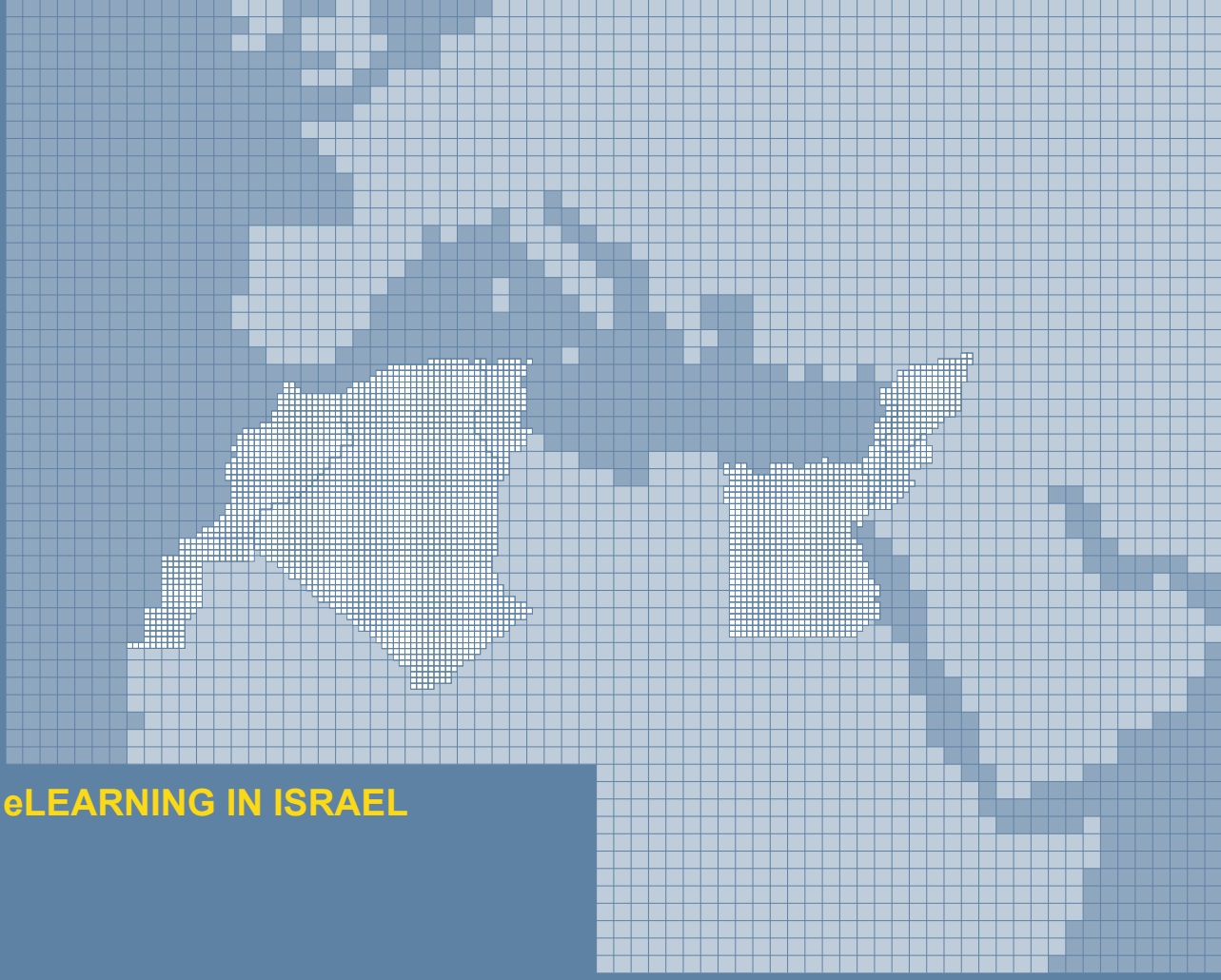

eLEARNING IN ISRAEL

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eLEARNING IN ISRAEL

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A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (http://europa.eu.int).

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EXECUTIVE SUMMARY

The main objective of this report is 'to contribute to the discussion, to exchange the best practices and to identify convergent strategies between the EU member states and Israel in the field of eLearning'. In the report, the concept of eLearning, which primarily involves study via Internet courses, is expanded to the more prevalent concept of ICT (information and communication technology), which includes the full gamut of Internet activities related to education and training.

