An Israeli model of a Networked Teachers' Training Center (NTTC) for implementation of Information Technology (IT) in curriculum development

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Abstract
This article suggests a philosophical framework for an Israeli model of a computerized Networked Teachers' Training Center (NTTC). It describes a community model being developed by a local community and the Education Ministry of Israel. The article clarifies the mission statement of the NTTC. It delineates what is being done in training three groups of teachers in three disciplines: science, mathematics and literacy through a rich Information Technology (IT) environment. It provides an evaluation of this initial phase and draws the multidisciplinary approach of the center for a communal curriculum development as its second phase.

Keywords
Information technology (IT), training, teachers, networked centers, curriculum development

1 INTRODUCTION

The committee for scientific technological education recommended in its report (Harari 1992) to the Israeli Ministry of Education to establish regional support centers for the study of mathematics, science, technology and computers. These centers would be set up by subject matters, and would be equipped with all the necessary means of communication - computer communication and other audio-visual means - in order to assist teachers in their developing needs (Recommendation D/6).

The 'Tomorrow 98' staff, which was set up in the Ministry of Education to realize the Harari Committee recommendations, published a list of principles and goals and called upon local communities to suggest programs and 'creeds' for regional teachers' centers on the basis of the committee's recommendations. The staff called on them to propose programs for cooperation between the staff and interested municipal forces.

Following the manifesto of the 'Tomorrow 98' staff the education department of the Ramat Hasharon city initiated an educational program for a networked community teachers' center.

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This article describes the goals of the center. It describes the proclamation of its mission as drafted by the steering committee in cooperation with the local authorities and the 'Tomorrow 98' staff. It clarifies the philosophical basis and community 'creed' for the goals defined, and reports on the results of the evaluation of Stage 1 of the project.

The 'Tomorrow 98' staff of the Ministry of Education is conducting an evaluation procedure separate from that being conducted by the center. The staff is assaying the project as a possible prototype for future centers that it will be involved in setting up. The results of the evaluation procedure published here are those of the center. These results indicate impressive achievements in the areas of knowledge that were studied in Stage 1 (academic year 1995-96) and a very positive attitude toward it on the part of the teachers who participated.

2 KNOWLEDGE BASED TEACHERS' CENTER

In order to formulate an objective for the networked community teachers' center in Ramat Hasharon, the steering committee met to discuss the creed of the center.

The rate of change to which we are witnesses in the basis of human knowledge requires a more comprehensive philosophical framework which will answer to the character of the changes which the teachers are facing and to which they will have to educate their students

It is customary to refer to the present era as 'The Information Age'. However, there are those who claim (Harkins 1992, Perelman 1993) that we are entering a different era - the Knowledge Age. It is not sufficient, in the Knowledge Age, just to have skills and training for accessibility to information in order to have an advantage over others. The Knowledge Age argues for the need for skills to achieve a successful application of information in real time. Those who possess skills for gathering information in real time, analyzing it, classifying it, and organizing it with new meaning are the ones who will acquire social, cultural, and economic advantages.

The main intellectual activity will be in increasing the value of the available information. Therefore, education in this age must focus on 'knowledge' - successful application of information in correct timing. In previous generations the isolated elite had to handle information that was voluminous and complicated in order to direct the efforts of people to improve their living conditions. These efforts took place in relatively small communities. In the Knowledge Age, on the other hand, information in imaginary amounts can be available to many who will compete globally in its use. In order for human society to succeed in directing its efforts and improving living conditions efficiently it will need a considerable number of students, citizens, and thinkers who will make their contribution such that they will be able to contribute additional human, ethnic, and special cultural value to existing information (Passig 1995).

Education in the Knowledge Age must assist in shaping students to be capable of making information into knowledge. In order to train teachers to manage an educational environment which will enable converting information to knowledge, it is only natural to set up a supportive environment that will enable teachers to train themselves and to try out the learning processes which transform information to knowledge. We must do more than just to build a supportive environment for teachers which trains them mainly to access and deal with information, as being done in Europe (1995, Veen Bruce 1995) and in the USA (Welch 1995).

