

**VIRTUAL CARTOGRAPHY –
SELF-DIRECTED
TEACHING /LEARNING SKILLS**

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While many cartographers believe in the unprecedented opportunities offered by the Internet to improve teaching and training, others are threatened by its size and by its somewhat chaotic and unstructured nature. To enhance our understanding of Web-Based Learning of Cartography, it is important to identify actual uses of the Web; in fact, to search thoroughly the potential variety of cartographic Websites (professional or popular), to organize it as an educational/logical device. The enclosed paper will illuminate and detect how cartographic Websites as learning environments may differ from previous/traditional computer-based instruction tools.

The title of the article contains three fundamental notions: **Virtual, Cartography and Self-directed Teaching /Learning skills**. The goal of the proposed framework is, therefore, to generate a new Virtual-Web course based on those 3 notions and construct it especially for students all over the world, each on with his spatial awareness, and according to his previous knowledge. **Virtuality**- exposes the students to the enormous potential concealed in the content of international and interlinked courses in Cartography which are updated, virtually connected, accessible, flexible and tied together on the web; **Cartography**- focuses on the scientific innovation and its disciplinary evolution; it concentrate in the latest news, while participating in forums of developers, lecturers and/or students. **Self-directed Teaching /Learning skills** -demonstrates the changes and improvements taken place in curriculum planning, instruction, teaching and training of Mapping/Cartography as a language and a communication intermediacy. It gives its attention to improve spatial analysis and its presentation. Application all the above notions to the Israeli students' needs and their spatial background, while demonstrate it in their closer space and to apply/ employ it in their own environment, to which they are aware of.

A. Virtual Cartography - Electronic Map Knowledge Distributor
Basic, Descriptive information

The World Wide Web (WWW) – is a huge content knowledge distributor. It is an interlinked and complex network of Information provider, which defines the components of our knowledge-based society. Its rapid evolvement is constantly and profoundly affecting the way people use information, communicate and learn. The web impact as a distributor of maps is remarkable. Especially it is powerful in spreading of popular, interactive, clickable and updated maps, which are opened to changes by the users -like travel and tourist maps.¹ Commonly to the open devices, there are many closed databases with which everybody can construct updated maps like weather maps for forecasting.²

1. Map knowledge Distributor:

Electronic distribution of maps through the Internet is quick, growing steadily and drastically. Individual web sites are responding to over 700,000 requests for maps in daily entries to maps' sites (e.g., GeoSystems, MapQuest). There are thousands of servers specializing in supplying maps, and the number grows constantly.³

Server	Cartography	Cartography edu. /ac.	GIS	Remote Sensing	Update
Yahoo ⁴	1081	194	84	8	3/99
Alta Vista ⁵	13,638 homepages, 52 counted as professional sites	92	239	164	3/2000
MSN	15,957 sites, 17,894 homepages, Privet and commercial advertising	6937 educational and academic sites	39,333	23,032	24/4/2001

Many cartographers focus on the technological improvements taken place in the computer communication area, emphasizing the web potential capacity. This potential is enormous, linked, complex, accessible, exchangeable and cheap. Large audiences of map consumers are encouraged to benefit this potential content

¹ <http://www.infohub.com/TRAVEL/traveller.html>; <http://www.delorme.com/cybermaps/>;
<http://www.library.nwu.edu/map/intgis.html>;

² <http://www.nws.noaa.gov/>; <http://wwwscas.cit.cornell.edu/landeal/climate.html>;

³ Peterson, M..P., (13/4/2000): "Cartography and the Internet: Introduction and Research Agenda", University of Nebraska at Omaha, in: <http://maps.unomaha.edu/NACISP26/article1.html>; and (1996): 'Trends in Internet Map Use', **ICA News**, International Cartographic Association, University of Aberdeen, **Proceedings**, p. 1635-1642;

⁴ <http://www.yahoo.com/geography/cartography>;

⁵ <http://www.altavista.com/cgi-bin/query?pg=q&sc=on&hl=on&q=cartography>;

knowledge rapidly. These quick adoptions influence the usage of maps' data, affect maps' communication modes and their ways of education and training. But, **quantity does not necessarily mean quality!** On the contrary, quantity might be an obstacle, because it is time consumer to search, and identify information and transfer it into knowledge. It is possible to channel or direct quantity into educational functions, thus improving the quality of maps' usage. In order to qualify the quantity of Electronic Map knowledge distributors, a **Basic and Descriptive Information** is needed.

