional lives.

Problems are everywhere, yet those problems differ. Problems and problem solving vary in several ways. First, problems vary from well-structured ill-structured problems (Jonassen, 1997, 2000). Most problems encountered in schools are well-structured problems. Well-structured problems typically present all elements of the problem; engage a limited number of rules and principles that are organized in a predictive and prescriptive arrangement; possess correct, convergent answers; and have a preferred, prescribed solution process.

Ill-structured problems, on the other hand, are the kinds of problems that are encountered in everyday practice. Ill-structured problems have many alternative solutions to problems; vaguely defined or unclear goals and constraints; multiple solution paths; and multiple criteria for evaluating solutions; so they are more difficult to solve.

Problems also vary in complexity. The complexity of a problem is a function of the breadth of knowledge required to solve the problem, the level of prior knowledge, the intricacy for the problem-solutions procedures, and the relational complexity of the problem (number of relations that need to be processed in parallel during a problem solving process) (Jonassen & Hung, 2009). Ill-structured problems tend to be more complex, however, there are a number of highly complex well-structured problems, such as chess.

Problems also vary between static and dynamic problems. In dynamic problems, the relationships among variables or factors change over time. Changes in one factor may cause variable changes in other factors that often substantively changes the nature of the problem. The more intricate these interactions, the more difficult it is any solution. Ill-structured problems tend to be more dynamic than well-structured problems that tend to be static.

Based on the differences in problems (structuredness, complexity, and dynamicity), Jonassen (2000) described a typology of problems. Each kind of problem calls on a different set of processes for their solution. Some of these problem types are described in Figure 1 and below.

Story problems:

Story problems are the most commonly encountered problems in formal education. From elementary mathematics through graduate level courses in dynamics, textbook chapters present story problems. Story problems include elementary combine, cause/change, or compare problems in math (Joe has 3 marble; Jane gave him three more; how many does he have); calculating resistance given voltage and amperage; calculating reagents needed to form a specific precipitate in a chemical reaction; or calculate interest accrued on a savings account. They usually take the form of embedding the values needed to solve an algorithm into a brief narrative or scenario. In order to meaningfully solve story problems, learners must construct and access a problem schema and apply that schema to the current problem. If they access the correct schema, the solution procedure is usually embedded within that schema. However, numerous difficulties occur when students extract the values from the narrative, insert them into the correct formula, and solve for the unknown quantity because they focus too closely on surface features of the problems.

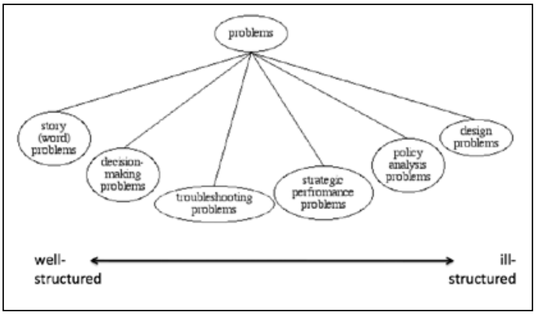


Figure 1. Kinds of problems.

Decision-Making Problems.

Decision-making problems are usually constrained to decisions with a limited number of solutions. For instance, do we move in order to accept a promotion? Which health plan do we select? Which school is best for my children? Though these problems have limited number of solutions, the number of factors to be considered in deciding among those solutions as well as the weights assigned to them can be very complex. Decision problems usually require comparing and contrasting the advantages and disadvantages of alternate solutions. Decisions are justified in terms of the weight those factors. More recent research has demonstrated the role of story construction in helping people make decisions. Rather than weighing alternatives, people often construct scenarios about possible outcomes, choosing the preferred scenario.

Troubleshooting problems:

Troubleshooting is one of the most commonly accepted forms of everyday problem solving. Maintaining automobiles, aircraft, or any complex systems requires troubleshooting skills. Debugging computer program requires troubleshooting. The primary purpose of troubleshooting is fault state diagnosis. That is, some part of a system is not functioning properly, resulting in a set of symptoms that have to be diagnosed and matched with the user's knowledge of various fault states. Troubleshooters use symptoms to generate and test hypotheses about different fault states.. In addition to procedural knowledge of the process, troubleshooting also requires conceptual knowledge of the system, strategic knowledge of when to use tests and methods, and hypothesis generation and testing are also required. Later in this chapter, I will briefly demonstrate an architecture for representing and supporting meaningful troubleshooting online.

Strategic performance:

Strategic performance entails complex activity structures in a real-time environment, where the performers apply a number of tactical activities to meet a more complex and ill-structured strategy while maintaining situational awareness. In order to achieve the strategic objective, such as teaching in a classroom or quarterbacking a professional football offense, the performer applies a set of complex tactical activities that are designed to meet strategic objectives. Pursuing strategies through tactical activities requires applying a finite number of tactical activities that have been designed to accomplish the strategy. However, an expert tactical performer is able to improvise or construct new tactics on the spot to meet the strategy. Those adjustments are contextually constrained. In face-to-face education, students are usually taught the prerequisite skills but not how to engage and regulate them in real time. That skill requires real-time simulations that are difficult to provide in both face-to-ace and online instruction.

Policy Analysis Problems.

Case problems are complex, multi-faceted situations. What makes these problems difficult to solve is that it is not always clear what the problem is. Because defining the problem space is more ambiguous, these problems are more ill-structured. These are the most common types of problem solved in professional contexts. Case problems require the solver to articulate the nature of the problem and the different perspectives that impact the problem before suggesting solutions (Jonassen, 1997). They are more contextually bound that any kind of problem considered so far. That is, their solutions rely on an analysis of contextual factors. Solving business problems, including planning production, are common case problems. Deciding production levels, for instance, requires balancing human resources, technologies, inventory, and sales Classical situated case problems also exist in international relations, such as ".... given low crop productivity in the Soviet Union, how would the solver go about improving crop productivity if he or she served as Director of the Ministry of Agriculture in the Soviet Union" (Voss & Post, 1988, p. 273). International relations problems involve decision making and solution generation and testing in a political context. Justifying decisions is among the most important processes in solving case problems.

Design problems:

Among the most ill-structured but meaningful problems are design problems. Whether designing instruction, an electronic circuit, a bicycle that flies, a marketing campaign for new Internet company, or any other product or system, designing requires applying a great deal of domain knowledge with a lot of strategic knowledge resulting in an original design. What makes design problems so ill-structured is that there are seldom clear criteria for evaluating success. The client either likes or hates the result but cannot articulate why. Therefore skills in argumentation and justification help designers to rationalize their designs. Although designers always hope for the best solution, the best solution is seldom ever known. Also, most design problems are complex, requiring the designer to balance many needs and constraints in the design and the clients. Despite the difficulties, design problems are among the most common in professional practice. Virtually every engineer, for example, is paid to design products, systems, or processes.

How to Teach Problem Solving

In my theory of problems solving, learning to solve problems requires working through a combination of cases and cognitive strategies (see Figure 2).

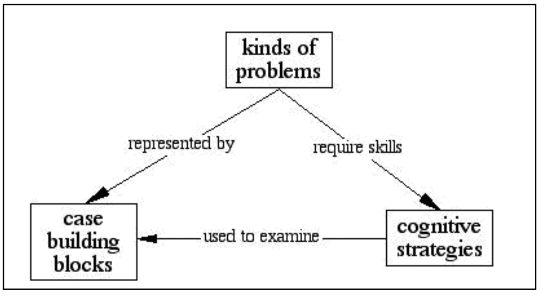


Figure 2. Components of problem-solving learning environments.

These are assembled into problem-solving learning environments (PSLEs). The primary building blocks of PSLEs are various cases (examples) that differ in terms of how they function (see Figure 3).

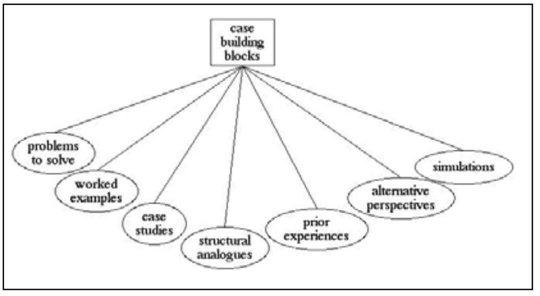


Figure 3. Case components of problem-solving learning environments.

PSLEs start with a problem to solve. Problem cases provide background information, contextual information, and instructional supports to help student generate and test different solutions to the problem presented. Cases as problems to solve have many instantiations in practice, including anchored instruction, goal-based scenarios, and problem-based learning.

The most direct approach to creating PSLEs is to provide examples. Cases as worked examples are instructional devices that typically include the problem statement and a procedure for solving the problem for showing how other problems may be solved (Atkinson, Derry, Renkl, & Wortham. 2000). Worked examples that focus on problem type and sub-procedures involved in the process are cognitively very demanding. They are useful for helping students to solve well-structured problems.

Case studies provide examples of how to solve ill-structured problems. In case studies, students study an account (usually narratives from one to 30 pages) of a problem that was previously experienced. Frequently guided by questions, students analyze the situation and processes and evaluate the methods and solutions. This analysis is usually ex post facto. In most case studies, students are not responsible for solving the problems, only analyzing how others solved the problems and engaging in what-if thinking. Case studies are stimuli for discussions. The goals of the case study method are to embed learning in authentic contexts that requires students to apply knowledge rather than acquire it.

One of the most effective ways to learn to solve problems is to examine similar problems for their structure and their solutions. There are two theoretical approaches to using cases as analogues: analogical encoding and case-based reasoning. The former is a process of analogical encoding. Analogical encoding is the process of mapping structural properties between multiple analogues. Rather than attempting to induce and transfer a schema based on a single example, comprehension, schema inducement, and long term transfer across contexts can be greatly facilitated by analogical encoding, comparison of two analogues for structural alignment.

Another way of using cases to support problem solving is by analogy with a prior experience to the source problem. Problem solving consists of finding the nearest case in an organized library of annotated problem cases and reusing or adapting it. When a new problem is encountered, most humans attempt to retrieve cases of previously solved problems from memory in order to reuse the old case. If the solution suggested from the previous case does not work, then the old case must be revised (Jonassen & Hernandez-Serrano, 2002). When either solution is confirmed, the learned case is retained for later use. Case-based reasoning is based on a theory of memory in which episodic or experiential memories in the form of scripts.

Ill-structured problems tend to be more complex than well-structured problems because multiple perspectives on the problem and its solutions exist. Based on cognitive flexibility theory (Spiro, Coulson, Feltovich, & Anderson, 1988), perspectives and thematic representations of content are presented to convey the underlying complexity of the problem. When students examine the problem from these multiple perspectives, they learn about which perspectives must be accommodated in the solution.

Finally, learners in many PSLEs use simulations of practice to try out their solutions. Simulations allow students to make mistakes with harm to anyone.

Cognitive Strategies in Problem Solving

In order to learn how to solve problems, students must use a number of cognitive strategies (see Figure 4).

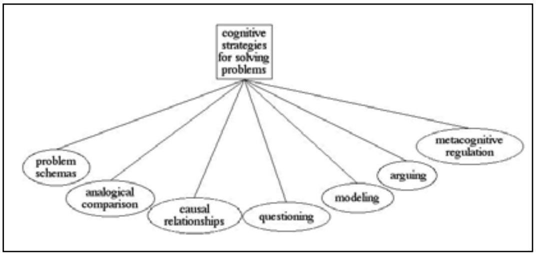


Figure 4. Cognitive strategies required to solve problems.

Constructing robust problem schemas is important to learning to solve problems in any domain. Problem solvers construct their understanding of a problem by arranging the structural and generic propositions of the text into coherent conceptual model. Robust problem schemas include situational and structural attributes of the problem as well as the procedures for solving the problem (should they exist).

As indicated earlier, analogical comparison of problems can facilitate learning how to solve them. The process is known as analogical encoding.

The most important cognitive strategy in solving problems is causal reasoning. Understanding the causal relationships that make up a problem is essential for learning how to solve any kind of problem. Causal relationships enable problem solvers to make predictions (hypotheses), inferences (diagnosis), implications (possibilities), and explanations. Causal relationships may be directly taught using influence diagrams (causal maps) or inferred from simulations or questions.

Questioning is the primary method used to prompt student understanding. In order to support problem solving, you should question learners about causal relationships or whatever other kind of property students need to learn. The goal of using questions is to get students to generate their own questions. The ability to ask deep level questions is also essential to problem solving.

Students may also use a variety of tools to construct models of problems. The method that I promote is the use of Mindtools (see other paper in this issue).

An essential skill for assessing students' understanding and ability to solve ill-structured problems is argumentation. Students need to be able to construct arguments in support of their solutions. Their arguments must also anticipate counter-arguments and be able to rebut them.

Finally, students need to learn how to regulate their problem-solving activities. Metacognition includes not only student's awareness of the requirements of the problem and their own skill but also the ability to regulate their learning activities.

Summary

The model proposed in this paper is suggested as a model for designing problem-solving learning environments. The permutation of problems, cases, and cognitive strategies suggests the need for hundreds of studies to demonstrate the effectiveness of different components in problem-solving learning environments.