The general goal of the community support center for teachers in Ramat Hasharon in the Knowledge Age aspires, therefore, to train and spur teachers to create a learning environment that will itself train and spur students on the one hand to turn the learning experience into

useful, practical and personal knowledge, and on the other hand will train them to present the results of the personal learning experience to others as new information.

3 THE MISSION OF THE RAMAT HASHARON NTTC

The mission was formulated as follows:

"The networked center for teachers in Ramat Hasharon will work on developing innovative skills and talents for teaching in computerized work environments in professional and multifarious fields of knowledge.

The center will train the teachers of the community to integrate the use of information resources in the processes of teaching/learning, to assemble collections of computerized learning materials for colleagues in the community, and to develop community information resources on special subjects.

The networking system that the center will operate will enable access to materials and discussions between groups of colleagues.

The center will develop and accompany leading teachers who will serve as agents of change for teaching in computerized environments in the schools of the community. The areas of knowledge in the center are: sciences, mathematics, literacy, and IT."

The Networked Teachers' Training Center was set up during the first three months of the running-in of the project (September-December 1995). The regional networks known as BBS are more suitable to defined professional communities. They are separate from world networks, such as Internet, which are connected to millions of users with access certification all over the world. The regional networks are intended for a more limited number of users for designated purposes. They offer quicker, more economical and more efficient services which can be independently run according to predefined needs. Therefore, they are especially suited for educational needs.

4 TRAINING ARRANGEMENT

Since the Ramat Hasharon support center aspires to train the educational community for the construction of knowledge and information, and since the accord of teacher colleagues supports the process of knowledge construction, the training of teachers in the center itself was put into the declaration of goals.

In Stage 1, 41 teachers are taking advanced study courses in frameworks of 240 hours, six instructors in various fields, and a steering committee. The steering committee consists of an academic advisor, the project manager (director of the education department of the Ramat Hasharon Council), a pedagogical coordinator, and five subject matters heads. All of them, 55 in all, were equipped with color computer notebooks loaded with various software packages and communication tools. The teachers were motivated to take the computers home and use them for their personal needs too. The teachers in Stage 1 were chosen from elementary and junior high schools. In Stage 2 (academic year 1996-7) the NTTC will include high school and kindergarten teachers. In Stage 1 the center is open one day a week. In Stage 2 the center will extend its operation for additional days in accordance with the number of participant teachers.

Table 1 Stage 1 Participants

Field	*Instructors*	*Elementary teachers*	*Junior high teachers*	*Total teachers*	*Hours*
Mathematics	2	8	8	16	240
Literacy	2	9	6	15	240
Sciences	2	6	9	15	240

The teachers participating in Stage 1 were chosen from fields of knowledge which were recommended by the Harari Committee and those being taught in the schools - sciences, mathematics, literacy, and IT. The training of teachers in new learning methods and materials in each field was turned over to national leaders developing modern teaching materials.

4.1 Mathematics

The advanced study courses in mathematics were taught by the mathematics staff of the Weizmann Institute headed by Dr. Rina Hershkovitz and Dr. Alex Friedlander. The courses focused on a number of channels.

Elementary school teachers - use of calculators and computers on the basis of a deeper understanding of mathematics. Another view of mathematics as profession composed of authentic problems. Geometry teaching methods in combination with varied means and graded applied problems.

Junior high school teachers - Learning methods with interactive IT. Organizing the learning process in a computer integrated classroom. Alternative ways of evaluation in teaching mathematics with IT.

4.2 Sciences

The advanced study courses in the sciences were conducted by Dr. Sarah Klachko. The courses focused on a number of channels.

New materials - Deepening the knowledge of the teachers in two subjects in the sciences - ecology and energy.

Continuity of learning - Building a continuity of learning from the elementary to the junior high schools with the two chosen subjects.

Preparation of learning materials - Preparation of activities in the chosen subjects and setting them up in the network.

4.3 Literacy

The advanced study courses in literacy were conducted by the literacy staff of the center for literacy in Levinsky College, headed by Dr. Hanna Ezer. The courses focused on two channels.

Literacy teachers - Deepening the knowledge of the teachers in the didactic field of literacy and exposure to computer applications in teaching literacy. Special emphasis was placed on the formation of the concept of their function as literacy advisers to teachers in various subjects.