2. Basic and Descriptive Information

This dimension includes basic information regarding the origin, creators, updating status, target population and relevant structural data of the site. This basic information is arranged in sub-categories:

- i. **Site Identification and Origin** - This category includes the site's name, URL and their affiliation (e.g. academic institution (edu/ac), public organization/ association (org.), government authority (gov.), private company (com.) or school), site author/creator and Language - or languages used in the site (Geographer/Cartographer/Surveyor; expert/specialist; teacher and/or student). Some of the cartographic sites are bilingual or multilingual, but very few are in local language.
- ii. **Site Updating and Evolution** - The variables in this category refer to the site's creation date, last updating, revising and sections that are still under construction.
- iii. **Site Size and Structure** - indicated by the number of html pages (using a scale ranging between a few pages and a couple of hundred pages). A huge site is not necessarily the best one. A short, focused, varied one might some time be more attractive and efficient.

The whole set of variables in the Basic and Descriptive dimension offers a view of preliminary characteristics of the site, which may serve for reference purposes and/or satisfy basic classification or grouping needs, prior to in-depth analysis of content-related features or educational configurations.

B. Cartography - Content Knowledge Distributor, Knowledge Attributes

The following chapter will focus on properly usage of the characteristics of **Cartography** – brings up-to-date developments, and relevant processes taking place in its scientific innovations.

Websites are first and foremost interactive storehouses for cartographic knowledge. While using a Web site, teachers make decisions about key issues, such as Ideas and Ideology of the cartographic knowledge, and the overall organization within which the knowledge is framed/ structured. The first one includes conceptual attitudes (regional, thematic framework), methodological positions (description, classification, qualitative/ quantitative analysis). The last one means ways used to present the above (media), or support offered for the efficient navigation through the knowledge space (navigation tools).⁶

1. Cartographic, Subject Matter Information Provider:

Learning processes include data manipulation functions.

- i. **Accumulation of Data** - generating, transmitting, storing, processing, documenting and retrieving of information. Gathering on-line products will broaden the cartographic horizon, like virtual courses in Cartography⁷, map and mapping⁸ and on-line atlases' production⁹ and usage¹⁰. The access to on-line resources may therefore qualitatively affect education (e.g. libraries¹¹, journals¹², museums¹³, and other public information repositories on the Internet¹⁴). Those on-line resources are represented in many ways: textual¹⁵, visual¹⁶, graphical, numerical¹⁷, dynamical, and auditory Websites¹⁸. Those presentations, not only affect recognition, identification and classification of data, they are in fact, intended to alternative studying strategies.
- ii. **Availability and Accessibility to Databases** (e.g., surveying¹⁹, datum, aerial and satellite images²⁰). The cartographer is able to retrieve, process, convert and invest efforts for his own purposes and needs.

⁶ Jacques, R., Nonnecke, B., Preece, J., & Mckerlie, D. (1993). Current designs in Hypercard: what can we learn? *Journal of Educational Multimedia and Hypermedia*, 2 (3), 219-237

⁷ Virtual Courses - <http://www.geog.ubc.ca/vqd/cartography/courses/courses.html>;
<http://www.geog.ubc.ca/vqd/cartography/courses/courses.html>; <http://www.utexas.edu/depts/grg/virtdept/main.html>;
<http://www.missouri.edu/~ludwig/137-98/index.html>; <http://www.csun.edu/~hfqeg005/cwq/>;
<http://www.geog.ubc.ca/vqd/cartography/courses/courses.html>;

⁸ Map and mapping - <http://www.library.yale.edu/MapColl/curious.html>; <http://tdc-www.harvard.edu/maps.html>;

⁹ Atlas production - <http://www.geod.ethz.ch/karto/projects/mmatlas/mma>;

¹⁰ On-line Atlases - <http://www.hammondmap.com/lame.html>; <http://www.3daldas.com/>; <http://www.delorme.com/cybermaps/>;
<http://www.nationalgeographic.com/maps/atlas/index.html>;

¹¹ Libraries - <http://www.library.yale.edu/MapColl/curious.html>;

¹² Journals - <http://www.p.iqg.ethz.ch/isprs/publications/journal/new/>;

¹³ Museums - James Ford Bell Map Collection URL: <http://www.bell.lib.umn.edu/Hist.html>;

Osher Map

Library: Jerusalem URL: <http://www.usm.maine.edu/~maps/>;

¹⁴ Public Resources - Agencies- <http://www.census.gov/>; The Central Intelligence Agency- <http://www.odci.gov/cia/>;
<http://www.library.nwu.edu/gpo/Cartography/>;

¹⁵ Textual - <http://www.csuchico.edu/~erovai/cartol.html>

¹⁶ Visual, Graphical- <http://hera.eecs.berkeley.edu/~ilpbook/95.15.graphics.html> ;

¹⁷ Numerical/analytical - <http://ncl.sbs.ohio-state.edu/home.html> ;

¹⁸ Dynamical and auditory-multimedia Websites - <http://www.ccs.queensu.ca/qtv/av1.html> ;
http://lm.ucdavis.edu/NMC/Justification_Doc_HTMLs/Appen ;

¹⁹ Datum, surveying – see comments no. 2, 13 and 19 above.