References

Atkinson, R., Derry, S. J., Renkl, A. _ Wortham, D. (2001). Learning from examples: Instructional principles from the worked examples research. Review of Educational Research, 70, 181-215.

Jonassen, D.H. (1997). Instructional design model for well-structured and ill-structured problem-solving learning outcomes. Educational Technology: Research and Development 45 (1), 65-95.

Jonassen, D.H. (2000). Toward a design theory of problem solving. Educational Technology: Research & Development, 48 (4), 63-85.

Jonassen, D.H., _ Hung, W. (2009) All problems are not equal: Implications for PBL. International Journal of Problem-Based Learning.

Jonassen, D.H. _ Hernandez-Serrano, J. (2002). Case-based reasoning and instructional design: Using stories to support problem solving. Educational Technology: Research and Development, 50 (2), 65-77.

Spiro, R., Coulson, R., Feltovitch, P., _ Anderson, D. (1988). Cognitive flexibility theory: Advanced knowledge acquisition in ill-structured domains. Paper presented at the The Tenth Annual Conference of the Cognitive Science Society, Hillsdale, NJ.

Voss, J.F., _ Post, T.A. (1989). On the solving of ill-structured problems. In M.T.H. Chi, R. Glaser, & M.J. Farr (Eds.), The nature of expertise. Hillsdale, NJ: Lawrence Erlbaum Associates.

Computer-based concept mapping in the learning process: an instructional and assessment tool for designing and concretizing an innovative course

Andreanna K. Koufou
Department of Educational Science and Early Childhood Education, University of Patras
Greece, A.Koufou@upatras.gr

Georgios Koutromanos
Faculty of Primary Education, National and Kapodistrian University of Athens
Greece, koutro@math.uoa.gr

Marida I. Ergazaki
Department of Educational Science and Early Childhood Education, University of Patras
Greece, ergazaki@upatras.gr

Vasilis I. Komis
Department of Educational Science and Early Childhood Education, University of Patras
Greece, komis@upatras.gr

Vasiliki P. Zogza
Department of Educational Science and Early Childhood Education, University of Patras
Greece, zogza@upatras.gr

Abstract

Concept maps are a cognitive tool variously used in the learning process, traditionally structured by pen and paper. Easily accessible and apprehensible concept mapping software offers the capability to be structured in a computer-supported environment, which enhances collaborative learning among students and simplifies matters related to classroom restrictions. The following paper presents the use of computer-based concept mapping as an instructional and assessment tool through the design, concretization, and evaluation of a course that took place in real classroom conditions with nine-year-old students. The study aims to highlight the ways in which concept maps are able to help the learning process by revealing students' conceptual representations before instruction and by functioning as an assessment tool capable of providing constant feedback to the instructor.

Keywords

Concept maps, concept mapping software, computer-supported learning, collaborative learning, instructional tool, assessment tool, conceptual representations.

1. Introduction

Concept maps are based on the theory of constructivism. In a constructivist frame, a person develops cognitive models that serve future thinking or acting. The process of knowledge construction depends on our conceptual representations. Effective learning means structuring new knowledge models by using, expanding, revising, or erasing the pre-existing representations. Thus, the study of representations is crucial in designing appropriate educational environments.

Concept maps are able to present a student's knowledge structure before teaching as well as during various phases of a course, thus providing opportunities for specialized curriculum planning, and constant evaluation and self-evaluation for both the student and the teacher.

Concept mapping software is a cognitive tool that enables students to construct concept maps. A good software makes the construction, revision, and storage of a map easier. Authors also point out that the advantages of a computer-based concept map extend beyond practical matters. It is possible that computer-based concept mapping helps the "reorganization of conceptual functions" in a way that is not possible without its use [1]

The use of concept maps in a classroom has to be accompanied by other strategies such as collaborative learning. Many researchers point out that this procedure creates social and conceptual conflicts between students, which are useful for learning [63, 64].

2. Theoretical Framework

Contemporary psychological approaches in learning and science didactics create a new, common base for the design and concretization of various subjects. Nowadays the concept that the learning process cannot be concretized without taking into consideration the conceptual representations of students and the process of knowledge construction is becoming more and more acceptable. Thus, learning is not a process of collecting, acquiring, or transferring knowledge. On the contrary, it is possible only with the conceptual contribution of the person that learns, and it takes place when the exploration of the student reveals inconsistencies between current representations and experience. In such case, the student tends to change his/her conceptual model, not necessarily in order to replace it with the objectively right but with the viable [2]. Therefore, the starting point of learning is what a person knows or ignores before teaching.

Often, traditional teaching slightly affects the conceptual representations of a student not only after a course but even in adulthood [3] because conceptual representations are disregarded during teaching. It is clear that a teaching course based on constructivism has to study the conceptual representations of students in order to exploit them, if they are according to a scientific model, or to reconstruct them, if they are conceptual obstacles, through the creation of conceptual conflict learning conditions [4].

Concept maps are a cognitive tool variously used in the learning process. They were first presented by Novak and Gowin [5, 6, 7, 8] and are based on the theories of Ausubel [9]. They are a popular way to represent knowledge [6, 10, 11] and to reveal the representations of the person that takes part in the learning process [12, 13]. A concept map consists of concepts and links. The links represent the relations among concepts, and can be labelled as oriented or not. Linked concepts form propositions.

Concept maps have been used in the study of physics [39, 40], chemistry [41, 19], ecology and environmental education [42, 43], biology [44, 45, 46, 47, 48, 49, 50], history [51], astronomy [52], veterinary medicine [53], engineering [54], literature [55, 56], geology [57], and mathematics [58, 59]. More recently, concept maps have been adapted for use in business settings [8].

Concept maps have been used with elementary students [60], middle school students [61, 52], high school students [62], and college students [46], including teacher education students [24].

In detail, concept mapping is used:
(a) As a heuristic for developing science curriculums [14]. Concept maps have been used in the study of the existing conceptual representations before teaching in order to design a proper course.
(b) As cognitive tools towards meaningful learning [15, 16, 17, 18]. Concept maps as cognitive tools assist students in clarifying their understanding and making explicit connections between concepts [19]. By involving them in

the analysis of the structural relations of the subject [12] and in the procedure of their organization in hierarchically higher schemes, students also learn about their knowledge structures. In this way, knowledge becomes more effective [20, 21], the student's memory and ability to use knowledge in other conditions is enhanced [12], and his/her understanding is improved [22]. Thus, concept maps can serve as meta-cognitive tools that will urge students towards meaningful learning [8].

(c) As an instructional tool [23, 24]. Educators have found concept maps useful in assessing students' prior knowledge, identifying gaps in student knowledge, helping teacher education students identify key concepts to target in their teaching, and determining the extent and quality of new connections students are able to make after instruction [24].

Concept maps measure aspects of learning that conventional tests do not measure particularly well. For example, concept mapping can provide information about students' misconceptions and incorrect conceptions, which are usually unavailable in conventional tests [25, 26]. For instance, researchers found that their students had confused 'salamander' and 'lamprey.' The researchers were able to find a possible flaw in their curriculum (lack of specimens of these species for students to examine, in contrast to other species for which specimens were available) with the aid of their students' concept maps [26]. Additionally, concept mapping allows the evaluation of the learning process and the teaching method as both are taking place and not only after their end, as usually happens with traditional evaluation tests. Therefore, the teacher is able to change or enhance his/her teaching strategies during a course when problems are revealed in the knowledge construction.

A crucial aspect of the teaching process is the assessment of the students' conceptual development. The traditional tests that are conducted after teaching do not allow a complete view of how students construct knowledge during teaching and do not reveal possible misconceptions. The use of concept maps as a tool for assessment, whether structural, relational, or a combination of both, originated in their qualitative characteristics. Despite the concerns about the scoring systems, and associated validity and reliability, concept mapping is generally considered a promising method.

The use of concept maps in the classroom has to be accompanied by other strategies such as collaborative learning. Collaborative learning as a teaching strategy is a transition from the individual, Piagetian theories to the wider, social, Vygotskian ones. Many researchers were involved with collaboratively constructed computer-based concept maps. They point out that this procedure creates social and conceptual conflicts between students, which are useful for learning [63, 64].

Finally, a concept mapping software makes the construction and revision of concept maps easier. In addition, their storage in digital format makes it possible for the maps to be distributed through computer networks, the Internet, and publishing through Web sites. Of great importance is the use of computer-based concept mapping by people with learning disabilities, particularly those who cannot read or process written information sources. The visualization that the diagrammatic form of a concept map offers also provides a great alternative for students with oral disabilities [1, 65].

There are many rubrics on concept map assessment suggested in the literature, usually depending on how the map was generated. If the user freely identifies concepts they feel are related to the subject, then the assessment may be either structural or relational. A structural, quantitative assessment assigns weighted scores to graph characteristics such as number of concepts, links, cross-links, and hierarchical levels; not all scoring systems take all the components into consideration [6]. A relational, qualitative assessment is done by comparing the map to an expert map in order to evaluate more qualitative characteristics and scores the overlap between them. This strategy assumes that there is some ideal organization that best reflects the structure in a domain. scores the overlap between them [38].

A quantitative assessment can be objectively calculated but does not take into consideration the quality of concepts, links, and propositions. A qualitative assessment is more subjective; however, it may have an advantage over structural methods when dealing with complex maps because it emphasizes map correctness and overall quality. Both quantitative and qualitative assessments can reveal valuable information about the process of understanding as well as the ability to reveal changes in understanding over time [53, 66].

3. Methodology

3.1 Objectives of the study

This study aims to highlight the use of concept maps as an instructional and assessment tool. We are particularly interested in how concept maps are able to help the learning process by revealing students' conceptual representations before instruction and by functioning as an assessment tool capable of providing constant feedback to the instructor.

Thus, the objectives of the study are:
1. To highlight the use of concepts maps as a way to enlighten the conceptual representation of a student.
2. To highlight the necessity of basing the design of an educational environment on the study of conceptual representations.
3. To highlight the advantages of the use of concept maps as an assessment tool relative to traditional evaluation tests.
4. To highlight the advantages of computer-supported concept mapping in real classroom conditions.

The following sections present the design and concretization of an innovative course using computer-based concept maps in a collaborative learning environment, with the participation of nine-year-old students in a Greek elementary school.

3.2 Research participants, settings, and concept mapping software

The research took place in real classroom conditions. Thirteen nine-year-old students, six (6) girls and seven (7) boys, participated in the study. Groups were formed by mixing genders, computer skills, and school performance criteria. The subject of the course was Nutrition. The students named their groups Calcium, Ferrum, and Carbohydrates.

Every group used a computer, in which concept maps were constructed and reconstructed before and after various phases of instruction. The class teacher was also the researcher.

A free concept mapping software named "ModellingSpace" was used. This was developed by the University of Patras in collaboration with the Aegean, Angers, Lisbon, Mons-Hainaut, and SclumbergerSema Universities (www.modellingspace.net).

The research started with the study of conceptual representations as they appeared in the concept maps structured by the students before teaching. Then, a course was designed, taking into consideration these representations.

During the course, the students constructed, revised, and reconstructed their maps after various phases of the teaching process. The maps, which were collected after every phase of instruction, were studied immediately using a combination of structural and relational assessment protocols in order to provide immediate feedback to the instructor about the effects of the instruction on the conceptual structures of students so that he/she can modify the educational environment accordingly.

In other words, when the knowledge construction tended to adopt the scientific model presented in the course, the original design was maintained. However, when misconceptions or a lack of structure was detected, the teaching strategies were enhanced or altered.

4 Results: Concept Map Assessment

4.1 Conceptual representations

The study of conceptual representations used concept maps structured by the students before teaching. The results of the map analysis that directed the course design follows and are compared with the results of other research on nutrition [67]:

The students' representations about food is related to the concepts "body" (Figures 1 and 2) and "health" (Figure 3), but there is no evidence about the kind of relation between the two. The students know that some foods are more beneficial to the body than others, but they ignore the reasons why this is so (Figures 1, 2, and 3). They have heard of food components such as calcium, ferrum, and carbohydrates, and thus named their groups after them, but they do not really understand how food is made up of these components and how the human body uses them (Figures 1, 2, and 3). Food is related to strength (Figure 1), health (Figure 3), and human body functions (Figure 2), but not to energy.

The analysis of the students' conceptual representations revealed a number of conceptual obstacles, which led to the selection of the teaching objectives presented below:

a. To structure the knowledge about the origin of food and its categories.
b. To distinguish the food groups.
c. To understand that food consists of components.
d. To structure the knowledge about the main food components and their contribution to an organism.
e. To structure the knowledge about the process of digestion.

4.2 Studying the knowledge structure process

4.2.1 Existence of strong or deficient pre-model

The evaluation of the concept maps structured during the course marked out important aspects of the learning process:

Students with a strong conceptual model before teaching (Figure 1), whether scientifically oriented or not, do not easily abandon it. On the contrary, they try to adjust their school knowledge to fit into their conceptual model (Figure 4).

Students with a deficient conceptual model before teaching try to replace it with school knowledge, but not always successfully (Figure 5).