Data published in June 2002 indicated that 1.7 million Israelis (26% of Israel's general population) presently use the Internet, and 64% of these use the Internet on a daily basis. *The global information technology report 2001–2002: Readiness for the networked world*, a comprehensive, innovative report which was prepared by the Centre for International Development at Harvard University, stated the following: 'Israel ranks 22nd overall (out of 75 nations) in Readiness for the Networked World. For the past decade, Israel's ICT sector has performed very well and attracted international acclaim, along with foreign investment and venture capital.'

There are four main national ICT programmes in education and training, whose main objective is to enable each pupil to utilise ICT and acquire the best of the world's cultural assets in the most advanced context, and to access information-rich learning environments and means of communication that will enable them to search for information, organise it, and use it to build their own information. The programmes, supported by the government and the private sector, are the Israeli Ministry of Education computerisation programme, the Computer for Every Child project, the Tapuah project, and the Lehava project. The last three programmes are especially targeted at communities from poor socioeconomic strata. The main features of the programmes are: computer and Internet accessibility (either by establishing community computer centres or by distributing computer systems to households); training and tutoring community members in ICT skills, primarily young students in that community; and the provision of updated software and courseware in education, governmental services, and leisure time.

Distance learning via the Internet is presently based on two main teaching methodologies, synchronous and asynchronous learning, which can exist separately or can be used to supplement each other. It would appear that a suitable combination of synchronous events (some 10% of the time) and asynchronous learning (about 90% of the course) could be the best solution for studying and teaching using eLearning courses, which integrate the added values of both synchronous and asynchronous methodologies.

The vast majority of the sites reviewed in the articles surveyed for this report are still text-based. Over half the sites use still images extensively, and around one fifth of the sites contain no visual images at all. Many of the sites do not include interactive images, animated images, or audio capability. We can assume that a period of transition is required to adjust the development of computer courseware to Internet courseware, naturally with options for broadband and fast communications.

From research and survey studies written on ICT in education and training in Israel,

we may learn that in order to properly take advantage of the potential of the Internet in the learning process, ICT courses should be implemented within the national curricula, as well as in the evaluation and assessment methods used to examine the knowledge and the skills of the students.

The qualities required from an online student in an ICT environment are independence, high motivation, confidence in and awareness of their own capabilities, and high self-control and problem-solving skills.

The characteristics of teachers who should integrate ICT into their teaching more easily than others are flexible thinking, openness to change, focus on processes rather than outcomes, curiosity, interest, independence, self-confidence – in short, a teacher who is a good pedagogue will also be a good online teacher. This is a teacher who constantly searches, develops, and applies innovative and quality teaching methods to improve his pupils' learning. Undoubtedly, ICT places a greater burden on the teachers due to the academic dialogues they conduct from their home with pupils, colleagues, and school administration, and changes are needed in the occupational, organisational, and physical structure of the teaching and learning systems used in schools in order for ICT to be integrated naturally and to contribute to the progress of pupils.

The digital gap is one more expression of the lack of social equity and lack of equal opportunity in society, but it also exacerbates the country's socioeconomic inequality. Several issues related to the digital gap in Israel are discussed in the report: socioeconomic status and place of residence, gender, immigration, native language and English, senior citizens, and special needs populations. The percentage of households connected to the Internet is very low in cities where many residents come from lower socioeconomic strata, and this percentage increases as the population's socioeconomic status rises. This gap, regarding the younger generation, is liable to lead to a lag in various spheres of education and employment, leaving the weaker sectors of the population on the fringes of society. National and public programmes such of those mentioned above have been developed and implemented to try and bridge this digital gap.

According to the data, it is obvious that there is a significant difference in computer and Internet usage between men and women in Israel. One of the key questions that must be addressed is whether ICT is perceived as a masculine occupation, and whether it is a cultural phenomenon that can be overcome. Even if we assume that, particularly in the ICT sphere, knowledge and skills must be taught to every girl and boy, there is still a need to continuously examine and find solutions to bridge the digital gap between the genders, as we do not know when this cultural gap will be closed.