In other words, to invest in profundity within cartographic developments, instead of expansion of databases for map design. For instance, improving generalization process, symbolization procedure and graphic presentation and visualization.

- iii. **Relevancy, Actuality, and Interactivity.** Bearing the rapid changes, occurring in our 'real' and virtual world, emphasizes the urgent need for modern and computerized tools. However, some web sites are not frequently updated; others are under construction or reconstruction and they are not relevant anymore; other's move with their producers to different addresses, and are consequently closed for interactivity. It is not appropriate, sometime unsuitable or difficult to use a site with no identification, affiliation, address, author, and reference or revised date.
- iv. **New Databases** in existing subjects or in new categories are created and stored in Geographic Information Systems. Those are connected, interlinked and are creating endless overlaid databases, especially fitted for spatial analysis.²¹ The cartographer faces a dilemma in resolution: either, deepening in one layer and improving its visualization; or, broadening in many compiled layers and making multiple analysis among them.
- v. **Representational Structure and Means** - identify the organizational template underlying the knowledge stratum (e.g., whether it reflects a linear, branching, or a Web-like structure). These variables refer to the media used for representing the knowledge (e.g., text²², still/static image²³, dynamic picture²⁴, interactive form²⁵ or animate²⁶ and sound) and the frequencies of their respective uses in a site. A cartographic website should fundamentally consist on dynamic/clickable maps rather than use of motionless devices (e.g., textbook)²⁷. With a paper format, as a matter of fact, everybody can study/teach everywhere; while with a website it is restricted to connection facilities.

2. Communication facilitator:

Computer-Mediated Communication (CMC) constitutes a powerful interaction means (e.g., e-mail, group conferencing²⁸, forum, and ICQ). It allows students to communicate with peers, teachers, and experts and also conduct collaborative work.²⁹ This is a powerful tool for interaction, discussion, rapprochement and debating among specialists, colleagues, co-authors of an article, or commissions, sharing common ideas³⁰. As such, it is characterized by a wide set of properties related to people's interaction with knowledge and with other people - and this, obviously, also raises key cartographical-educational issues.

- i. **Types of Tele-Learning** - The first category focuses on the different patterns which distance learning via technology may take. These patterns include learning situations such as: **tele-information**- transfer and handling, varied transaction modes among students with/without tutors (via e-mail, chat-rooms or discussion groups). **Tele-interaction**- distant performance of actions or operation of physical systems (tele-manipulation, tele-creation)³¹.
- ii. **Types of Communication** - The design of the learning environment in a Website may include synchronous as well as a-synchronous activities. It is also relevant to identify the kind of information conveyed in synchronous mode. Accordingly, the essential or constituent elements of the Web are the links. (1) **Links** among units of information are functioning as indicating free associations, structured categorization, logical chains or causal relationships. The appropriate identification of these functions, as well as of the link addressee's qualities, seem to be important conditions for mindful travel in the Web's knowledge space.³² (2) The last category in this dimension is **Communication Means**. It focuses on the technical means and formats by which communication is supported in a Website.

²⁰ GIS- <http://www.spatial.maine.edu/~max/cacmgis.html> ; http://www.cgrer.uiowa.edu/servers/servers_references.html#interact;

²¹ Cartography linkages - <http://www.csun.edu/~hfqeg005/cwg/cartsite/cartsite.html#Cartography>;

²² Text - **Pedagogy** Purpose and Design The challenge for our profession in regard to electronic texts is one of theorization and design: <http://www.ucet.ufl.edu/~bruegg/nassr/nassrpedagog>

²³ Static image - <http://www.nws.noaa.gov/>;

²⁴ Dynamic picture - <http://wwwscas.cit.cornell.edu/landeal/climate.html>;

²⁵ Interactive form - <http://www.fsl.noaa.gov/frd-bin/MAPS.homepage.cgi>;

²⁶ Animated - <http://www.hammondmap.com/lame.html>;

²⁷ ICA commission for cartographic education and training's (CET) decision

²⁸ Group conferencing - E-Mail Discussion Group on the History of Cartography

<http://kartoserver.frw.ruu.nl/HTML/STAFF/krogt/maphist.htm>

²⁹ Berge, Z. (1995). Computer-mediated communication and the online classroom in distance education: from marks in the sand to computer conferencing via optics. In Z. Berge, & M. Collins (Eds.), Computer-mediated communication and the online classroom. Cresskill, NJ: Hampton Press; Berge, Z. L., & Collins, M. (Eds.) (1998). Wired together: The online classroom in K-12. Cresskill, NJ: Hampton Press.; Harasim, L., Hiltz, S., Teles, L., & Turoff, M. (1995). Learning networks: A field guide to teaching and learning online. Cambridge, MA: MIT Press;

³⁰ Collaborations-Harasim, L. (1993). Collaborating in cyberspace: Using computer conferences as a group learning environment. Interactive Learning Environments, 3(2), 119-130.