4.2.2 Successful knowledge structure

In cases of successful knowledge structures, maps appear structural and conceptual in development, as they appear in the concept maps structured before instruction (Figure 1), after the first phase of instruction (Figure 6), and in the final phase (Figure 7) in group Calcium. In addition, a successful knowledge structure is revealed by the study of concept maps structured before instruction (Figure 3), after the concretization of the first two objectives of the didactic approach (Figure 5), and in the final phase (Figure 8) in group Carbohydrates.

4.2.3 Misconceptions and unsuccessful knowledge structure

In cases of misconceptions and unsuccessful knowledge structures, if there are no other external problems, such as lack of collaboration among group members, difficulties with the software, etc., then the teaching strategies need to be enhanced or changed.

More specifically, the first map after instruction in group Calcium generally reveals the adoption of the scientific model regarding food origin and categories presented in the course. However, the fact that they defined eggs and poultry as different categories, and thus different concepts, reveals a misconception and gives feedback to the instructor so that he/she can enhance the teaching strategies in this field (Figure 9).

In addition, the final concept map of group Calcium presents organism and body as two different concepts. It could be that the students distinguished organism from body by connecting organism to the inner organs of the body, such as the heart and the lungs, and body to external activities, such as movement. In other words, in this area there is a misconception that the instructor has to deal with.

The final concept map of group Carbohydrates also reveals that students consider beans as belonging to the food category cereals (Figure 8).

Finally, the concept map of the group Ferrum, after the concretization of the four objectives of the didactic approach (c.f. paragraph 4.1), reveals an unsuccessful knowledge structure by not referring to "poultry" as the third sub-concept of the concept "meat."

5 Conclusions - Future Perspectives

In accordance with the above research activity, the following conclusions are presented:

The study of conceptual representations is necessary in order to set a didactical approach, and concept mapping is an effective cognitive tool towards this direction.

Designing an educational environment can be a continuous process due to the feedback provided by the concept maps that students construct during instruction. Thus, concept maps can serve as assessment tools that are free from the restrictions of final evaluation tests.

Concept mapping software can facilitate the adoption of concept mapping in everyday classroom settings due to the easy construction, revision, reconstruction, digital storing, and distribution of concept maps that it offers.

During the research, the possibility of studying the kind of interaction that takes place between individuals, among the members of a group, and within the group itself during the knowledge construction process was raised. In other words, it might be possible to study individual knowledge construction in comparison with group knowledge construction using concept maps.

In addition, questions were raised about the choice of the more appropriate assessment protocol in order to evaluate concept maps accurately and, at the same time, without overlooking their qualitative characteristics.

Appendix

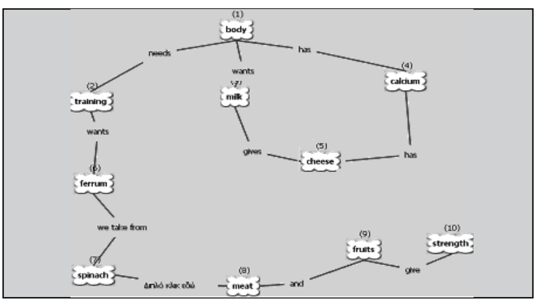


Fig. 1: Concept map before teaching group ''Calcium''

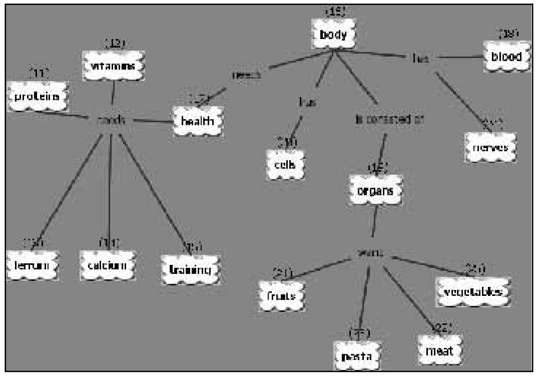


Fig. 2: Concept map before teaching group ''Ferrum''

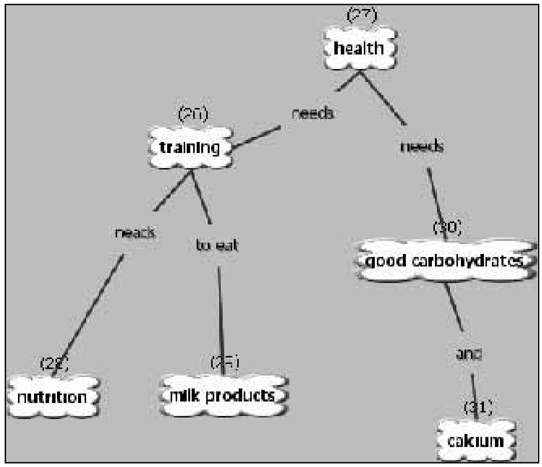


Fig. 3: Concept map before teaching, group ''Carbohydrates''

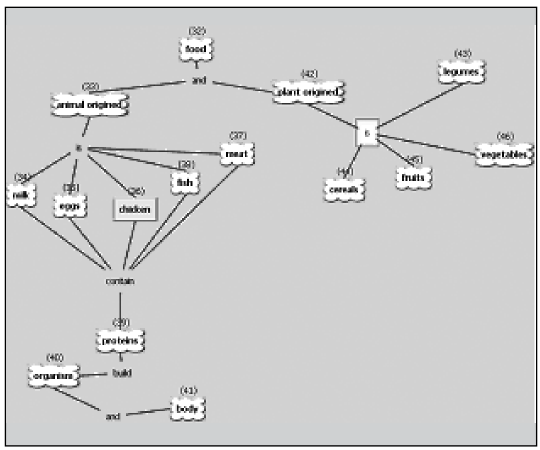


Fig. 4: Concept map after the materialization of the three objectives, group ''Calcium''

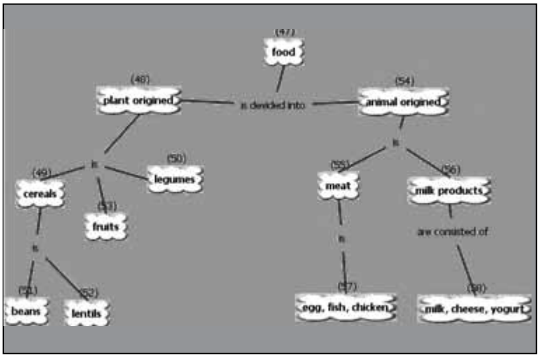


Fig. 5: Concept map after the materialization of the two first objectives, group ''Carbohydrates''

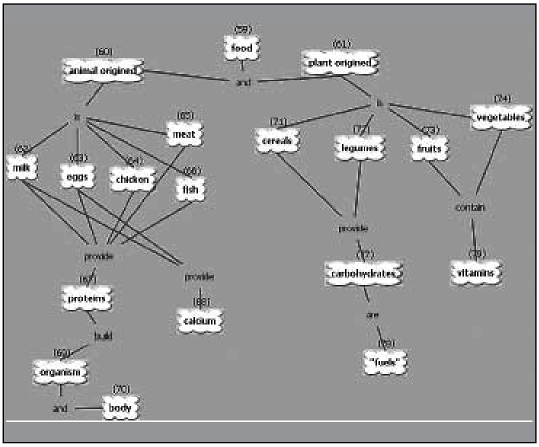


Fig. 6: Concept map after the materialization of the two first objectives, group ''Calcium''

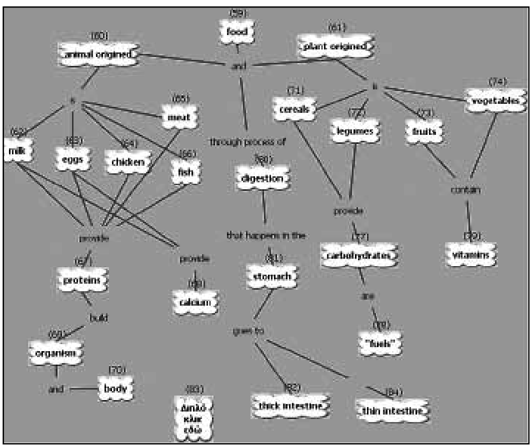


Fig. 7: Final concept map, group ''Calcium''

References

References

[1] **Anderson-Inman, L., Ditson, L. and Ditson, M. (1998):** Computer-based concept mapping: Promoting meaningful learning in science for students with disabilities. Information Technologies and Disabilities Journal Special K-12 issue V05N1-2, article 2.

[2] **Von Glasersfeld, E. (1990):** An exposition of constructivism: Why some like it radical. In Constructivist views on the teaching and learning of mathematics.19-29. Davis, R.B., Maher C.A. And Noddings, N. (eds). Reston, Virginia, National Council of Teachers of Mathematics.

[3] **Viennot, L., (1979):** Spontaneous reasoning in elementary dynamics, European Journal of Science Education 9(1):205-221.

[4] **Ravaniw, K., (2003):** Introduction to Physics Didactics, Athens, New Technologies Publications, In Greek.

[5] **Novak, J. D. (1977):** A theory of education. Ithaca, NY, Cornell University Press.

[6] **Novak, J. D. and Gowin, D. (1984):** Learning How to Learn. New York, Cambridge University Press.

[7] **Novak, J. D. (1990):** Concept mapping: a useful tool for science education. Journal of Research in Science Teaching 27(10/12): 937-950.

[8] **Novak, J. D. (1998):** Learning, creating and using knowledge: Concept maps as facilitative tools in schools and corporations. Mahwah, NJ, Lawrence Erlbaum.

[9] **Ausubel, D. (1968):** Educational psychology: A cognitive view. Holt: Rinehart & Wilson.

[10]. **McAleese, R. (1994):.** A Theoretical view on concept mapping. ALT 2(2):38-48.

[11] **Fisher, K.M., Wandersee, J. H., and Moody, D. (2000).** Mapping Biology Knowledge, Boston: Kluwer Academic.

[12] **Jonassen, D. and Marra, R., M. (1994):** Concept mapping and other formalisms as mind tools for representing knowledge. ALT-J 2:50-56.

[13] **Fisher, K.M. (1990).** Semantic networking: The new kid on the block. Journal of Research in Science Teaching, 27, 1001-1018.Starr 1990
[14] **Starr, M. L. and Krajcik, J. S. (1990).** Concept maps as a heuristic for science curriculum development: Toward improvement in process and product. Journal of Research in Science Teaching, 27, 987-1000.

[15] **Cliburn, J.W., Jr. (1990).** Concept maps to promote meaningful learning. Journal of College Science Teaching, 19 (4), 212-217

[16] **Heinze-Fry and J.A., Novak, J.D. (1990).** Concept mapping brings long-term movement toward meaningful learning. Science Education, 74, 461-472.

[17] **Roth, W.M. and Bowen, M. (1993).** Maps for more meaningful learning. Science Scope, 17 (4), 24-25.

[18] **Roth, W.M. and Roychoudhury, A. (1993).** Using vee and concept mapping in collaborative settings: Elementary majors construct meaning in physical science courses. School Science and Mathematics, 93 (5), 237-244.

[19] **Markow, P. G. and Lonning, R. A. (1998)** Usefulness of concept maps in college chemistry laboratories: students' perceptions and effects on achievement. Journal of Research in Science Teaching, 35 (9), 1015-1029.Kozma, R. B. (1987). The implications of cognitive psychology for computer-based learning tools. Educational technology, 27(11), 20-25.

[20] **Kozma, R. B. (1992)** Constructing knowledge with Learning Tool. In P. Kommers, D. Jonassen & T. Mayers, eds. Cognitive Tools for Learning. Berlin: Springer

[21] D**avis, E. (1990)**. Representations of Commonsense Knowledge. Morgan Kaufmann publishers.

[22] **Martin, D.L. (1994).** Concept mapping as an aid to lesson planning: A longitudinal study. Journal of Elementary Science Education, 6 (2), 11-30.

[23] **Mason, C.L. (1992).** Concept mapping: A tool to develop reflective science instruction. Science Education, 76 (1), 51-63.

[24] **Liu, X. and M. Hinchey**, "The Validity and Reliability of Concept Mapping as an Alternative Science Assessment," Proceedings of the Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY, Misconceptions Trust, 1993.

[25] **Rice, D., Ryan, J. and Samson, S. (1998).** Using concept maps to assess student learning in the science classroom: Must different methods compete? Journal of Research in Science Teaching, 35, 1103-1127.

[26] **Jonassen, D., Beissner, K. And Yacci, M. (1993).** Structural knowledge: techniques for representing, conveying and acquiring structural knowledge. Hillsdale (N. J.): Erlbaum.

[27] **White, R.T and Gunstone, R. (1992).** Probing understanding. New York: Falmer Press.
Wiggins, G . (1989). A true test: Toward more authentic and equitable assessment. Phi Delta Kappan, 70, 703-713.

[28] **Briscoe, C. and LaMaster, S.U. (1991).** Meaningful learning in college biology through concept mapping. The American Biology Teacher, 53, 214-219.

[29] **Holley, C.D. and Danserau, D.F. (1984).** The development of spatial learning strategies. In C.D. Holley & D.F. Danserau (Eds.), Spatial learning strategies. Techniques, applications, and related issues (pp. 3-19). Orlando: Academic Press.