It is clear that senior citizens make significantly less usage of ICT. This is in spite of the fact that in general, people of that age usually have more leisure time, can contact their family and friends, can do so from their homes without having to rely on physical mobility, and can find interest in a variety of different spheres. In order to overcome this digital gap, we have seen the development of several local initiatives by schools, more system-orientated initiatives from educational networks such as ORT and Amit, and a comprehensive programme from the Ministry of Education, the Multigenerational Connection programme. Pupils in this programme, who have mastered ICT technologies, teach senior citizens from their communities the secrets of computers and the Internet.

At this point in time we do not really understand the significance of the ICT revolution in general, and its impact on education and training systems in particular. One way to help us understand this process is to enlist a methodology that could help analyse innovative and excellent pedagogic initiatives for integrating ICT in education and training institutions.

Some conclusions from comprehensive studies described to examine models for ICT-integrated pedagogic innovations in Israel are listed below.

- When the school has a history of innovation, and local policy is encouraging, three initiators – the school principal, people who are 'crazy' about the idea, and the computer co-ordinator – can work to implement innovation by recruiting infrastructures and external bodies.
- Vision first – In the process of implementing ICT-integrated pedagogic innovation you must formulate a vision and harness it to innovation and ICT integration.
- Institutionalise innovation – Innovation is based on excitement, but its continuation and dissemination rely on the ability to make it part of the organisational network (with suitable budgeting and manpower).
- The claim that teachers and their training are one of the most important factors in implementation turns out to be only partially correct. The teachers who are involved have the most power, but the teaching staffs in general have less power, and their involvement is not essential to the success of ICT integration.

In the studies described in this report, and from interviews conducted with experts on ICT integration in education and training systems in Israel, we obtained the names of elementary schools, secondary schools, colleges, universities, education networks, local authorities, public bodies, and private companies that are considered to be pioneers and innovators in the field of ICT-integrated pedagogic innovation.

Our assumption is that we are at the beginning of a process of integrating ICT in education and training, and researchers and scholars are still trying to understand the phenomenon, the many different variables involved and how they interact, and the advantages, disadvantages, and ramifications of the various factors at work in ICT environments for teaching and learning.

If we summarise the innovation demanded of educational institutions in light of the impact of ICT, our focus is drawn to a process of flexibility. The issues the school and teacher training institution must address are rooted in a perceptual change with regard to: the flexibility of the school's organisational structure; flexibility in teaching and learning processes and methods for training both teachers and teacher trainers; flexibility in dealing with information and turning it into meaningful and relevant knowledge; flexibility in methods for feedback and curricular assessment; and flexibility in including parents and the community in the educational processes taking place in schools.

From this report we may conclude that ICT is not simply another discipline, nor is it merely a tool. Rather, ICT is a language with its own alphabet, vocabulary, and syntax that must be taught to the citizens of every country, who must be allowed to access and use it to promote the advancement of each individual and the prosperity of the entire community in which he or she lives.

1. INTRODUCTION

1

1.1 HOW DID THE STUDY EVOLVE?

The European Union, following the Lisbon summit, included among its objectives that of becoming 'the most competitive and dynamic knowledge-driven economy in the world'. In this context, the European Commission has set up the 'eLearning Action Plan' (COM(2001) 172 final), as a tool for adapting the EU education and training systems regarding the concept of a knowledge economy and digital culture. eLearning is also one of the key building blocks in the European concept of lifelong learning.

The vocational education and training (VET) system of Israel operates within the standards of VET systems in market economies and faces a large number of challenges that are common to the systems of EU member states. One of the strategic choices made by the Israeli authority focuses on substantial investments in advanced technologies (including information technologies and others). This, together with the need to guarantee quality education and training to scattered communities, makes eLearning a common topic of interest for both Israel and the EU member states.

In the framework of the support to the EU – Israel Association Agreement, a project was defined to promote exchanges between the EU member states and Israel in the field of eLearning. It was based on proposals made in 2001 by the European Training Foundation (ETF) and the Israeli Ministry of Labour and Social Affairs [1]. To underpin exchanges, a study on eLearning in Israel was conducted with a view to contributing to the discussion, exchanging the best practices and identifying convergent strategies between the EU member states and Israel in the field of eLearning. The conclusions of the study are presented in this report.

The topic of eLearning covers a wide range of themes, as outlined in the four strands of the eLearning Action Plan of the EU. One of the main areas of attention for the proposed study will be the implications of eLearning in teacher and trainer training. Other interesting topics would be communities of interest, networks of centres for excellence and

sociopedagogic research on the effectiveness/quality of eLearning processes.