Papers - <http://wings.buffalo.edu/~plewe/paperwww.html> ; <http://wings.buffalo.edu/~plewe/paperwww.html>;

<http://www.ncsa.uiuc.edu/SDG/IT94/Proceedings/Autools/p>;

³¹ Interactions - <http://www.utexas.edu/depts/grq/virtdept/contents.html> ;

<http://www.geog.ubc.ca/vgd/cartography/courses/courses.html>;

<http://www.missouri.edu/~ludwig/137-98/index.html>; <http://www.csun.edu/~hfqeg005/cwg/>

³² Links - Resources site - <http://geog.gmu.edu/projects/maps/cart2.html#edu> ;

<http://geog.gmu.edu/projects/maps/cartogrefs.html> ; <http://www.geosys.com/> ; <http://www.mapfacts.com/>;

This second dimension in cartographic roles- **Communication Facilitator** - unveils both the unique and particular as well as the obvious and banal communication -related features of an Cartographic site. On one hand, communication is what most characterizes the technology, and Cartographic sites aim to accomplish this potential in rich and varied ways. On the other hand, site developers may miss this potential by adopting only the technique while replicating practices which were already successfully implemented in pre-Web technologies. In such a case, no Cartographic added-value of communication features is obtained. Mapping the location of proposed Web-based activities between the banal and the unique, is at the core of the communication issue³³.

3. Creation Environment Supplier:

A considerable number of user-friendly tools for the creation of Web-deliverable materials are currently available. These tools support students' creativity and initiative, allowing them to generate and publish their own Web units, without mediators and with minimal technical assistance.³⁴

- i. **Starting Point** – it is possible to start cartographic teaching/ learning in each educational level, from kindergarten to higher grades, along with the convertibility of its communication capacities.³⁵ It presumes a start-up from a basic and former cartographic knowledge.
- ii. **Thematical Selection and Preference** – virtuality and interactivity enable several thematic preferences. There are no synchronic sequences, progressive or modular evolution of knowledge.³⁶
- iii. **Accessibility and Flexibility in Unit Planning** – The inner structure of any cartographic subject, presented in a flow chart, can/may be different.³⁷
- iv. **Independent/Individual Study** – the virtual course states the framework, within it each student studies autonomously, according to his basic knowledge, ability, and previous experience of map use.
- v. **Interactive learning** – the interaction can exist among the students, teachers and experts. They can operate within a forum of discussion and be co-instructed under the supervision of a mediator.

It seems clear that these functions of the Internet may affect the way of education. There is a debate however, whether the technology will help solving the fundamental problems of teaching, learning and training of Cartography, or will it create new ones? Will it improve the quality of learning?³⁸ Skeptical voices have been heard recently, suggesting that the capabilities of the Web are simply extensions of the existing software capabilities. Moreover, the advantages of using the Web are merely a matter of efficiency and scope rather than unique contribution that could fundamentally alter relationships among learners, teachers and curriculum planners.³⁹

C. Virtual Education, Self-Directed Teaching, Training and Learning of Cartography

Three main ideas are in the theoretical basis of this chapter:

The first idea is creating the **Pedagogical Colloquium**, while taking teaching seriously.⁴⁰ This pedagogical curriculum is based on problem solving, and is built as case study for teacher, pedagogical as well as professional ones.⁴¹ This idea will go side by side with the web-site construction, as an educational device to improve learning.