[30] **Pankratius, W. J. (1990).** Building an organised knowledge-base: Concept mapping and achievement in secondary school physics. Journal of Research in Science Teaching, 27 (4), 315-333.

[31] **Schmid, R.F. and Telaro, G. (1990).** Concept mapping as an instructional strategy for high school biology. Journal of Educational Research, 84, 78-85.

[32] **Stice, C.F. and Alvarez, M.C. (1987).** Hierarchical concept mapping in the early grades. Childhood Education, 64, 86-96.

[33] **Willerman, M. and Mac Harg, R.A. (1991).** The concept map as an advance organizer.

Journal of Research in Science Teaching, 28, 705-7 1 1.

[34] **Baxter, G.P., Glaser, R. and Raghavan, K. (1 9 9 3).** Analysis of cognitive demand in selected alternative science assessments. Report for the Center for Research on Evaluation, Standards, and Student Testing. Westwood, CA: UCLA Graduate School of Education.

[35] **Beyerbach, B.A. (1 9 8 8).** Developing a technical vocabulary on teacher planning: Preser-vice teachers' concept maps. Teaching & Teacher Education, 4 , 339-347.

[36] **Hoz, R., Tomer, Y. and Tamir, P. (1 9 9 0).** The relations between disciplinary and pedagogical knowledge and the length of teaching experience of biology and geography teachers. Journal of Research in Science Teaching, 27, 973-985.

[37] **Lomask, M., Baron, J.B., Greig, J. and Harrison, C . (1 9 9 2, March).** ConnMap: Connecti-cut's use of concept mapping to assess the structure of students' knowledge of science. Paper presented at the annual meeting of the National Association of Research in Science Teaching, Cambridge, MA.

[38] **Ruiz-Primo, M. and Shavelson, R. (1 9 9 6).** Problems and issues in the use of concept maps in science assessment. Journal of Research in Science Teaching, 33, 569-600.

[39] **Roth, W.-M. and Roychoudhury, A. (1 9 9 3).** The concept map as a tool for the collaborative construction of knowledge: A microanalysis of high school physics students. Journal of Research in Science Teaching, 30, 503-534.

[40] **Gangosa, Z. (1 9 9 6)** Meaningful Learning Based Instructional Design. Meaningful Learning Forum. On the World Wide Web: http://www2.ucsc.edu/mlrg

[41] **Stensvold, M. S. and Wilson, J. T. (1 9 9 0)** The interaction of verbal ability with concept mapping in learning from a chemistry laboratory activity. Science Education, 74 (4), 73-480.

[42] **Brody, M. (1 9 9 3)** Student misconceptions of ecology: identification, analysis and instructional design. Paper presented at Third International Seminar onMisconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY.

[43] **Heinze-Fry, J. A. (1 9 9 7)** Concept mapping: weaving conceptual connections. Paper presented at Weaving Connections: Cultures and Environments - Environmental Education and Peoples of the World, Vancouver, British Columbia, Canada (North American Association for Environmental Education).

[44] **Heinze-Fry, J. A. and Novak, J. D. (1 9 9 0)** Concept mapping brings long-term movement towards meaning learning. Science Education, 74 (4), 461-472.

[45] J**egede, O. J., Alaiyemola F. F. and Okebukola, P. A. (1 9 9 0)** The effect of concept mapping on students' anxiety and achievement in biology. Journal of Research in Science Teaching, 27 (10), 951-960.

[46] **Degroot, S. S. (1 9 9 3)** Concept mapping with computer support, laser disc and graphics applied to microbiology. Paper presented at Third International Seminar on Misconceptions and educational Strategies in Science and Mathematics, Ithaca, NY.

[47] **Markham, K. M., Joel J. and Jones, M. G. (1 9 9 3)** The structure and use of biological knowledge about mammals in novice and experienced students. Paper presented at Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY.

[48] **Songer, C. J. and Mintzes, J. J. (1 9 9 3)** Understanding cellular respiration. Paper presented at Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY.

[49] **Farrokh, K. and Krause, G. (1 9 9 6)** The relationship of concept-mapping and course grade in cell biology. Meaningful Learning Forum. On the World Wide Web: http://www2.ucsc.edu/mlrg

[50] **Coleman, E. B. (1 9 9 8)** Using explanatory knowledge during collaborative problem

solving.The Journal of the Learning Sciences, 7, 3&4, 387-427.

[51] **Baldissera, J. A. (1993)** Misconceptions of revolution in history textbooks and their effects on meaningful learning. Paper presented at Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY.

[52] **Zeilik, M., Schau, C., Mattern, N., Hall, S.,** Teague, K. and Bisard, W. (1997) Conceptual astronomy: a novel model for teaching postsecondary science courses. American Journal of Physics, 65 (10), 987-996.

[53] **Edmondson, K. (1995)** Concept mapping for the development of medical curricula. Journal of Research in Science Teaching, 32 (7), 777-793.

[54] **Moreira, M. A. and Greca, I. (1996)** Concept mapping and mental models. Meaningful Learning Forum. On the World Wide Web: http://www2.ucsc.edu/mirg

[55] **Leahy, R. (1989)** Concept mapping: developing guides to literature. College Teaching, 37 (2), 62-69.

[56] **Moreira, M. M. (1996)** The use of concept maps in EFL classroom. Meaningful Learning Forum. On the World Wide Web: http://www2.ucsc.edu/mirg

[57] **Gonzaalez, F. M. (1993)** Diagnosis of alternative conceptions in science in Spanish primary school students. Paper presented at Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY.

[58] **Khan, K. M. (1993)** Concept mapping as a strategy for teaching and developing the caribbean examinations council (CXC) mathematics curriculum in a secondary school. Paper presented at Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY.

[59] **Moreira, M. A. and Motta, A. M. B. (1993)** Concept mapping in 7th grade mathematics: an exploratory study. Paper presented at Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics, Ithaca, NY.

[60] **Eschenbrenner, M. (1994)** Concept mapping in the primary grades. Unpublished MSc dissertation. California State University, Fullerton.

[61] **Sizmur, S. and Osborne, J. (1997)** Learning processes and collaborative concept mapping. International Journal of Science Education, 19 (10), 1117-1135.

[62] **Stensvold, M. S. and Wilson, J. T. (1990)** The interaction of verbal ability with concept mapping in learning from a chemistry laboratory activity. Science Education, 74 (4), 473-480.

[63] **Van Boxtel, C., van der Linden, J. and Kanselaar, G. (2000)**. Collaborative Learning Tasks and the laboration of Conceptual Knowledge. Learning and instruction, 10, 311-330.

[64] **Osmundson, E., Chung, G. K., Herl, H. E. And Klein, D. C. (1999).** Knowledge mapping in the classroom : A tool for examining the development of students' conceptual understandings (Technical report No. 507). Los Angeles: CRESST/ University of California.

[65] **Anderson-Inman, L., Knox-Quinn, C. and Horney, M. A. (1996).** Computer-based study strategies for students with learning disabilities: Individual differences associated with adoption level. Journal of Learning Disabilities, 21(8), 21-25.

[66] **Kinchin, I., Hay, D. and Adams, A. (2000).** How a qualitative approach to concept map analysis can be used to aid learning by illustrating patterns of conceptual development. Educational Research, 42(1), 43-57.

[67] **Driver, R., Squires, A., Rushworth, P. and Wood-Robinson, V. (1994)**. Making Sense of Secondary Science: Research on children's ideas. New York: Routledge.

MYTecC:
Developing Teenagers Cultural competency, Social and Leadership Skills through the Application of a Virtual-Social Curriculum

Nikleia Eteokleous
Mediterranean Youth Technology Club, Project Researcher
Lecturer in Educational Technology
Department of Primary Education,
School of Education,
Frederick University Cyprus
nikleia@cytanet.com.cy

Abstract

Technology has been making it to classrooms for over four decades, deeply affecting education. The rapid diffusion of the Internet created new approaches to learning including online course delivery. It provides a realistic, visually compelling, and motivating interactive environment for developing the skills and knowledge needed in today's multicultural environment, another characteristic of the society we live in. Given the above, the current study aims to develop teenagers' cultural competency, social and leadership skills, and multicultural awareness through virtual-based activities, extensively using Web 2.0 tools, in a non-formal educational setting, aiming in instilling a new learning, collaboration and communication culture. MYTecC (Mediterranean Youth Technology Club, introduced below) aims to embrace all the above under its multicultural internet-based, virtual umbrella.

Introduction - Theoretical Background

Computers have been making it to classrooms for over five decades, and their use evolved from "learning from computers", to "learning about computers", to "learning with computers", or in other words "computers as mindtools" (Dexter et al., 1999; Eteokleous, 2007; Hadjithoma, & Eteokleous, 2007; Jonassen, 1999). With the rapid diffusion of the Internet; new approaches to learning were created including online course delivery (Crosta, 2004). As a result, the interest in the development and use of online learning has been steadily increasing (Dabbagh & Kitsantas, 2004) providing "anytime, anywhere learning". The internet as a medium to implement online learning provides a pervasive new channel for education, it removes time and space constraints, it increases flexibility and accessibility to education and knowledge (Berge, 1999; Tianguang Gao & Lehman, 2003). Web 1.0 users were characterized as passive "consumers" of information, or in other words, the audience, without having any contribution and involvement. Therefore, they were reading, receiving and researching (the 3 Rs). Nowadays, Web 2.0 created the framework for user participation. Specifically, a site's primary content is contributed by its users, where the traditional one way information flow is becoming a two-way conversation. The users are contributing, collaborating, and creating (the 3C's) (Ala-Mutka, Punie, & Ferrari 2009; Hargadon, 2009; Murugesan, 2009; Richardson, 2009). The term, Web 2.0 is commonly associated with web applications which facilitate interactive information sharing, interoperability, user-centered design and collaboration on the Web. Examples of Web 2.0 include web-based communities, hosted services, web applications, social-networking sites, and video-sharing sites. A Web 2.0 site allows its users to interact with other users or to change website content, in contrast to non-interactive websites where users are limited to the passive viewing of information that is provided to them (Hargadon, 2009; Prensky, 2001; Richardson, 2009).

The students, mainly under the age of 18, can be characterized as digital natives (Prensky, 2001) or digital learners (Murugesan, 2009; Oliver & Carr, 2009; Richardson, 2009). They are extensively using the Internet and the Web 2.0 tools for various reasons such as: playing web-games, visiting social networking websites (i.e. Face book, MySpace, Twitter, Delicious, Flickr, LinkedIn, Live Journal), using email accounts, searching for information, communicating through chat rooms, developing websites, becoming net-writers through wikis and blogs, etc (Burnett et al., 2003; Hargadon, 2009; Murugesan, 2009). By the time teenagers turn 18, they will play 10,000 web games, they will talk 10,000 hours on the phone and they will send and receive more than 200,000 emails (Prensky, 2001).

Millions of people around the world participate to various social networking sites. The concept of social networking is becoming even more popular, "invading" to people's everyday lives and activities. Numerous Web 2.0 tools are used at the social networks such as: Discussion forums, Blogs, Wikis, Chat-rooms, Electronic calendars, Electronic documents (i.e. Google documents) etc. These tools provide the opportunity to the users in conducting various actions such as create profile pages, socializing, friending, create groups of common interest, upload photos, video, music, comment on events, pictures, etc. Having in mind the above, it is suggested that the social networking can be transformed to educational networking, by using the various web 2.0 tools into the educational practice, towards achieving educational goals.

Additionally, technology provides a realistic, visually compelling, interactive, and motivating environment (Goddard, 2002; Polonoli, 2001; van Braak, 2001), for developing the skills and knowledge needed in today's multicultural environment, another characteristic of the society we live in. Our society is composed of more than one ethnic group so it can be broadly characterized as multicultural (Smolicz, 1996). Often multiculturalism is defined as more than the acceptance of the presence of diverse racial, cultural, economic and social groups; it refers to peoples' philosophy for, and attitude toward, people of different race, ethnicity, geographical origin, gender, sexual orientation, physical ability, religion, economic class and age. In this sense, human differences are recognized, respected, appreciated and celebrated within a multicultural environment (Nikolaou, 2000).

Given the above, what is technology's role in developing 'respect' among people with different culture, religion, language and nationality? How the Web 2.0 tools can be used to develop social and leadership skills to the youth that are considered important characteristics for today's globalized, interconnected world? Would it be possible to recognize, respect, and appreciate differences among human beings by utilizing Web 2.0 tools through Internet-based activities? The Mediterranean Youth Technology Club aims to embrace and put in practice all the above under its multicultural, virtual umbrella.

The Mediterranean Youth Technology Club

MYTecC, the Mediterranean Youth Technology Club (http://www.mytecc.com), is a multidimensional project aiming at using ICT to empower young people in order to enhance their opportunity for employment. MYTecC also aims to build bridges between youth enabling them to express their cultural identity and to get to know other cultures. The ultimate objective is to promote the principles of respect for cultural diversity, tolerance, the spirit of volunteerism, and social responsibility by creating a human network in a program supporting and enhancing dialogue and exchange in a Web 2.0 environment. Specifically, MYTecC's vision focuses on creating future leaders who are aware of their social responsibility and duties, are able to improve their local communities, and are effective local and global citizens. The objectives of the project are the following:

1- To empower youth with information and communication technology.