In this study we will expand the concept of eLearning – which reflects, primarily, study via Internet courses – to the more prevalent concept of ICT (information and communication technology), which includes the full gamut of Internet activities related to education and training, such as: distribution of information, communications, designing curricular materials and, naturally, eLearning.

In the report that examines applied strategies for ICT in Australia, Canada, Finland and Israel [2], which was submitted to the Ministry of Education of Luxembourg in 2000, we find the following:

> 'The earlier tendency to measure the degree of ICT implementation using the student-to-computer ratio has now given way to more qualitative measures of ICT applicability, accessibility and connectivity… ICT is obviously no longer considered as an add-on for high achievers or a more personalized approach for students with learning difficulties or lacking motivation, but rather as another essential aspect of literacy and as such, is generally being integrated as a tool across the curriculum. Equity of learning opportunities is a further issue that is increasingly becoming a major area of preoccupation throughout the world.'

From this report we may conclude that ICT is not simply another discipline, nor a mere tool. Rather, ICT is a language with its own alphabet, vocabulary, and syntax that must be taught to the citizens of every country, who must be allowed to access and use it to promote the advancement of each individual and the prosperity of the entire community in which he/she lives.

1.2 INTERNET AND EDUCATION MILESTONES

In an article written by Nachmias and Mioduser [3], we learn about the milestones along the way towards integrating the Internet in education. In September 1969, the first server-to-server message was sent from the computer network at UCLA to the Stanford Research Institute. A short time later, two more servers were added, and the first computerised communications network was created. In the early 1990s, when the circle of those using information technology was expanding, and in light of the development of communications networks and advanced technologies, use of communications networks to send messages multiplied, and many agencies began using graphic interfaces to present and retrieve information. Thus the Internet began to take shape, and the vast network known as the 'worldwide web' was formed.

In October 1995, the US Federal Networking Council defined the concepts of 'Internet' and 'worldwide web' as follows:

- a network that is logically linked through a unique international address on the basis of an Internet protocol (IP);
- a network that is capable of supporting communications using the transmission control protocol/Internet protocol (TCP/IP);
- a network that supplies, utilises, or enables, either publicly or privately, high-level services based on the given communications and infrastructure.

Now, at the start of the 21st century, the worldwide web already contains billions of data pages, over 10 million servers around the world that are connected to one another through the same communications protocol, and over 600 million Internet users.

Nachmias and Mioduser [3] propose four key ways in which the Internet can be used for teaching and learning.

1. **Tool for disseminating information** – The Internet is a vast database and working with it (to search, classify, process, display, transmit, save and store information) is at the heart of educational activity. Examples of database environments can be seen in models of digital national libraries (e.g. the US Library of Congress and the

Gutenberg Project); digitised encyclopaedias (e.g. Encarta and Britannica); portals for huge databases (e.g. NASA and Discovery); and other subject-related sites taken from national curricula.

2. **Communications facilitator** – New communications possibilities, both synchronous and asynchronous, that are available via the Internet to teachers and students, both near and far – both socially and geographically – foster different types of educational dialogues, such as: assistance and consulting on curricular matters, e-lectures, pupil networks, integrated web-based courses (where regular university courses based on 14 weeks of classes that meet for only two hours each week become courses of 14 weeks where the instructor can be reached at any time via the computer) and virtual learning communities.
3. **Web-based learning while creating** – The Internet provides users with a variety of sophisticated and user-friendly tools (web page editors, picture and sound processors) that support creativity and initiative in preparing and disseminating material over the Internet. Thus, users can share their knowledge with others, hold it up for review and continue with the shared creative process.
4. **Virtual teaching environments** – The Internet is capable of transcending barriers of time and place by creating new learning environments, such as: virtual courses (which, with the addition of traditional distance learning, allow for ongoing and direct communication between teacher and pupils, and among the pupils themselves, such as in the case of the World Lecture Hall); virtual schools (such as those belonging to the ORT Israel network and Israel's Centre for Educational Technology); virtual universities, and virtual museums.

Although key ways 2 and 4 proposed by Nachmias and Mioduser [3] seem similar, we should note that there are two main areas of communication that can be facilitated by the Internet:

- interaction between the teaching and learning materials on the one hand and the learners and the teachers on the other;
- communication and dialogue among teachers, students, experts, parents and the community.