The second idea is based on Shulman's most recent researches and writings, in which he had emphasized the importance of "**teaching as community property**".⁴² The content of his notion is the basic knowledge for Teacher Resource, Instruction and Community Center in this paper. Moreover, he focuses on a special input on the central role of a "scholarship of teaching" in supporting needed changes in the cultures of higher education⁴³. The educational/ cartographic web

³³ Cartographic communication - <http://www.odu.edu/~allen/cartlinks.html> ;

³⁴ Creation sites - <http://ourworld.compuserve.com/homepages/mgis/>

³⁵ K-Education: 5-k mapping -<http://world.std.com/~mapping/index.html>; middle school mapping - <http://world.std.com/~mapping/index.html>; <http://7-12educators.tqn.com/msub29.html>; <http://mapping.usgs.gov/www/html/1educate.html>;

³⁶ Selection & preference: (CS, GIS, GPS, DRG, DLG, DEM) ³⁶<http://www.maps-eureka.com/digital.html>;

³⁷ see comment 46;

³⁸ Owston, R. D., (1997). The World Wide Web: A technology to enhance teaching and learning? *Educational Researcher*, 26(2), 27-33;

³⁹ Windschittl, M., (1998). The WWW and classroom research: What path should we take? *Educational Researcher*, 27(1), 28-33;

⁴⁰ Hutchings, P.(1997): "The Pedagogical Colloquium: Taking Teaching Seriously in the Faculty Hiring Process" *To Improve the Academy* (16): 271-294;

⁴¹ Silverman, R., W. Welty, and S. Lyon (1996): *Case Studies for Teacher Problem Solving, 2nd ed.* New York: McGraw Hill;

⁴² Cerbin, W. (1996): "Inventing a New Genre: The Course Portfolio at the University of Wisconsin-La Crosse." *Making Teaching Community Property: A Menu for Peer Collaboration and Peer Review*, by Pat Hutchings, Washington, DC: in The American Association for Higher Education. (AAHE) Teaching Initiatives: Publications <http://www.psu.edu/celt/portfolio.html> Shulman, L., (1993): "Teaching as Community Property: Putting an End to Pedagogical Solitude" *Change*, 25 (6): 6-7;

⁴³ <http://ultibase.rmit.edu.au/Articles/bibliography/shulman.html>;

site, therefore, has two main roles: as a teacher Resource Center and a community property, and as an Instruction & training delivery arbitrator.⁴⁴

Third idea is based on the term **self direction** which refers to four distinct (but related) phenomena: a personal attribute (personal autonomy); the willingness and capacity to conduct one's own education (self-management); a mode of organizing instruction in formal settings (learner control); the individual, non-institutional pursuit of learning opportunities in the "natural societal setting" (autodidaxy)⁴⁵.

In its broadest meaning "self directed learning" describes a process in which individual students take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human, material or virtual resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. Meaning, each student is responsible for one methodological/ pedagogical unit in the cartographical subject presented.⁴⁶

1. Teacher Resource Center and a Community Property:

A large number of educational/cartographic resources is available on the Web, from raw materials which may serve as building blocks for lesson plans, to complete learning units and curricular solutions⁴⁷. Teachers face a broad scope of options, from adopting and adapting existing materials to generating and contributing new Web-materials on their own. The main idea is to enable students to take responsibility for their own learning. The purpose of this chapter, however, is to focus on pedagogical features of sites, which were explicitly designed for education.⁴⁸ The pedagogical variables aim to unveil these features, allowing us the estimation of the developers' stance regarding the nature of the instruction elicited by their site. The following variables are organized in categories fitted to the **educational aims and objectives of learning processes**⁴⁹. The latter are configured while designing a teaching portfolio in inquiry-oriented style. For the purposes of this paper, they serve for illustrating the combination between Cartography and teaching. Those target-learning processes and self directed teaching/ learning would be used to demonstrate the pedagogical unit plan and the self directed teaching/learning (ch. D):

- i. **Relevant and Actual Event** – the Pop pilgrimage to the Holy Land in the millennium (year 2000);
- ii. **Formulating a Problem-Oriented Question**, posing a dilemma or a debate- what world are we leaving/teaching in? Is the world surface Spherical/flat? Is it 3dimensional/plane? 'Real'/virtual? Physical/topical?
- iii. Preferring a **Theoretical Framework** - P. Dana's projection site⁵⁰, in which he designed a 5d interconnection among projections: Types of (geometrical, pseudo), kinds of data (numerical, graphical...), conformity (distance, direction), osculation and positioning;
- iv. **Designing a Flowchart** with logical connections/linkages. There are many projections' sites, in each one of them the starting point is different, having a distinct inner structure;⁵¹
- v. **Dismantling the Problem into its Multipliers, Formulating Sub-titles**, by wording secondary questions, underlying the sub-titles of the research of earth (shape, size or spatial presentation);
- vi. Proceeding from the most straightforward way of knowing something - **Data Acquisition/ Retrieving (A.2i)**. The sites' activities, presentations and alternative studying strategies offered in it;

⁴⁴ Barr, R.B. and J. Tagg. "From Teaching to Learning: A New Paradigm for Undergraduate Education", *Change* (4): 13-25 (November/December 1995). Stillwater, OK: New Forums Press and the Professional and Organizational Development Network in Higher Education, 1997;