2- To provide youth with tools and concepts which would enable them to become responsible members in their communities.

3- To develop a culture of dialogue based on respect, tolerance and reason.

4- To raise awareness among young people about the opportunities and challenges resulting from globalization and how to positively deal with them.

MYTecC targets young people between the age of 14 and 18 who are trained by a team of instructors. Each cycle of MYTecC is one year and the activities are conducted after-school. The project is based on a solid training foundation which includes social empowerment, technological skills, and a course in technical English. Specifically, participating youth simultaneously follow three different but complimentary learning tracks: ***1)*** Technology and networking skills, based on the Cisco Systems IT Essentials training; ***2)*** Technical English, which enhances their opportunity for employment and allows for communication with others (www.mywaves.org); and ***3)*** Social - Virtual empowerment curriculum is delivered through classroom-based and internet-based (virtual) activities (http://myteccstudents.ning.com/). The Social aspect focuses on communication skills, social responsibility and leadership. The Virtual aspect links countries together, encourages networking among the working groups from the participating countries, through activities and games aiming at strengthening dialogue and positive interaction. The development of a virtual community brings added value through a constant exchange of thoughts, ideas and experience within a framework of tolerance and respect.

Clearly an initiative of this magnitude requires a solid partnership to ensure its continuity and sustainability. The partnership currently includes: the Public Benefit Investment (PBI) Department of CISCO (http://www.cisco.com), and the ICTDAR (Program Information and Communication Technology for Development in the Arab Region, http://www.ictdar.org/) a regional program of the UNDP (United Nations Development Program).

MYTecC classes officially started at the end of February 2008, to the 8 participating countries (Egypt, Israel, Jordan, Morocco, Palestine, Portugal, Turkey, and Yemen) and ended in June-July 2009. Twenty instructors and more than 300 students were part of the MYTecC community. A mini-MYTecC cycle starts in February 2010 in 5 countries (Israel, Morocco, Palestine, Portugal, and Turkey) and in September 2010 a full MYTecC cycle starts in more than 10 countries, hopefully including Cyprus as well!

To coordinate the work in the 8 countries and to ensure smooth execution, a decentralized management team has been put in place which meets every two weeks virtually, consisting of an Instructor Coordinator (from Morocco), a Research and Monitoring Manager (from Cyprus), a Virtual Curriculum Manager (from Portugal), a Content Manager (from Morocco), and a Technical Support Manager (from Palestine). This team is comprised of members of the MYTecC core instructor team. The Instructor Coordinator and the Research and Monitoring Manager also meet bi-weekly with Partners' representatives and the ICTDAR Project Manager to review MYTecC progress and resolve developing implementation issues.

The Social - Virtual Curriculum

Today, with the advent of Web 2.0, the internet has become truly interactive.
Wikimedia, videos, blogging, forums and chats are excellent examples of how
definitions, ideas, photographs, videos and voice can be input and shared over a powerful Web 2.0 internet. The above is captured in detail through MYTecC social-virtual curriculum. MYTecC puts in practice the development and expansion of the Internet and specifically, the Web 2.0 technologies and tools. In addition

MYTecC takes advantage teenagers' internet ease of use and high Web 2.0 tools literacy in performing internet-based educational activities.

The current study focuses on the application and the effects of the Social-Virtual Curriculum, where its overall philosophy can be described as follows: empower the students personally, raise their awareness of the right social skills and citizenship values (at the community, country, and global level) and get the students in the frame of mind to become social entrepreneurs. To achieve the above, the social-virtual curriculum is divided in three dimensions.

The first dimension, the Personal development dimension, focuses on building students' personal skills, examining their role in the community and discusses in detail the issue of volunteerism, including sub-topics such as: teamwork, communication styles, critical thinking, effective inquiry and research, etc. The Civic Education dimension, aims to broaden students understanding on various values and concepts such as similarities and differences, cultural diversity, democratic system, respect, acceptance, leadership, conflict resolution, stereotyping, etc. It also examines the roles and responsibilities of the students as citizens in the development of their communities. During the third dimension, Social Entrepreneurship, the students go through a basic business planning training, in an attempt to develop community projects/ socially responsible business ideas that will create job opportunities for the people in their communities. Teamwork, effective communication and collaboration will be the means to achieve the above. Finally, the students will introduce the projects to community key-persons, local organizations, friends and parents in order to get funding, and/ or a small micro-loan. Examples of the sub-topics included at the Social Entrepreneurship dimension are: creativity, business and community Entrepreneurship, business plan, and socially (local) responsible business.

The virtual aspect supports, enhances and strengthens the concepts covered through the social curriculum on a broader level. The students from the participating countries will have the opportunity to get to know each other through the virtual curriculum activities as well as collaborate to accomplish various activities/ tasks. Finally, it aims to develop a feeling of "internationality" by establishing integrated international groups across countries to work on projects, and provide participants with cross-cultural education and experiences, in an attempt to promote strong connections with their counterparts.

Main Aim

The current study evaluates the application and the effect of the social-virtual curriculum of the MYTecC project. Specifically, it explores the development of teenagers' cultural competency, social skills, and multicultural awareness through virtual-based activities, aiming in instilling a new learning culture. The Web 2.0 tools are used as mindtools and project-based learning is applied by providing students group activities to be performed through a web-platform.

Research Methodology

To address the above, a mixed method approach is employed, making use of quantitative and qualitative data (Cresswell, 2003). This paper focuses on the qualitative aspect of the research methodology. The qualitative component is addressed through interviews with the students and the instructors. Additionally, chatting rooms' archives, discussion forums and websites' activities observations took place in order to get a closer look of the virtual activities performed and students' discussions. For the qualitative part purposive sampling is used to draw the subjects (Kvale, 1996).

Research Outcomes

It is revealed that without no doubt, the social-virtual curriculum is of vital importance in achieving MYTecC goals. It is indeed one of its main pillars and it is the venue to achieve students' mindset shift, through which instructors managed to pursue the following goal: "Teach our students how to think". Students and instructors appeared to totally agree regarding the benefits acquired through the social-virtual curriculum. They reported that it is an enjoyable and a valuable experience since they all learn lots of things from the discussions, the games, the debates, and the activities performed. Instructors supported that it is very important for the students, reporting that "...it is a totally new experience. ...it seems that they really like and enjoy it...they just love it...". An instructor characterized the social-virtual curriculum as the perfect thing!

The virtual aspect brought a whole new dimension by officially bringing together through educational and fun activities MYTecC students across 8 countries! A new learning, communication and collaboration culture is officially launched through MYTecC!! Students from the participating countries had the opportunity to interact and mingle with each other, both informally and formally through MYTecC activities among and between countries. The communication, interaction, and exchanges through the chat rooms, discussion forums, and blogs at MYTecC community site (http://mytecc.ning.com) were amazing.

It was observed that the initial actions of the students at the community website were to complete their personal profiles and adjust their websites to their preferred-colors, upload pictures and videos (for educational and entertainment purposes), share music clips and songs, identify similar interests (i.e. sports), and search for friends from other countries to interact with. Besides the initial actions, students mentioned that the virtual curriculum provided them the opportunity to learn about new cultures and countries, chat with students from other countries, and present their countries to others as well as make new friends from other countries. In addition, they commented, discussed, and shared their ideas in the forums about various subjects with students from other countries such as world problems, daily life issues, their visions, career objectives, etc. They also reported that they enjoyed the idea of utilizing Web 2.0 tools for educational activities; expressing at the same time their excitement regarding the activities performed such as developing and recording video clips and songs, taking pictures, developing games, involved in trivia games, broadcasting radio sessions, etc.

The students also supported that they learned how to communicate with others and specifically with persons that posses different characteristics than they do, how to discuss about various subjects, express, and argue about their beliefs and opinions, further develop their views, think in depth various issues, and listen to others, but at the same time respect their opinions. To support the above, a student mentioned: "...I like the social curriculum because we share ideas and information even though sometimes we don't agree. But I like that...". Along the same lines, a student reported: "MYTecC provided me the ability to communicate with others who are different than me", and another one said that "...in MYTecC I made lots of new friends and I' m so happy for this". The students with great disappointment reported that they do not have the opportunity to experience something similar in their school environments.

Students supported that through the social-virtual curriculum they experienced personality and behaviors changes, they evolved as persons and became more open-minded, by giving them opportunities that would not have in any other case, not even in school. Additionally, they learned how to take initiatives and developed leadership characteristics. "...we learn how to be leaders for us and our communities, we can lead ourselves and also lead the others...", a student enthusiastically mentioned. They feel that they are more responsible, tolerant, self ...confident, not biased towards others, learned about important values in life, how to deal with people, and how to present themselves to others as well as managed to discover and better understand themselves through discussions and interactions with youth from other countries. To support the above, a student said: "I changed as a person...I have a lot of tolerance now...as a person I had some stereotypes but through MYTecC discussions my ideas changed, differences among people do not seem to be that important anymore". Another one discussed that "...in MYTecC I learned how to communicate with others how to support my views by presenting arguments and be self-confident". Finally, a student confessed the following: " I changed my views about others...I believe that they are people like me, we are all equal even though we have different ideas, religions, cultures...I better understood that in MYTecC".

Besides the above, some problems reported regarding the social-virtual curriculum. The problems encountered were mainly focused on two areas: 1) addressing specific subjects, such as religion, and stereotypes and 2) technical and internet connection problems. Regarding the first one an instructor mentioned that "... At first, the students understood the social curriculum in a wrong way, especially about religion...I managed to make the students and the families understand what I was teaching. I am not teaching them to lose their identities but to further develop their personalities ...". Through the application of the social-virtual curriculum numerous technical problems, and internet connectivity inconsistencies reported. The above resulted in bad communication and sometimes postponing MYTecC web-based activities.

Conclusion

It has been revealed that the opportunities provided make the difference. Through MYTecC, the students realized that the use of technology can be applied for various purposes in their lives: personal, educational and professional. The appropriate educational environment enhanced with the Web 2.0 tools integration, promotes students' motivation, creativity, the opportunity to synthesize information, and discover numerous aspects of their skills and abilities. The educational use of the Web 2.0 tools promote the dialogue, discussion, openness and authenticity; as well as create the foundation for collaboration, respect, understanding and peaceful coexistence among youth

This is an excellent and valuable opportunity for people (instructors and youth), and institutions to participate in an attempt to enhance the quality of education provided to our children. We all have the chance to meet other people and network, tremendously benefited from our interactions, provide and gain valuable knowledge and skills. In this ever-changing Hi-Tech, globalized world it is responsibility of all of us to develop culturally responsible and competent citizens that will be able to survive in the cultural diversity. It is a great challenge to develop citizens that can be characterized as multicultural and be in a position to promote peace culture in today's interconnected world. A Moroccan instructor passionately said: "I'm so proud to be part of this dream team...You're a locomotive..You're a bulldozer...With you all together, nothing is impossible and I have faith in the future as long as we're all shoulder to shoulder". A student argued that " MYTecC is a paradise...". Cisco's **Public Benefit Investment, Europe and Emerging markets Manager, Zika Abzuk, mentioned: "We believed it was possible! Now, we know that it is!".**

Note: Responsible/ Contact Person for the MYTecC project in Cyprus

Dr Nikleia Eteokleous, a Lecturer in Educational Technology at Frederick University, is the Research and Monitoring Manager of the project. She is the representative/ contact person for MYTecC project in Cyprus, and has also undertaken the promotion, application and operation of the project in Cyprus. Her contact details are: Email: nikleia@cytanet.com.cy; eteokleous.nikleia@mytecc.com. Tel: 99322070

References

Ala-Mutka, K., Punie, Y. _ A. Ferrari (2009). Review of Learning in Online Networks and Communities. U. Cress, V. Dimitrova, and M. Specht (Eds.): EC-TEL 2009, LNCS 5794, European Communities 2009, pp. 350-364.

Berge, Z. (1999). Interaction in post-secondary web-based learning. Educational Technology, January-February, 5-11.

Burnett, et al. (2003). From Recreation to Reflection: Digital Conversations In Educational Contexts. Educational Studies in Language and Literature, Kluwer Academic Publishers, Netherland, V 3: 149-167, 2003.

Creswell, J. W (2003). Research design: Qualitative, quantitative and mixed methods approaches (2nd ed.). Thousand Oaks, CA: Sage.

Crosta,. L (2004). Beyond the use of new technologies in adult distance courses: an ethical approach. International Journal on E-Learning, 3(1), 48-61.

Dabbagh, N. _ Kitsantas, A. (2004). Supporting self-regulation in student-centered web-based learning environments. International Journal on E-Learning. 3 (1), 40-48.

Dexter, S.L., Ronald, E.A., _ Becker, H.J. (1999). 'Teacher's views of computers as catalysts for changes in their teaching practice'. Journal of Research on Computing in Education, 31(3), 221-232.

Eteokleous, N. (2007). Evaluating Computer Technology Integration in a Centralized Educational System. Computers and Education Journal. Available online 10 September 2007, doi:10.1016/j.compedu.2007.07.004

Goddard, M. (2002). What do we do with these computers? Reflections on technology in the classroom. Journal of Research on Technology in Education, 35(1), 19-26.