The teachers in general - In the plenum meetings all the teachers studying in Stage 1 were exposed to theoretical and practical problems in literacy and IT.

All the teachers also received training in a variety of computer applications - word processing, information retrieval programs, computer communication, and multimedia tools.

5 EVALUATION

5.1 First questionnaire

A first evaluation procedure was conducted at the first meeting with the teachers before beginning the activity in the center. Forty-one teachers participated and filled out a two-part questionnaire. In the first part were 19 closed questions concerning their willingness to accept changes in the personal and school levels, their readiness to learn how to use new pedagogical tools, and their positions concerning computers and computer communication. In the second part the teachers were asked to indicate those things which, in their opinion, teachers need today in order to successfully perform their function.

At first we analyzed factors in order to put together the questions which examined the same world of content. In this analysis we found four factors which satisfied the criterion Eigenvalue>1. These factors are:

- The attitude of the teachers towards computers. This factor explained 22.9% of the variation.
- The apprehension of the teacher from teaching with the aid of computers. This factor explained 12.7% of the variation.
- The teacher's readiness for changes. This factor explained 11.5% of the variation.
- The attitude of the teacher towards the need to use new pedagogical tools in their work. This factor explained 9.0% of the variation.

At the second stage we have calculated the internal reliability coefficients (Kronbach alpha) for all four factors. Factor 1 - 0.90, Factor 2 - 0.68, Factor 3 - 0.67, and Factor 4 - 0.54.

Clearly, the internal reliability of the first factor is the highest, that of the second and third factors is reasonable, and that of the fourth factor is low (a partial explanation for this may line in the small number of items).

The possibility of a linear connection between the four factors was examined. It was found, according to the Pearson correlations which were calculated, that the lower the teacher's apprehension for working with computers the more positive his or her attitude to computerized communication was ($r= -0.27$, $p<0.05$). Also, the more the teacher reported on a stronger need for new pedagogical tools and to adapt to them, the more positive was their attitude towards computers ($r=0.37$, $p<0.01$).

Table 2 First Factor

		1	2	3	4
5.	Knowledge of computer communication can contribute greatly to the teacher's functioning.	4.9	29.3	61.0	4.9
9.	There is a considerable gap between the tools that teachers get during their training and the tools that are necessary in teaching.	2.4	14.6	56.1	26.8
11.	Computer communication is a good means for communication between students and teachers.	0.0	17.1	53.7	29.3
12.	A teacher's success in the future depends on his or her ability to master computer applications in teaching.	2.4	17.1	51.2	29.3
15.	Use of the computer will help me get closer to my students.	9.8	36.6	29.3	24.4
16.	I am interested in using the computer in my teaching.	0.0	0.0	24.4	75.6
17.	The successful teacher of the future will be the one who is up to date in modern technology.	0.0	9.8	36.6	53.7

1. Disagree 2. Agree slightly 3. Agree considerably 4. Agree very much

Table 3 Second Factor

		1	2	3	4
7.	Computer communication has great potential to assist in the work of the teaching staff.	0.0	7.3	51.2	41.5
10.	Learning how to work with a computer terrifies me.	63.4	34.1	2.4	0.0
13.	I don't think I'll ever really be able to master the computer.	80.5	19.5	0.0	0.0
18.	Putting computers into the school makes the teacher-student relationship more mechanical and less personal.	41.5	51.2	2.4	4.9

1. Disagree 2. Agree slightly 3. Agree considerably 4. Agree very much

Table 4 Third Factor

		1	2	3	4
1.	I feel the need to change my way of working as a teacher.	4.9	29.3	61.0	4.9
3.	In order to meet the requirements of the age, the school has to undergo very significant changes.	2.4	7.3	51.2	39.0
4.	I am satisfied with the way I fulfill my function.	0.0	12.5	75.0	12.5
6.	I am fearful that the more the computers are used the less necessary a figure the teacher will become.	46.3	51.2	0.0	2.4
8.	Today every teacher has to learn how to work with a computer.	0.0	0.0	22.0	78.0