⁴⁵ Candy, P.C., What is Self-Directed Learning, in *Self-Direction For Lifelong Learning*. 1991, Jossey-Bass: San Francisco. p. 5 - 23. <http://www.clt.uts.edu.au/learning.html>

⁴⁶ Knowles, M., Inquiry Project No. 2: What is Self-Directed Learning? in *Self-Directed Learning: A Guide for Learners and Teachers*. 1975, Cambridge Adult Education: Prentice Hall Regents: Englewood Cliffs, NJ. p. 18 – 22; <http://www.iinet.net.au/~healthcd/aself.htm>; <http://www.clt.uts.edu.au/learning.html>

⁴⁷ Educational - <http://ultibase.rmit.edu.au/Articles/bibliography/shulman.html>; <http://www.psu.edu/celt/portfolio.html>;

⁴⁸ Riel, M. (1993). *Global education through learning circles*. In L. Harasim (Ed.), *Global networks - computers and international communication*, Cambridge, MA: MIT Press;

⁴⁹ Bloom, B.S.(1956): **The Taxonomy of Educational Objectives: The Cognitive Domain**, MacKay, New-York; He proposed his taxonomy (or categorization) of cognitive learning in the early 60's, and it has proved itself over time. Since then, various educationists have developed sets of verbs associated with each cognitive level, which could be expected of students who have reached that level of understanding;

⁵⁰ Projection-P. Dana's site - <http://www.utexas.edu/depts/grq/gcraft/notes/mapproj/mapproj.html>;

⁵¹ <http://www.geo.hunter.cuny.edu/mp/>

- vii. Continuing with the comprehension path of classifying/ordering and processing the given **Learning Resources (A.2ii)**. Their Skills, Qualifications and Understanding are influenced by the student/teacher starting point. The variables in this category aim to unveil the scope and variety of resources embedded in the site's design. An additional goal is to identify if learning resources are constrained to the Web-site materials, or whether these are complemented with external physical resources (e.g., modeling kits for performing "real tasks guided by 'virtual' instruction") and/or human resources (e.g., peers, teachers, [A.3i, ii]);
- viii. Through **Modeling Hypothesis**, presentation of possible solutions. Present potential answers, verification, falsification or contradiction. Presentation of possible solutions after a complex **Analysis** of study's results and present them graphically (A.3vi, v). Ending with **Integration and Synthesis** of various types of information handling⁵².
- ix. Following **Decision-Making** processes, drawing **Conclusive Remarks**. Formulating new rules to engrave alternative regulations about different generalizations, which might lead to challenge the traditional-theoretical attitude;
- x. Tracing **Creative Activity or Invention**⁵³, planning a new projection according to a new concept and a newborn theoretical approach. Construction of a new version of a projection, like the multi-focal projection, and it's alternative usage⁵⁴
- xi. The last and the most sophisticated and complex objective - **Critical Evaluation**,⁵⁵ feedback and assessment – The wide range of didactic configurations of Websites (e.g., from highly structured worksheets to broadly open-ended inquiry activities), poses a serious challenge to the design of evaluation resources. The variables in this category aim to elucidate whether evaluation means were included in a Web site, and to identify the evaluation model behind these means (e.g., from standardized Tests' to alternative evaluation). The goal is to constitute a reasonable representation of the pedagogical model guiding the development of the site, and the way different concrete components reflect and realize this model.

2. Instruction and Training Delivery:

Numerous Websites provide educational activities and courses for all grade levels in a large number of subjects.⁵⁶ The conception of the Web as a learning environment is gaining more and more adherents, and is instantiated in varied forms, (e.g., distant learning courses⁵⁷ and even degrees⁵⁸, collaborative learning projects⁵⁹, virtual environments for complementary and informal education). The former summarizes as follows:

- i. **Instructional Configuration** - A set of variables aimed to identify the learning mode, or compound of modes in the site (e.g., individualized, collaborative), and whether these are confined to Web-only resources or they also link to additional external resources (e.g., local library⁶⁰, visits and tours⁶¹);
- ii. **Instructional Model** - variables, aimed to detect the developers' conception of the learning process within the Web-site (e.g., directed and hierarchically organized, inquiry-oriented, open-ended);
- iii. **Instructional Means** - The rapidly changing technology offers an impressive range of possibilities for the development of instructional resources. The variables in this category indicate the presence in the site of these resources (e.g., hypermedia database, virtual 3D environments, or on-line student-modeling and adaptive mechanisms)⁶²;

While many educators believe in the unprecedented opportunities and potential offered by the Internet to enhance education, others are intimidated by its somewhat chaotic and unstructured nature. The unlimited freedom, the overwhelming amount of information and the possibility for anyone to take part in the creation of knowledge, may become a barrier in fulfilling the perceived potential.