Hadjithoma, C., _ Eteokleous, N. (2007). ICT in Primary Schools: Explaining the Integration in Relation to the Context. Mediterranean Journal of Educational Studies, 12 (1), 1-25

Hargadon, S. (2009). White Paper on Educational Networking: The important role Web 2.0 will play in education. Retrieved from the www.elluminate.com on October 15th 2009

Jonassen, D. H. (1999). Computer as Mindtools in Schools: Engaging Critical Thinking, (2nd ed.). Columbus, OH: Prentice Hall.
Kvale, S. (1996). InterViews: An Introduction to qualitative research interviewing. Thousand Oaks, CA: Sage.

Murugesan, S. (2009). Social Issues and Web 2.0: A Closer Look at Culture in E-Learning. Handbook of Research on Web 2.0, 3.0, and X.0: Technologies, Business, and Social Applications. Publisher: IGI Global.

Nikolaou, G. (2000). Integration and education of foreign students in elementary schools, (in Greek), Athens: Ellinika Grammata.
Oliver, M & Carr, D. (2009). Learning in virtual worlds: Using communities of practice to explain how people learn from play, British Journal of Educational Technology, 40 (3), pp 444-457

Polonoli, E. K. (2001). Integrating technology into classroom: Three questions concerned principals must ask. Principal Leadership, 2 (4), 34-38

Prensky, M. (2001). Digital Natives Digital Immigrants. On the Horizon, MCB University Press, 9 (5), October 2001

Richardson, W. (2009). Becoming Internet Wise: Schools can do a far better job of preparing students for their connected futures online, Educational Leadershsip, pp 26-31

Smolicz, J. (1996). Multiculturalism and an overarching framework of values: Some educational responses for ethnically plural societies. In E. R. Hollins (ed.), Transforming curriculum for a culturally diverse society (pp. 59-74). Mahwah, NJ: Lawrence Erlbaum Associates.

Tianguang Gao and James D. Lehman, (2003). The effects of different levels of interaction on the achievement and motivational perceptions of college students in a web-based learning environment. Journal of Interactive Learning Research, 14 (4), 367-387.

Van Braak, J. (2001). 'Factors influencing the use of computers mediated communication by teachers in secondary education'. Computers and Education 36, 41-57.

«Η Σύγχρονη Εκπαιδευτική Τεχνολογία στην υπηρεσία της Διαπολιτισμικής Παιδαγωγικής στο Δημοτικό Σχολείο για την Υπέρβαση των Κοινωνικών Στερεοτύπων και της Προκατάληψης» Περίληψη διδακτορικής διατριβής με επιβλέποντα τον Καθηγητή του Πανεπιστημίου Αθηνών Αριστοτέλη Ράπτη

Γεωργία Μούκα
Διδάκτωρ Καποδιστριακού Πανεπιστημίου Αθηνών
Παιδαγωγικό Τμήμα Δημοτικής Εκπαίδευσης
Εκπαιδευτικός Πρωτοβάθμιας
Διευθύντρια 8ου Δημοτικού Σχολείου Καλλιθέας
gmouka@yahoo.com

Εισαγωγή Στο Ερευνητικό Πρόβλημα

Προβληματική της έρευνας

Η διαπολιτισμική εκπαίδευση και η εκπαιδευτική τεχνολογία μπορούν να συνεργαστούν και να στηρίξουν η μία την άλλη με την συνδυαστική ενεργοποίηση πολλών χαρακτηριστικών τους ώστε η παιδαγωγική διαδικασία να είναι μια διαδικασία συνεχούς αλληλεπίδρασης μεταξύ μαθητών και εκπαιδευτικού. Είναι ανάγκη βέβαια να τονιστεί ότι στις κοινωνικές επιστήμες, η εκπαιδευτική τεχνολογία είναι απαραίτητο να χρησιμοποιηθεί όχι μόνο παρέχοντας το απαραίτητο πληροφοριακό υλικό αλλά κυρίως ως γνωστικό εργαλείο ανάπτυξης κριτικής σκέψης, ανάπτυξης κοινωνικών δεξιοτήτων και ανάπτυξης αξιών αναδεικνύοντας παράλληλα τη διαφορετικότητα και την ετερότητα του άλλου. (Knapp & Glenn, 1996, Berson, et al., 2000, σσ. 121-131)

Ειδικότερα, επιλέχτηκε να προσεγγιστεί ερευνητικά το κοινωνικό φαινόμενο της ξενοφοβίας και του ρατσισμού διότι πλήθος σχετικών ερευνών έχουν καταδείξει ότι τα φαινόμενα ρατσισμού και ξενοφοβίας που έχουν εμφανιστεί στην πρωτοβάθμια και κυρίως στη δευτεροβάθμια εκπαίδευση παίρνουν τεράστιες διαστάσεις καθώς και ότι ο ρατσισμός είναι διακριτός στη σχολική τάξη, μολονότι από τη δεκαετία του 1980 αναπτύσσεται στα σχολεία η αντιρατσιστική προσέγγιση. Τα παιδιά που μεγαλώνουν σε πολυπολιτισμικά διαφοροποιημένα περιβάλλοντα έχουν ανάγκη όχι μόνο να μάθουν να συμβιώνουν με άλλα παιδιά, τα οποία προέρχονται από άλλες χώρες με διαφορετικό πολιτιστικό υπόβαθρο, αλλά να επικοινωνούν με αυτά, να συνδιαλέγονται, να συνεργάζονται και να συνδιαμορφώνουν απόψεις και στάσεις. Για να επιτευχθούν όλα τα παραπάνω απαραίτητη προϋπόθεση είναι να υπάρξουν αλλαγές τόσο σε επίπεδο οργάνωσης του σχολείου, όσο και σε επίπεδο θεσμικών αλλαγών. Αλλαγή στον τρόπο διδασκαλίας, αναθεώρηση των στόχων του αναλυτικού προγράμματος, ενσωμάτωση νέων εργαλείων στην μαθησιακή διαδικασία και κυρίως σύμφωνα με τη Θ. Δραγώνα, εναντίωση μέσα από την καθημερινή παιδαγωγική πρακτική σε κάθε είδους διάκριση, είτε αυτή είναι κοινωνική, πολιτισμική, φύλου, γλωσσική ή θρησκευτική και σε κάθε είδους στερεοτυπική ιεράρχηση του διαφορετικού. Ζητούμενο είναι με ποιο τρόπο και ποια μεθοδολογία θα επιτευχθούν αυτές οι αλλαγές. Η εκπαιδευτική τεχνολογία μπορεί να βοηθήσει ουσιαστικά σε αυτήν την κατεύθυνση διότι δίνει διέξοδο από την απλή αναβάθμιση έως και το μετασχηματισμό του διδακτικού περιβάλλοντος.

Το ζήτημα, λοιπόν, που ερευνήθηκε είναι αν και κατά πόσο μπορούν τα πολυμέσα να αξιοποιηθούν στη διδασκαλία γνωστικών αντικειμένων που σχετίζονται με την Πολιτική και την Κοινωνική Αγωγή όπου σύμφωνα με το διαθεματικό ενιαίο πλαίσιο προγράμματος σπουδών σκοπός της διδασκαλίας του *μαθήματος είναι να καταστούν οι μαθητές/τριες ικανοί να διαχειρίζονται και να αντιμετωπίζουν τα δύσκολα κοινωνικά και ηθικά προβλήματα, που συχνά εμφανίζονται στη ζωή τους, τόσο στο άμεσο όσο και στο ευρύτερο φυσικό και κοινωνικό περιβάλλον.*

Ειδικότερα αν μπορούν τα πολυμέσα:

- *να αξιοποιηθούν στη διδασκαλία εννοιών και γνωστικών αντικειμένων που καλλιεργούν την κοινωνική αντίληψη, ευαισθησία και γνώση*
- *να αξιοποιηθούν ως μετασχηματιστικά εργαλεία, αλλαγής ή ισχυροποίησης στάσεων, διαθέσεων, αντιλήψεων και αξιών*
- *να αξιοποιηθούν ως εργαλεία για την υιοθέτηση νέων προτύπων συμπεριφοράς με σεβασμό στις ανθρωπιστικές αξίες*
- *να αξιοποιηθούν ως εργαλεία διαμόρφωσης προσωπικότητας υπεύθυνης, δημοκρατικής και ελεύθερης, με κοινωνικές και ανθρώπινες ευαισθησίες χωρίς θρησκευτικές και πολιτισμικές διακρίσεις*

Σκοπός της έρευνας

- οι πιθανές αλλαγές στις στάσεις και αντιλήψεις των μαθητών απέναντι στα κοινωνικά στερεότυπα και στην προκατάληψη ως αποτέλεσμα συγκεκριμένης, ειδικά σχεδιασμένης διδακτικής παρέμβασης, δηλαδή μέσω της ανάπτυξης και της παιδαγωγικής αξιοποίησης συγκεκριμένου εκπαιδευτικού, υπερμεσικού λογισμικού
- η αξιοποίηση των αλληλεπιδραστικών πολυμέσων ως μετασχηματιστικών γνωστικών εργαλείων στο πλαίσιο της Διαπολιτισμικής Αγωγής για τη διευκόλυνση της ολόπλευρης ανάπτυξης των μαθητών με την καλλιέργεια της κριτικής κοινωνικής αντίληψης, της ευαισθησίας και της δράσης προάγοντας το «χειραφετικό, μετασχηματιστικό ενδιαφέρον για τη γνώση».

Σκοπιμότητα και Φιλοσοφία έρευνας

Η συμβολή της παρούσας έρευνάς και κατά συνέπεια η σκοπιμότητά της δεν έγκειται στην απλή διαπίστωση και ίσως και στην ερμηνεία μιας προβληματικής κατάστασης αλλά στην ενεργό χειραφετική δράση του ερευνητή δασκάλου, έτσι ώστε να επιτευχθούν οι ακόλουθοι στόχοι:

- Χειραφέτηση και ανάπτυξη της κοινωνικής αυτοσυνειδησίας των μαθητών, μέσω της κριτικής και απελευθερωτικής προσέγγισης επίκαιρων κοινωνικών προβλημάτων, όπως είναι η ξενοφοβία, ο ρατσισμός και η προκατάληψη, με στόχο την αντιμετώπιση τους. Με την έννοια αυτή οι μαθητές δεν αποκτούν μόνο γνώσεις και δεξιότητες ούτε μόνο κατανοούν τα κοινωνικά δρώμενα αλλά τα αλλάζουν μετατρέποντας την κατανόηση σε δράση (Κ.Μακράκη, Μακράκης 2006).
- Χειραφέτηση των δασκάλων και του διαμοιρασμού, μέσω των πορισμάτων της έρευνας, της όλης εμπειρίας με τους εκπαιδευτικούς, καθώς και της παροχής προς αυτούς ενός διδακτικού προτύπου κριτικού δασκάλου, που αναλαμβάνει ενεργό ρόλο στις διδακτικές του/της παρεμβάσεις και ο οποίος απαιτεί απεγκλωβισμό από παγιωμένους παθητικούς ρόλους και πρακτικές και την υιοθέτηση της κριτικής, αναστοχαστικής μεθοδολογίας. Ο δάσκαλος δεν περιορίζεται πλέον σε μια μονοδιάστατη προσωπική και διδακτική αλλαγή, αλλά προχωρεί και σε μετασχηματιστικές δράσεις που συνδέονται διαλεκτικά με δομές και διαστάσεις του ευρύτερου κοινωνικού και εκπαιδευτικού συστήματος.

Σχεδιασμός και Ανάπτυξη Εκπαιδευτικού Λογισμικού «Παιδιά του Κόσμου»

Αρχική Ιδέα και Αναστοχαστική Δράση

Η αρχική ιδέα ανάπτυξης του εκπαιδευτικού υποστηρικτικού λογισμικού «Παιδιά του Κόσμου» στηρίχτηκε κυρίως στην παραδοχή και στη διαπίστωση της αναγκαιότητας ύπαρξης ενός ευέλικτου παιδαγωγικού σχήματος θεσμικής και διδακτικής παρέμβασης με την αξιοποίηση των τεχνολογικών εργαλείων, όπου να παρέχει στα παιδιά την ευκαιρία να κατασκευάσουν από κοινού ηθικές αρχές δράσης και συμβίωσης και να αναθεωρήσουν ή αντίστοιχα να ενισχύσουν συγκεκριμένες στάσεις και αντιλήψεις και κυρίως να ευαισθητοποιηθούν σε φαινόμενα ρατσισμού και ξενοφοβίας. Μετά τα αποτελέσματα όμως της αρχικής διερεύνησης αξιών και στάσεων των μαθητών/τριων και την «αναστοχαστική» δράση αναδομήθηκαν και επαναπροσδιορίστηκαν οι παιδαγωγικές πρακτικές και η μεθοδολογία , η διδακτική δράση και το περιεχόμενο της εφαρμογής.

Συγκεκριμένα άλλαξε τελείως ο σχεδιασμός του λογισμικού. Αρχικά το λογισμικό στηρίχτηκε στο επιχείρημα ότι η αρμονική συνύπαρξη προϋποθέτει από τη μια τα αλλοεθνή παιδιά να μάθουν τη γλώσσα του σχολείου, και από την άλλη τα αυτόχθονα παιδιά να μάθουν πληροφορίες για τον πολιτισμό των αλλοεθνών παιδιών.