1.3 ICT IN ISRAEL

According to the data presented below in table 1 [4], the number of computer owners in Israel has continuously increased in recent years, as has the number of Internet subscribers.

Data published in the TIM Survey by the TNS Group in June 2002 [5] indicated that 1.7 million Israelis (26% of Israel's general population) presently use the Internet, and 64% of these use the Internet on a daily basis.

According to the same survey, 91% use the Internet from home, 36% from work, 18% from school, and 17% from other locations. Most Internet use consists of: information searches (92%), electronic mail (83%), software downloads (69%), reading newspapers and other news sources (53%), participating in chat groups (42%), playing online games (20%), purchasing goods and services (37%), banking/financial activity (33%), and participating in online forums (24%).

Table 1: Percentage of households with computers and Internet subscriptions between 1997 and 2001

	1997	1998	1999	2000	2001
Home computer	33.5	36.6	40.7	47.1	49.9
Internet subscription	4.6	8.2	11.9	19.8	22.5

Source: Central Bureau of Statistics, Ownership of durable goods, by deciles of net income per standard person, Jerusalem, Israel, 2002. www.cbs.gov.il.

The global information technology report 2001–2002: Readiness for the networked world, a comprehensive, innovative report which was prepared by the Centre for International Development at Harvard University, states the following:

> 'Israel ranks 22nd overall (out of 75 nations) in Readiness for the Networked World. For the past decade, Israel's ICT sector has performed very well and attracted international acclaim, along with foreign investment and venture capital. Driven by a highly ICT-literate population, an abundance of high-tech talent and research from the Israeli military and strong ties to financial backers in the United States, the nation has shown itself to be an innovative ICT leader, particularly in the field of software development.'

The Networked Readiness Index (NRI) [6] consists of two main facets:

- network usage (Israel ranked 24), which is defined by five individual variables related to the quantity and quality of ICT use;
- enabling factors (Israel ranked 19), which include four domains:
  - network access (Israel ranked 20) – information infrastructure: hardware, software and support;
  - network policy (Israel ranked 19) – ICT policy, business and economic environment;
  - networked society (Israel ranked 18) – networked learning, ICT opportunities and social capital;
  - networked economy (Israel ranked 21) – including e-commerce, e-government and general infrastructure.

Thus we can see that Israel's ranking within the regional grouping is notable. Among the 25 nations that comprise the top third of the NRI, Israel is the only nation from the Middle East and North African regions.

2. ICT FACILITIES AND PROGRAMMES IN THE ISRAELI EDUCATION AND TRAINING

2

2.1 NATIONAL ICT PROGRAMMES IN EDUCATION AND TRAINING

There are two main objectives underlying the national ICT programmes [8]:

- to inculcate knowledge and skills to every pupil in the ICT sphere;
- to enable pupils to utilise this knowledge to acquire the best of the world's cultural assets in the most advanced context, and to access information-rich learning environments and means of communications that will enable them to search for information, organise it and use it to build their own information.

There are a number of government and public programmes in this sphere: the Ministry of Labour and Social Affairs ICT programmes; the Ministry of Education computerisation programme; the Computer for Every Child project, which operates under the auspices of the prime minister's office; the project sponsored by the Tapuah Association, which is mainly funded by the public sector; and the Lehava project, which is funded by the Ministry of Finance.

2.1.1 THE ISRAELI MINISTRY OF LABOUR AND SOCIAL AFFAIRS ICT PROGRAMMES

A joint Israel–Germany programme entitled 'ICT training programmes for the unrepresented youth and adult populations' started in 2002. It was based on a rationale and a work plan that were submitted by B. Levinson (Israel) and Dr Schlegel (Germany) and approved both by the Ministry of Labour and Social Affairs (MOLSA), Israel, and the Federal Ministry of Education, Science, Research and Technology (BMBF), Germany.

In this programme ICT curricula development, training programmes and evaluation methodologies are being shared

between both countries, and the first training courses are in the phase of implementation.

2.1.2 THE ISRAELI MINISTRY OF EDUCATION COMPUTERISATION PROGRAMME

This programme was implemented following publication in August 1992, of the report of the Tomorrow 98 Committee on Science and Technology Education headed by Prof. Haim Harari. This report was based on the report by the Committee for Computerising the Education System headed by Dr Elad Peled in January 1992.