1. Disagree 2. Agree slightly 3. Agree considerably 4. Agree very much

Table 5 Fourth Factor

		1	2	3	4
2.	The pedagogical tools and teaching approaches that are available to me satisfy my teaching needs.	9.8	65.9	24.4	0.0
14.	I must get new pedagogical tools in order to perform my job at a high level.	9.8	26.8	46.3	17.1
19.	Teacher who does not adapt themselves to the technological developments of the coming century will in the end find themselves outside the system.	2.4	14.6	43.9	39.0

1. Disagree 2. Agree slightly 3. Agree considerably 4. Agree very much

An open question was attached to the questionnaire. The teachers were asked to indicate what they lacked/needed in order to fulfill their function successfully. Following are the teachers' remarks processed under two principal domains.

Requirements at the personal professional level: Giving up conservative pedagogical approaches (such as frontal teaching); academic updating; up-to-date technological tools; intensive training; mastering computers; knowledge of and use of information resources; alternative evaluation methods; education past the B.Ed.; openness to

changes; a more personal style between teacher and student; proper handling of discipline problems.
Requirements of the teaching environment: A smaller number of students per class; a rich and varied teaching environment; audio-visual equipment and computers; larger work areas for groups and whole classes; close and regular contact with institutions of higher learning for updating; staff work; compensation for staff work; backing of initiatives and ideas by the administration; contact between the school and the outside world.

5.2 Second questionnaire

Three months after the beginning of the activity in the center the teachers were asked to fill out a second questionnaire. The questions which examined various aspects of the project (satisfaction on the part of the various professions, atmosphere during the lessons, motivation, and involvement), and the criteria for success as defined by the steering committee (understanding of the connection between the professional and the interdisciplinary parts, introduction of changes into teaching, mastery of computer applications).

The answers clearly indicate that the teachers came with cheerfully and motivated to learn (97%), and that the material studied was relevant to the level of their school classes (87%). All the teachers (100%) felt that the instructors were professional, that they were committed to the success of the project, that there was a positive atmosphere, and that there was cooperation in the lessons.

A significant part of the group (85%) indicated that they see changes in their work as teachers following their participation in the project, and that the training instilled a desire in them to read and study by themselves. There were no significant differences in the responses of the elementary school teachers and the junior high school teachers.

Table 6 Satisfaction (%)

		1	2	3	4
1.	The instructors had mastered the material taught.	0	0	28	72
2.	The material taught was mostly new to me.	3	44	53	0
3.	The material was conveyed in a dynamic and interesting way.	0	25	50	25
4.	The atmosphere in the class was positive, an atmosphere of learning and cooperation.	0	0	11	89
5.	The professional and interdisciplinary aspect of the project was clear to me.	0	18	29	53
6.	I came cheerfully and motivated to learn.	0	3	5	92
7.	The material taught matched the level of the class.	3	8	46	43
8.	The lessons instilled a desire in me to read and study by myself.	0	15	49	36
9.	I am very satisfied with the mathematics lessons.	0	23	23	54
10.	I am very satisfied with the science lessons.	0	27	33	40
11.	I am very satisfied with the literacy lessons.	0	0	41	59
12.	I am very satisfied with the lessons about the open tools in the computer.	3	28	31	38
13.	As a result of the project I see changes in my work as a teacher.	3	12	52	33
14.	I would recommend that every teacher take part in this project.	0	8	28	64
15.	I see the application in my teaching work of the material learned.	0	21	36	43
16.	I felt involved (and not passively) in the learning process.	0	6	25	69
17.	The instructors showed a full commitment to the project's success.	0	0	19	81
18.	I am in full control of the computer applications that were taught.	0	31	44	25

1. Totally incorrect 2. Somewhat incorrect 3. Somewhat correct 4. Very correct

The purpose of this questionnaire was to follow up the effect of the project on the work of the teachers. We expected that the more the project advanced the greater the percentage of teachers who would report on the influence of the materials learned on their work in the classroom. It seems that already at this stage of the training (three months from the outset) at least a third of the teachers participating felt that there was an effect on their work. Principally salient were the effects on the way of thinking in preparing lessons (61%), on the technical possibilities that are available to them (61%), on understanding the needs of the students (70%), on the form in which material is transmitted in the lesson (54%), and on the integrating of the computer in the work (67%).