Μετά την αναστοχαστική δράση επαναπροσδιορίστηκαν οι βασικές έννοιες οι θεωρίες και τα επιχειρήματα καθώς σύμφωνα με τη Θ. Δραγώνα η αρχική προσέγγιση νομιμοποιεί μεν τη διαφορά ενισχύοντας την στερεοτυπική εικόνα του διαφορετικού και προβάλλοντας την εξωτική διάσταση του Άλλου αλλά συνάμα συρρικνώνει ένα κοινωνικό πρόβλημα σε ατομικό .

Σύμφωνα με τις θεωρίες της Διαπολιτισμικής Παιδαγωγικής το διαφορετικό ενυπάρχει στη σχολική τάξη εξαιτίας της κοινωνικής ανισότητας την οποία αποδέχεται και αναπαράγει το σχολικό σύστημα και όχι εξαιτίας της συνύπαρξης του ξένου με τον ντόπιο μαθητή στην τάξη. Άρα λοιπόν σκοπός της παρέμβασής μας είναι οι δραστηριότητες του λογισμικού να παρέχουν στα παιδιά διαφορετικής κουλτούρας και κοινωνικής προέλευσης τη δυνατότητα ανάπτυξης μιας δυναμικής επικοινωνίας μέσω της γνώσης για την κοινωνική λειτουργικότητα του στερεότυπου και της προκατάληψης.

Στάδια Ρατσισμού και Ενότητες Λογισμικού

Σύμφωνα με τις απόψεις των ειδικών επιστημόνων ο ρατσισμός αποτελεί το τελευταίο στάδιο μιας εξελικτικής διαδικασίας που αποτελείται από τα εξής μέρη:

Κατηγοριακή αντίληψη του άλλου. Η ταξινόμηση, δηλαδή, του άλλου σε κατηγορίες, ανάλογα με τα εξωτερικά του χαρακτηριστικά, τη γλώσσα, τη συμπεριφορά κτλ.

Στερεοτυπική σκέψη - Στερεότυπο. Στερεότυπο ονομάζεται η σκέψη η οποία με αφετηρία την ταξινόμηση ενός ατόμου σε μια κοινωνική κατηγορία (π.χ. λευκός, Έλληνας, Μαύρος, Εβραίος κτλ.) οδηγείται σε ατεκμηρίωτες γενικεύσεις ως προς τις ιδιότητες που υποτίθεται ότι έχει ένα άτομο που ανήκει σε μια ή περισσότερες από τις παραπάνω κατηγορίες. Στην κοινωνική ψυχολογία στερεότυπο είναι η παγιωμένη τυποποιημένη ιδέα σχετικά με μια κοινωνική κατηγορία: η τεμπελιά, που σχετίζεται με τους Μαύρους, η πλεονεξία με τους Εβραίους, η βία με τους Άραβες αποτελούν στερεότυπα (Pierre- Taguieff, 1997, σελ. 124).

Προκατάληψη. Αν το στερεότυπο παραπέμπει στην εικόνα που έχω για τον άλλο, η λέξη «προκατάληψη» περιγράφει τη στάση του υποκειμένου απέναντι στον άλλον, την αρνητική προδιάθεση, η οποία δεν πυροδοτείται από τις ατομικές ιδιοσυγκρασιακές ιδιότητες του άλλου, αλλά από την κοινωνική του ταυτότητα. Η προδιάθεση για ευνοϊκή ή δυσμενή μεταχείρισή του αφορά σε ολόκληρη την ομάδα, την κοινωνική κατηγορία στην οποία αυτός ανήκει.

Διάκριση. Ο όρος «διάκριση» αναφέρεται στην άδικη μεταχείριση ενός ατόμου που ανήκει σε μια συγκεκριμένη ομάδα για την οποία υπάρχουν στερεότυπα και προκαταλήψεις από τη σκοπιά του φορέα τής διάκρισης. Η σχέση ανάμεσα στην προκατάληψη και τη διάκριση είναι σχέση θεωρίας-πράξης, με την έννοια ότι η προκατάληψη αφορά σε ετοιμότητα για δράση (στάση), ενώ η διάκριση είναι συμπεριφορά, δράση (Γκότοβος, 1998, σελ. 7-34).

Οι ενότητες που αναπτύχθηκαν στο λογισμικό ακολουθούν αντίστοιχα τα παραπάνω στάδια εξέλιξης του φαινομένου του ρατσισμού και παράλληλα βασίζονται στα βασικά συστατικά της κριτικής σκέψης σύμφωνα με τον Fischer (1992), στις 12 διαστάσεις της κριτικής ανάλυσης του Ennis (1984) και στην ικανότητα κριτικής σκέψης στην αξιολόγηση ισχυρισμών και επιχειρημάτων των Beyer (1987) και Woolfolk (1998). Αναλυτικότερα Οι ενότητες **«Άποψη»**, **«Γεγονός»**, **«Εντύπωση»** και **«Ταμπέλες»** υπάγονται στο στάδιο της «κατηγοριακής αντίληψης του άλλου» σύμφωνα με τα στάδια εξέλιξης του ρατσισμού.

Οι ενότητες **«Γενίκευση»** και **«Στερεότυπα»** υπάγονται στο στάδιο της «Στερεοτυπικής σκέψης - Στερεότυπο» σύμφωνα με τα στάδια εξέλιξης του ρατσισμού.

Τέλος οι ενότητα **«Προκατάληψη»** υπάγεται στο στάδιο της «Προκατάληψης» και της «Διάκρισης» σύμφωνα με τα στάδια εξέλιξης του ρατσισμού.

Απόδοση Στόχων με την Ολοκλήρωση του Λογισμικού

Να είναι ικανοί οι μαθητές/τριες:

• να εντοπίζουν στο προφορικό λόγο και σε κείμενα στερεότυπες φράσεις και γενικεύσεις
• να αποφεύγουν όσο είναι δυνατό στη γραφή και στο λόγο τη χρήση στερεότυπων φράσεων και γενικεύσεων.
• να αναγνωρίζουν τι είναι η γενίκευση τι εξυπηρετεί και πώς λειτουργεί η ατεκμηρίωτη και αβάσιμη γενίκευση.
• να αντικρούουν λεκτικά στερεότυπες φράσεις
• να αναγνωρίζουν και να σέβονται τη διαφορετικότητα στην αντίληψη.
• να προσεγγίζουν κριτικά την κάθε είδους πληροφόρηση.
• να σέβονται τις ιδιαιτερότητες, τις ιδιομορφίες και τις διαφορές των άλλων

Μεθοδολογία Και Στρατηγικές

Η διδακτική μεθοδολογία που υιοθετήθηκε κατά την ενασχόληση με το λογισμικό ακολούθησε την παρακάτω πορεία, σύμφωνα με τις θεωρίες του εποικοδομισμού:

• Δημιουργία ομαδοσυνεργατικού κλίματος και ανάπτυξη της αλληλεπίδρασης μεταξύ μαθητών, μεταξύ μαθητών και δασκάλας, μεταξύ μαθητών και λογισμικού
• Συζήτηση και ανάλυση προβληματικών καταστάσεων, προωθείται η αναζήτηση και η διερεύνηση μέσω των ερωτήσεων των ενδιαφερόντων των μαθητών
• Εισαγωγή στην υπό εξέταση έννοια
• Καταγραφή απόψεων
• Πληροφοριακό υλικό και παραδείγματα, η πληροφορία εισάγεται κυρίως ως ενίσχυση στην επίλυση του προβλήματος
• Δραστηριότητες ενδιαφέρουσες που δένονται με ένα συγκεκριμένο πραγματικό και αυθεντικό πρόβλημα, στηρίζονται στην ολική προσέγγιση της γνώσης και απαιτούν κριτική διαδικασία σκέψης (ανάλυση γεγονότων, σύνδεση απόψεων, κριτική επεξεργασία).
• Αναστοχαστική δράση των μαθητών/τριων.

Η αναστοχαστική δράση στηρίχτηκε στις παρακάτω φάσεις:

Αυτό που συνέβη

Οι μαθητές ενθαρρύνονται να συγκρίνουν και να αντιπαραβάλουν όσα γνώριζαν με όσα τελικά διδάχθηκαν και ανακάλυψαν έτσι ώστε να αναδειχτεί η «γνωσιακή σύγκρουση» που επιτελείται κατά τη μαθησιακή διαδικασία.

Τι μάθαμε;

Ο σκοπός αυτής της φάσης είναι να ενθαρρυνθούν οι μαθητές να οικοδομήσουν τις νέες έννοιες και μερικές γενικές αρχές ή υποθέσεις βασισμένες στην εμπειρία τους και στα όσα γνώρισαν κατά τη μαθησιακή διαδικασία.

Πώς αυτό αφορά τον πραγματικό κόσμο;

Ο σκοπός αυτής της φάσης είναι να ενθαρρυνθεί και να ξεκινήσει μια συζήτηση για το πώς οι αρχές και οι νέες έννοιες που προσδιορίστηκαν στη προηγούμενη φάση μπορούν να εφαρμοστούν στις πραγματικές καταστάσεις ζωής.

Τι θα γινόταν εάν...

Ο σκοπός αυτής της φάσης είναι να ενθαρρυνθούν οι μαθητές και να σκεφτούν τι θα συνέβαινε εάν η δραστηριότητα παρουσιαζόταν σε ένα διαφορετικό πλαίσιο ή με ένα άλλο σύνολο οδηγιών.

Επόμενη προβληματική κατάσταση

Ο σκοπός αυτής της φάσης είναι να διευκολυνθεί η δράση. Οι μαθητές ενθαρρύνονται να χρησιμοποιήσουν τις ιδέες τους με τέτοιο τρόπο ώστε να επινοήσουν συγκεκριμένες φόρμες όπου μπορούν να χρησιμοποιηθούν οι νέες πληροφορίες ή οι συμπεριφορές.

Θεωρητικό Πλαίσιο Έρευνας Χειραφετική Έρευνα Δράσης

Η Χειραφετική Έρευνα Δράσης δεν επιδιώκει να προσθέσει στοιχεία σε ένα υπάρχον σώμα γνώσης για τη διδασκαλία, αλλά να συμβάλλει στο μετασχηματισμό της εκπαιδευτικής θεωρίας και πρακτικής με χειραφετικούς στόχους. Είναι μια διαδικασία ενδυνάμωσης για τους συμμετέχοντας γιατί τους ωθεί να αναλάβουν δράση με βάση τον κριτικό αναστοχασμό

(Κατσαρού & Τσάφος 2003). Η Χειραφετική Έρευνα Δράσης στηρίζει τον αναστοχασμό ως μία διανοητική διεργασία και την υπέρβαση ως μία πρακτικού τύπου λειτουργία έτσι ώστε η θεωρία δένεται αρμονικά με την πράξη. Οι εκπαιδευτικοί έρχονται αντιμέτωποι με πρακτικές, μεθόδους και παγιωμένες αντιλήψεις, συνειδητοποιούν τις πολιτικο-κοινωνικές συνιστώσες που τις δημιούργησαν και προχωρούν σε δράσεις μετασχηματιστικές με στόχο το μετασχηματισμό των κοινωνικών δομών και συστημάτων και ενίοτε και την ανατροπή τους.

Η συγκεκριμένη Έρευνα Δράσης Χειραφετικού Γνωσιακού Ενδιαφέροντος στηρίχτηκε:

Στην ενεργό συμμετοχή του μάχιμου εκπαιδευτικού της τάξης

Είναι αλήθεια ότι μόνο οι ίδιοι οι μάχιμοι εκπαιδευτικοί είναι σε θέση να γνωρίζουν όσο κανένας άλλος τις παιδαγωγικές ανάγκες και δυνατότητες του μαθητικού τους πληθυσμού καθώς επίσης τις αδυναμίες και τα όρια του εκπαιδευτικού τους έργου. Έτσι λοιπόν είναι λογικό και άκρως αποτελεσματικό ο ίδιος ο εκπαιδευτικός να αξιολογεί το εκπαιδευτικό του έργο, να ερευνά, να εφαρμόζει τεχνικές ελέγχου αποτελεσμάτων και να επιλέγει τις καταλληλότερες παιδαγωγικές μεθόδους και διδακτικές παρεμβάσεις με στόχο τη βελτίωση και πολλές φορές την τροποποίηση της εκπαιδευτικής διαδικασίας και πράξης.

Στην πλήρη κατανόηση από μέρους του εκπαιδευτικού-ερευνητή του κοινωνικού και πολιτισμικού γίγνεσθαι

Μέσα από την πλήρη κατανόηση του κοινωνικού και πολιτισμικού γίγνεσθαι μπορούν να ανιχνευθούν προβλήματα, να δημιουργηθούν παρεμβατικές δράσεις και να προκληθούν διδακτικές αλλαγές. Η αλλαγή έρχεται μέσα από την καθημερινή δράση, για να αλλάξει ουσιαστικά η κοινωνία από μια εκπαίδευση, που δεν αποσκοπεί στον έλεγχο και στη χειραγώγηση αλλά στη χειραφέτηση και την αλλαγή (Μακράκη & Μακράκης).