The educational community has experienced many ups and downs in its attempt to create coexistence and synergism with the evolving information technologies. This community has to realize that the Internet, thirty years after it was created and four years into its massive use and commercialization, is still unstable

⁵² Berenfeld, B. (1996). Linking students to the infosphere. *T.H.E. Journal*, 4/96, 76-83;

⁵³ Silverman, R., W. Welty and S. Lyon. *Case Studies for Teacher Problem Solving, 2nd ed.* New York: McGraw Hill, 1996; *Introduction to Education Cases for Teacher Problem Solving*. New York: McGraw Hill, 1994; *Primis Education Series: Case Studies for Teacher Problem Solving*. New York: McGraw Hill, 1993-1996.

⁵⁴ Shlomi, E., (1978): "Polyfocal Projection for Statistical Surfaces", *The Cartographic Journal*, Vol. 15, No.1, June 1978;

⁵⁵ <http://www.nene.ac.uk/oesd/th1expo.htm> ;

⁵⁶ Hackbarth, S. (1997). "Integrating Web-based learning into school curriculum", *Educational Technology*, 37 (3), 59-71.

⁵⁷ <http://www.geog.ubc.ca/vgd/cartography/courses/courses.html>; <http://feature.geography.wisc.edu/woodward/courses.html>;

⁵⁸ <http://www.geo.swt.edu/programs/masters/cartgis.html>;

⁵⁹ collaborative learning – see comment no. 41

⁶⁰ Local library - <http://virtual.tau.ac.il> ; http://www.oranim.macam98.ac.il/geo/geo_main.html; Geobase@vms.huji.ac.il ; <http://yael@cqb.gov.il>;

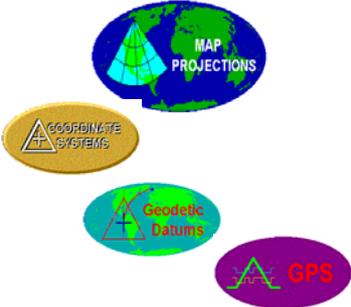
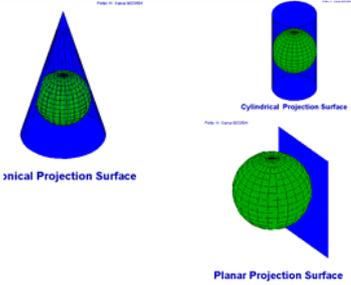
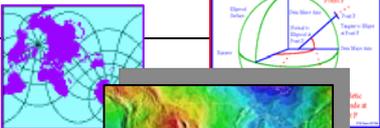
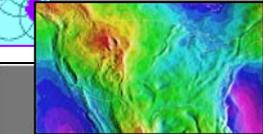
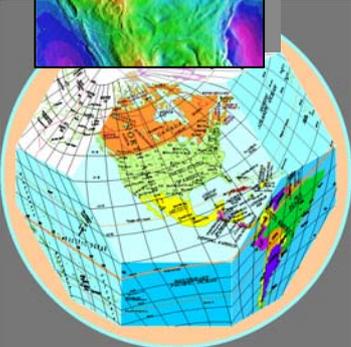
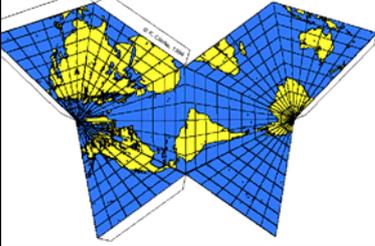
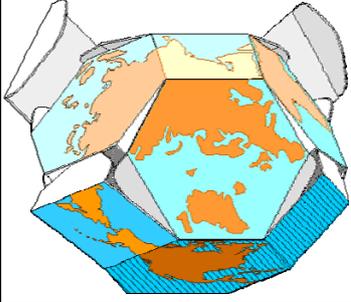
⁶¹ Visits and Tours - <http://tel-aviv@gov.il>;

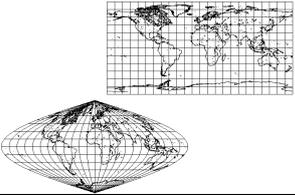
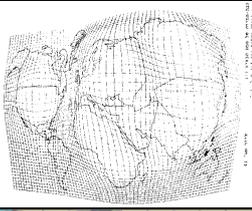
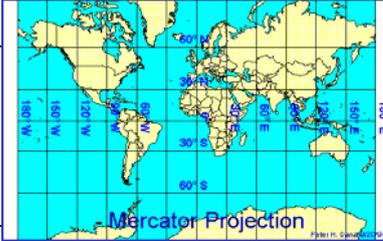
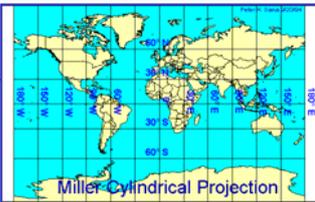
⁶² See comment no. 1

and rapidly changing. Its major effect on the life of societies and individuals is yet ahead of us, and its influence on the educational system is yet to be explored.⁶³