Implementation of the programme was the responsibility of the Education Ministry's Science and Technology Administration, which published a master plan for computerising the education system [9].

The main principles of this programme were:

- preparing the physical infrastructure needed to set up rooms, furniture, electricity lines, communications connections, etc.;
- purchasing state-of-the-art computer resources, with the goal of providing one computer for every 10 pupils in the school, and one computer for each pre-school;
- pedagogic implementation – training all education workers to make the best use of information technologies, to instil a computer culture and promote methods for teaching and learning in computerised environments.

The Ministry of Education joined forces with the National Lottery (Mifal Hapayis) and local authorities in order to realise this plan.

As part of this comprehensive programme, many varied implementation frameworks were established, such as: sending facilitators to help integrate computer usage in schools and pre-schools; opening up training centres and developing a series of in-service courses for inspectors, principals, teachers, and computer co-ordinators in schools; demonstrating how to integrate the use of computers in teaching different subjects during their training at colleges and universities; developing computerised learning environments in 'pioneering' model schools; and research, development, and evaluation.

Investment in this national programme during its first four years (1994 to1998) reached some $130 million, and at the end of this phase a total of about 46 000 computer stations had been set up in schools and pre-schools; in other words, approximately 45% of educational institutions had been affected [8].

The goals of the second phase of the programme (1998 to 2002) were: to install some 60 000 computers, to complete the computerisation of around 1 160 schools that were not computerised during the first phase, and to solve the problems of the 'millennium bug' in those schools that had already been computerised.

In the report published in June 2003 by the Science and Technology Administration for the Knesset (Israeli parliament) Education and Culture Committee [10], it was noted that: between 1994 and 2003 there were 2 562 schools and 3 053 pre-schools that had been equipped with 99 983 computers; thus, 78.4% of elementary schools, about 85% of lower and upper secondary schools, and 75.7% of schools for special education had been computerised. Around 1 700 schools (66%) had been linked to the Internet and some 600 of these were using Asymmetrical Digital Subscriber Line (ADSL) fast Internet services.

In 1998 and 1999, surveys were conducted regarding the schools that had become part of the computerisation programme during 1996-97 [9]. The principle findings show that:

- the percentage of teachers using computers in their teaching was approximately 66% in the elementary schools, 60% in the lower secondary schools, and 50% in the upper secondary schools;

- the vast majority of teachers had participated in in-service training courses held in schools that had received computers through the programme;
- the main reason teachers did not increase their use of computers for teaching purposes was the lack of computers and suitable software available, and technical difficulties.

In addition, the report on reducing the digital gap within the education system which was presented to the Knesset Education and Culture Committee [8], stated that the primary obstacles to realising the programme were the limited number of computers, their placement in classrooms rather than in computer rooms, and training teachers to use the computer as a meaningful tool in the teaching process. Apparently, in the opinion of the author of that report, the numerous in-service courses that were held for teachers had not been sufficiently effective.

2.1.3 THE COMPUTER FOR EVERY CHILD PROJECT

This was declared by Prof. Shimon Shetreet in 1993 when he served as minister of the economy, and it has been classified as a national project by prime ministers since 1996 [8]. Under this project, children from poor socioeconomic backgrounds who were found to be capable of learning and attaining high scholastic achievement using computers were chosen as candidates to receive home computers. The programme began in 1997 and its main goal was to distribute 30 000 computer systems to Israeli children who could not otherwise afford to purchase such equipment. This meant exposing about 100 000 Israeli children and 60 000 parents to the world of computers, teaching them the skills needed to use ICT and its applications. The programme is still in operation.

The total budget came to around $18 million, which came from government bodies, local authorities, contributions from commercial companies, the Mifal Hapayis Lottery, and a symbolic payment by the child's family.

The computer system distributed to each household participating in the programme included an advanced computer, comprehensive training for the children plus one adult from the family, software, educational courseware, support services for 30 months, and an Internet connection (four hours per day for two years) [11].

The project's final evaluation report, submitted in May 2001 by Prof. Navah Ben-Zvi [12], stated that up until July 2000, approximately 10 000 computers had been distributed in 78 localities. The report's main findings are summarised below.