Στην επίγνωση ότι η διδακτική παρέμβαση δεν αποτελεί μια μονοδιάστατη καινοτομία στο πλαίσιο της τάξης

Η Έρευνα Δράσης Χειραφετικού Γνωσιακού Ενδιαφέροντος δεν αποτελεί μια απλή διδακτική παρέμβαση ενδιαφέροντος με στόχο τη βελτίωση των πρακτικών αλλά έχει ως στόχο την επιδυμητή κοινωνική αλλαγή μέσω του μετασχηματισμού ή και της ανατροπής.

Στην αναστοχαστική διαδικασία σε όλη τη διάρκεια της έρευνας

Πορεία και Στάδια Έρευνας

Το πλαίσιο το οποίο στηρίχτηκε η ανάπτυξη συγκεκριμένων σταδίων και η πορεία της έρευνας δόθηκε μέσα από την απάντηση των ερωτήσεων (Μακράκη & Μακράκης, 2007):

Πού βρίσκονται και τι γνωρίζουν οι μαθητές/τριες για το θέμα;

(δόθηκαν ερωτηματολόγια, έγινε καταγραφή απόψεων, συμπληρώθηκαν σημασιολογικοί χάρτες)

Τι θέλουν και τι χρειάζεται να μάθουν;

(αναστοχαστική δράση, εκτίμηση και αξιολόγηση των καταστάσεων, κοινωνιολογική ερμηνεία, εκπαιδευτικοί στόχοι που συσχετίστηκαν με συγκεκριμένες κοινωνικές αλλαγές και μετασχηματιστικές δράσεις)

Πώς θα φτάσουμε στην ικανοποίηση των αναγκών τους;

(σχεδιάστηκαν τα μέσα, τα υλικά και οι δραστηριότητες)

Πώς θα γνωρίσουμε εάν ικανοποιήθηκαν οι μαθησιακές ανάγκες;

(αξιοποίηση λογισμικού, ερωτηματολόγια).

Συμπεράσματα

Τα συμπεράσματα της έρευνας ταξινομήθηκαν στις παρακάτω βασικές κατηγορίες με τη χρήση δύο μεθοδολογικών τεχνικών.

- Συμπεράσματα μέσω συσχετισμού περιπτώσεων προ-ερευνητικής και ερευνητικής διαδικασίας
- Συμπεράσματα μέσω της συγκριτικής μελέτης των πορισμάτων της προ-έρευνας και των πορισμάτων της κυρίως έρευνας

Κατηγορία 1η : συμπεράσματα που αφορούν τη χρήση των τεχνολογικών εργαλείων για τη διδασκαλία εννοιών της Διαπολιτισμικής Παιδαγωγικής.

Σε όλες τις περιπτώσεις η χρήση των

τεχνολογικών εργαλείων σε δράσεις μετασχηματιστικού γνωσιακού ενδιαφέροντος λειτούργησε ως καταλύτης της παραδοσιακής τάξης αναδεικνύοντας το εποικοδομιστικό μαθησιακό πλαίσιο και ως μοχλός χειραφέτησης του δασκάλου απεγκλωβίζοντάς τον από παγιωμένες πρακτικές και προσδίδοντάς του ένα ρόλο πιο ενεργό μέσα από την αναστοχαστική μεθοδολογία. Η χρήση του αλληλεπιδραστικού πολυμεσικού υλικού τροποποίησε τον εκπαιδευτικό σχεδιασμό και διαμόρφωσε ένα νέο μαθησιακό περιβάλλον το οποίο στηρίχτηκε στον εποικοδομισμό και ενθουσίασε τα παιδιά. Οι μαθητές βίωσαν την εργασία σε ομάδες ως διαδικασία κοινωνικής συνεργασίας και αλληλεπίδρασης. Η μετατόπιση από ολόκληρο το σώμα των μαθητών σε μικρές ομάδες είχε σαν αποτέλεσμα οι μαθητές να γίνουν πιο διαλλακτικοί, πιο επικοινωνιακοί και λιγότερο ανταγωνιστικοί. Τέλος η χρήση της τεχνολογίας ως γνωστικό εργαλείο, για τη διδασκαλία μαθημάτων που καλλιεργούν την κοινωνική ευαισθησία και αλληλεγγύη, ενέπλεξε το μαθητή σε διανοητικού τύπου εργασία η οποία καλλιέργησε την κριτική σκέψη και την ανακαλυπτική μάθηση καθώς η γνώση η οποία παράχθηκε στηρίχτηκε στη διερευνητική εργασία και στην εξερεύνηση της πληροφορίας μέσω των πολλαπλών απεικονίσεων.

Κατηγορία 2η : συμπεράσματα που αποτυπώνουν την κατανόηση και τη διαπραγμάτευση εννοιών που κατά κύριο ρόλο αποτελούν μέρος της κοινωνικής γνώσης που αποκτούν τα παιδιά στη διάρκεια της κοινωνικοποίησής τους και συχνά εξελίσσονται σε προκαταλήψεις που αποτελούν τη βάση του φαινομένου του ρατσισμού και της ξενοφοβίας.

Μέσω της χειραφετικής δράσης που ανάπτυξαν οι μαθητές/τριες με την ενασχόλησή τους με το λογισμικό κατάφεραν να κατανοήσουν σε ικανοποιητικό βαθμό την κοινωνική λειτουργικότητα του στερεότυπου, να αναγνωρίσουν με υψηλό ποσοστό επιτυχίας τις στερεότυπες φράσεις στις δραστηριότητες και να εφεύρουν τις κατάλληλες αντισταθμιστικές δηλώσεις απέναντι στην έκφραση μιας στερεότυπης φράσης. Συνέπεια αυτής της κατανόησης υπήρξε η δυνατότητα να συνειδητοποιήσουν την αντίφαση και την ασάφεια που δημιουργεί η ατεκμηρίωτη γενίκευση και η άκριτη κατηγοριοποίηση και με ποιο τρόπο σταδιακά ενισχύουν την προκατάληψη και τη διάκριση ως στάση.

Κατηγορία 3η: συμπεράσματα που αποτυπώνουν τις αντιλήψεις και τις στάσεις των μαθητών απέναντι στο διαφορετικό και στη ετερότητα και που αποτυπώνουν το μέτρο αποδοχής «του Άλλου» από μέρους των μαθητών.

Αμέσως μετά την χειραφετικού τύπου δράση που πραγματοποιήθηκε με τη χρήση του λογισμικού τα στοιχεία που συλλέχτηκαν από τα ερευνητικά εργαλεία κατέδειξαν τα εξής: η διάθεση και η στάση των μαθητών/τριών μετασχηματίστηκε από αρνητική σε περισσότερο θετική απέναντι σε διάφορες μειονότητες τόσο σε επίπεδο κοινωνικό όσο και σε επίπεδο διαπροσωπικό δηλαδή στις καθημερινές συναναστροφές και φιλίες.

Κατηγορία 4η: συμπεράσματα που αποτυπώνουν την ικανότητα των μαθητών να αναγνωρίζουν το φαινόμενο του ρατσισμού σε εύρος και σε βάθος.

Οι μαθητές/τριες όχι μόνο έμαθαν να αναγνωρίζουν το ρατσισμό ως φαινόμενο, αλλά μπόρεσαν να διακρίνουν, ως ένα βαθμό, και τις επιπτώσεις του. Αυτό έχει μεγάλη σημασία στη συγκεκριμένη έρευνα γιατί κριτήριό της δεν υπήρξε μόνο η εννοιολογική προσέγγιση της λέξης «ρατσισμός» αλλά κυρίως η ανάπτυξη γνώσης για το πώς εκδηλώνεται ο ρατσισμός , η αναγνώριση καταστάσεων που υποθάλπουν το ρατσισμό και οι επιπτώσεις του σε προσωπικό και κοινωνικό επίπεδο.

Προτάσεις

Βαδίζοντας προς τη Διαπολιτισμική Παιδαγωγική

Η Διαπολιτισμική Παιδαγωγική μέσα από τη συνεχή δράση της παρέχει στα παιδιά την ευκαιρία να κατασκευάσουν από κοινού ηθικές αρχές δράσης και συμβίωσης και να αναθεωρήσουν ή αντίστοιχα να ενισχύσουν συγκεκριμένες στάσεις και αντιλήψεις και κυρίως να ευαισθητοποιηθούν σε κοινωνικά φαινόμενα.

Απευθύνεται σε όλους τους εκπαιδευτικούς που επιθυμούν να καταλάβουν την εγγενή ανομοιογένεια της σχολικής τάξης που αφορά στην οικονομική και κοινωνική προέλευση, στη γλώσσα, στο φύλο, στις διαφορετικές επικοινωνιακές, συναισθηματικές και μαθησιακές ανάγκες, στους διαφορετικούς ρυθμούς μάθησης, στις πολιτισμικές ιδιαιτερότητες - όπως είναι η θρησκεία ή οι συνήθειες (Δραγώνα Θ.)

Ένταξη και χρήση των τεχνολογικών εργαλείων στο μεθοδολογικό σχήμα της Διαπολιτισμικής Παιδαγωγικής

«Το κλειδί για την επιτυχία βρίσκεται στην εύρεση των κατάλληλων σημείων για την ενσωμάτωση της τεχνολογίας με μια νέα παιδαγωγική πρακτική, που θα προετοιμάσει τους μαθητές για τη ζωή τους στο μέλλον. Με άλλα λόγια, οι υπολογιστές και η άλλη τεχνολογία δεν πρέπει να αντιμετωπισθούν ως ανεξάρτητα εργαλεία με τρόπο τεχνοκεντρικό αλλά ως εργαλεία που είναι ένα αναπόσπαστο τμήμα της εμπειρίας και της μάθησης ενός παιδιού**»** (Strommen & Lincoln, 1992).

Χρήση της Έρευνας Δράσης στην καθημερινότητα του σχολείου

Η έρευνα δράσης ως μεθοδολογικό εργαλείο στοχεύει στην προσωπική ολοκλήρωση του εκπαιδευτικού αφού του παρέχει τη δυνατότητα να βελτιωθεί μέσα από την ανάπτυξη δεξιοτήτων συλλογικότητας και να αυξήσει την αυτοεκτίμησή του μέσω της εμπιστοσύνης στην εργασία του. Η ερευνητική εργασία κάνει τους εκπαιδευτικούς πιο ευέλικτους στη σκέψη τους και ανοιχτότερους σε νεωτερισμούς και καινοτομίες (Pine, 1981).

Χρήση των πορισμάτων της συγκεκριμένης έρευνας στην καθημερινότητα της τάξης

Η συγκεκριμένη έρευνα μπορεί να λειτουργήσει ως επιμορφωτικό υλικό στους εκπαιδευτικούς οι οποίοι δεν γνωρίζουν πώς να αξιοποιούν παιδαγωγικά τα τεχνολογικά εργαλεία μέσα στη τάξη και μέσα στην καθημερινότητά τους με διαφορετικό τρόπο απ΄ ότι τα άλλα εποπτικά μέσα και διστάζουν για αυτό να εμπιστευθούν τις ιδέες τους και να συμμετέχουν στη διαδικασία παιδαγωγικού σχεδιασμού και ανάπτυξης πολυμεσικών εφαρμογών.

Βιβλιογραφία

Γκότοβος, Α. (1998). Ρατσισμός- Κοινωνικές, Ψυχολογικές και παιδαγωγικές όψεις μιας ιδεολογίας και μιας πρακτικής, σελ.6-34, 66,ΥΠΕΠΘ, Γενική Γραμματεία Λαϊκής Επιμόρφωσης Αθήνα.

Δραγώνα Θάλεια, Η Διαπολιτισμική Εκπαίδευση http://www.e21.gr/articles_full.asp?ArticleID=209

Κατσαρού _ Τσάφος Από την Έρευνα στη Διδασκαλία. Η εκπαιδευτική Έρευνα Δράσης, Αθήνα 2003, εκδ. Σαβάλλας

Ν.Κ. Μακράκη και Β. Μακράκης , (2006), Διαπολιτισμικότητα και Εκπαίδευση για ένα Βιώσιμο Μέλλον, σελ.147-149, Εκδόσεις Πανεπιστήμιο Κρήτης

Knapp, L., Glenn, A., (1996) Restricting schools with technology. New York: Allyn & Bacon

Beyer, B.K. (1987). Improving student thinking: a comprehensive approach. Boston: Allyn & Bacon

Berson, M. (2000): Rethinking research and pedagogy in the social studies.The creation of caring connections through technology and advocacy. Theory and Research in social education 28(1),

Pine, G.J. (1981). Collaborative action research: The integration of research and service. Paper presented at the annual meeting of the American Association of Colleges for Teacher Education, Detroit, MI.

Strommen, Erik F. _ Lincoln, Bruce. (1992, August). Constructivism, technology, and the future of classroom learning. Education and Urban Society, 24, 466-476.

Woolfolk Hoy, A., _ Tschannen-Moran. M. Implications of cognitive approaches to peer learning for teacher education. In A. O'Donnell & A. King (Eds.)

X-RAY@εκπαίδευση

www.kesea-tpe.com