⁶³ Dede, C. (in press). Emerging technologies and distributed learning. *The American Journal of Distance Education*

D. Application to the Spatial Background
Matching all the mentioned notions to the Israeli students' needs

	The Pop pilgrimage to the Holy Land in the millennium	Relevant and Actual Event
	What World are We (WWW) teaching in? Is the world surface spherical/plane? Is the world surface 'real' / virtual?	Formulating a Problem-Oriented Question
	He designed a 5d interconnection among projections	Theoretical Framework – P. Dana's Projection site
	Describing Logical connections/linkages	Designing a Flowchart
	Wording secondary questions, underlying the sub-titles of the research of earth (shape, size or spatial presentation)	Dismantling the Problem into its Multipliers, Formulation Sub-titles,
	The sites' activities, presentations and alternative studying strategies offered in it	Data Acquisition / Retrieving
	Skills, Qualifications and Understanding are influenced by the student/teacher starting point	Classifying/Ordering and processing the given Learning Resources.
	Present potential answers, verification, falsification or contradiction	Modeling Hypothesis presentation of possible solution.
		
	Possible alternative to solve the presented problem; interpretation	Decision-Making processes, Conclusions

		
	<p>Construction of a new version of a projection, like multifocal projection and their alternative usages</p>	<p>Modeling Hypothesis, Creative Activity or Invention</p>
		<p>Drawing Conclusions Formulating new rules to engrave alternative regulations about different generalizations</p>
	<p>standardized Tests' to alternative evaluation</p>	<p>Critical Evaluation feedback and assessment</p>

E. The Importance of Virtual Cartography, Education and Teaching

Special emphasis is placed in the virtual course in Cartography and in its principles. This, in light of the technical innovations that computers' software and their systems supply. Accessibility and flexibility in updating databases and the speed of absorbing its products, caused many problems. Those products vary from being maps (in different scales, in several sizes and no longer limited to sheet's format);⁶⁴ or images of maps (aerial-photos, orthophotos, radar and satellites images)⁶⁵ or/and alternatives to maps (cartograms, drawings, sketches, graphs etc.)⁶⁶. Most of those graphic expressions are not maps at all, they are graphic alternatives which take maps' place in presenting spatial phenomena and processes.

The distinction among those graphic products is important to Cartography as a science. A map is not just a spatial database, but a concept and a language in the discipline of spatial information. A map is more than merely a general, graphical and casual representation; It delivers spatial messages and as such, it has a communication function.

'Cartography is defined as a scientific domain which is dealing with the conception, production, dissemination and study of maps'.⁶⁷ Adoption/adaption of this definition brings up the outline of 'What is a Map?'.⁶⁸ In what ways or characteristics a map differs from other spatial/ graphical presentations? The answers are crucial to understand the conceptual attitude of Cartography as a whole and its products in particular. Wrong conceptual attitude will cause unsuitable graphic expressions which may represent mistakenly spatial/functional relationships.

This article focused into aspects of Cartography: its vitality, its scientific basis and its educational approach. The article emphasizes on the process of teaching Cartography through the internet and its unique way of accumulation and distribution of knowledge. It underlines how the web is not merely another educational mean, but another way of teaching and learning. The power of the web as an educational promoter of knowledge can act both ways: either, enhance and improve cartographic understanding and skills; or, scattering unqualified knowledge, data or graphic illustrations.

⁶⁴ US Digital Atlas & Do-It-Yourself Tiger 95/97 -<http://www.mapdata.net/0202.htm>;

⁶⁵ <http://phoebe.cair.du.edu/~shick/gis.html> ;

⁶⁶ <http://www.utexas.edu/depts/grg/gcraft/contents.html>;

⁶⁷ See coment no. 4, Board C., (Nov. 1996): **ICA News**, International Cartographic Association, University of Aberdeen, *Proceedings*, p.1; Personal Thoughts, Michael Wood-President of ICA ; <http://pcuf.fi/~rta/sks40es1.html>;

⁶⁸ Vasiliev I., Freundsuh S., Mark D. M., Theisen G. D., and McAvoy J., (1990): 'What is a Map?', *The Cartographic Journal*, Vol. 27, pp. 119-123;