Table 7 Effect on the Work of the Teacher (%)

		1	2	3	4
1.	On my way of thinking when preparing lessons.	6	33	40	21
2.	On connecting the material with other fields of knowledge.	12	41	25	22
3.	On the technical possibilities available to me.	10	29	29	32
4.	On understanding the needs of my students.	12	18	33	37
5.	On the way of transmitting material in the lesson.	9	37	30	24
6.	On integrating the computer in my work.	12	21	30	37
7.	On my ability to communicate with my students.	31	34	22	13
8.	On my ability to work with other teachers.	24	37	21	18
9.	On a better understanding of the subject which I teach.	24	28	27	21

1. Totally incorrect 2. Somewhat incorrect 3. Somewhat correct 4. Very correct

6 CORRELATION

After analyzing the second questionnaire we set up Pearson correlations in order to examine whether there was a linear connection between the teachers' answers at this stage and their answers to the first questionnaire which was given out before the beginning of the training.

The results show that just as the teachers reported in the first questionnaire a more positive attitude towards computers and computer communication, so they reported after three months that they are coming to class cheerfully and with motivation to learn (0.60=R), that they are satisfied with the lessons on the computer (0.50=R), and that they feel involved in the learning process (0.66=R).

Three months after the beginning of the year long training the teachers reported that the training already had an effect on their work by enabling them to communicate better with their students (0.61=R), by enabling them to work with other teachers (0.41=R), and to understand better the subject being studied (0.42=R).

The results showed that just as the teachers revealed in the first questionnaire a greater readiness for change in the personal and school level, so they reported after three months that they saw changes in their work as teachers (0.49=R), that the instructors showed a complete commitment to the success of the project (0.68=R), that the training had already had an effect on their work in their way of thinking when preparing lessons (0.53=R), in relating the material with other materials (0.60=R), and in better understanding of the needs of their students (0.45=R).

From these correlations it can be clearly inferred that the teachers after three months had already developed positive attitudes to computers and computer communication and a readiness for changes in their personal and school level. They indicate that the teachers were greatly satisfied with the training set-up on a community model of a teachers' center and in a technologically rich environment. The correlations also indicate advantages of the community model as a factor which generates a quite rapid effect on the teacher's classroom work.

7 GOALS FOR A SECOND STAGE

National projects of information resources for teachers on the model of "Science Community" (http://www.lamda.org.il) and international projects like Teacher's On-line, which supply daily lesson systems to teachers in various fields of knowledge (http://www.southwind.net) answer principally the need to give teachers access to updated resources of materials in the subjects they are teaching. However, the model of the community teachers' center about which we are reporting here set for itself a more developed goal. Since we identified the developing tendency in modern society which is characterized by Knowledge Based Environment, we set a goal to design an environment in which the teachers in the community would be trained to derive knowledge from information. We believe that we are transgressing reality if we should settle for a design of a support environment for teachers that just prepared them mainly to access, to deal with and to extract information.

For this purpose the steering committee of the center met towards the end of Stage 1 and framed the goals of Stage 2. Stage 2, it was decided, would consist of three components:

1. Interdisciplinary and multidisciplinary training.
2. Extending the activity to kindergarten teachers, high school teachers, school principals, and students.
3. Expanding the activity - from local community activity to functional regional activity.

8 INTER AND MULTI-DISCIPLINARY TRAINING

In Stage 1 the participating teachers from each field met with teachers from the other fields in plenum meetings in order to study units from fields of common interest and in workshops in order to begin to develop a multidisciplinary symposium. In Stage 2 it was decided to anchor the interdisciplinary and multidisciplinary study in the training program. One third of the class hours of each group of teachers from each field of knowledge was allotted for these meetings. The leaders of these groups were asked to suggest a program and a design for inter- and multidisciplinary meetings. The purpose of these meetings will be to produce learning and teaching materials together. These products will be integrated into the information resources which would be accessible to other teachers in the community and outside it. These products are the 'knowledge' that the center strives to have the teachers construct.

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