- The computers did, indeed, reach the children who needed such aid according to the socioeconomic criteria set for the project (large families, single parent families, economic distress), but not necessarily those with average or better scholastic aptitude, as stated in the project goals – rather, only less than the average and weaker pupils were reached.
- The vast majority of pupils use the computers almost every day, both for games and for studies. The scope of computer usage did not decline over time, but rather became more varied and occupied a central place in the pupils' leisure activities.
- The parents expect an improvement in the child's chances for advancement in his/her studies and for success in later life, as well as in their self-confidence.
- It was not possible to estimate the improvement in scholastic achievement because there was no structured, ongoing contact with the schools attended by the pupils participating in the project, as stated below.
- The parents were pleased with the training, although they would have wanted more intensive training as well as additional equipment and an Internet connection (which was provided in the later stages of the project). One of the most important criticisms that should be remembered in the future was that there was no structured, ongoing contact with the schools attended by the pupils participating in the project. Teachers in the schools did not receive guidance and instruction regarding possible support for the pupils and the effective

contribution to be made by the project towards advancing the pupils in school.

2.1.4 THE TAPUAH PROJECT

Tapuah is a non-profit organisation working to familiarise the general public living in distressed neighbourhoods with basic concepts related to computer usage and the Internet. The programme, which is still going on, was initiated by MK Michael Eitan in his capacity as science minister from 1997 to 1998, and was funded by donations. The project, which is not a government programme, strives to reduce the gaps in the realm of Internet usage in the 30 localities where it is being implemented [8]. In its mission statement, the Tapuah Association aims to bring about a situation wherein a significant portion of the population has ICT skills and is connected and using these skills within five years [13]. Among the skills mentioned: the ability to freely use an Internet browser; the ability to use e-mail; understanding how to look for information using an Internet search engine; and familiarity with basic applications for day-to-day use, such as e-learning, e-commerce, electronic banking; and obtaining information from government sources.

Centres were located in towns with minorities, poverty-stricken neighbourhoods, and development towns. The target audience included pupils, parents, science trainees, industrial workers, and retirees.

The Tapuah Association operates in conjunction with the local authorities, the Israel Association of Community Centres (IACC), commercial companies, and government ministries. An assessment of the Tapuah project [8] indicates that the goal of opening 30 centres was achieved; the goal of reaching the general public was partially achieved, and most of the users were schoolchildren. The computer centres are open for guided use of the Internet, with a 12-hour starter course that includes an introduction to basic topics related to computers and the Internet.

There is criticism regarding the establishment of the centres outside the schools, and there was a recommendation to consider uniting the computer centres within the framework of the schools, which would likely save both money and bureaucracy.

2.1.5 THE LEHAVA PROJECT

This project was established with a view to reducing the digital gap within Israel, and between Israel and other developed countries around the world. The decision was made in 2001 by the then minister of finance, Sylvan Shalom, to approve the transfer of funds to carry out the proposal made by MK Michael Eitan, chairman of the Knesset Internet and Information Technology Committee, to establish community-based computer centres [14].

The project's main goals were [15]:

- to establish 100 local centres within three years, each one containing 40 computer stations with broadband Internet access;
- to establish a national digital library for cultural assets in Hebrew (encyclopaedias, lexicons, periodicals, educational software, and so on);
- to teach the basic knowledge required to operate a computer and access relevant information by searching the Internet to 500 citizens in each centre, primarily young people;
- to enable people who have no computer at home to use public computers on a regular basis, for several hours each week;
- to establish consulting networks of online experts to improve government and public services;
- to teach people the skills they need to use information to advance their education, promote their well-being, and improve the quality of their leisure time.

The target population involved young children aged two to five, pupils and parents, employed persons, retirees, and mentally and physically challenged persons.

The overall predicted cost for the programme was around $110 million during the first five years, and about $18 million for yearly operating costs (not including funds to upgrade the computers).

The evaluation of the programme [8], which was aimed at different populations, showed that: as with the experience of the Tapuah project, it is difficult to reach the general public and to engender computer use among groups that are not pupils; a 12-hour course in computer operations and using the Internet, and a minimal knowledge of English, are insufficient for teaching the knowledge and information required for the programme; and learning about computers through the course alone is ineffective – daily use of the computer is required in order to become adequately familiar with it.

The author of the report supports this evaluation wholeheartedly, stating that ICT is a language that must be employed in different areas of life and should be developed in order to gain proper mastery of it.

Another recommendation, as with the Tapuah project, is to use and establish the programme in school computer rooms, thereby reducing costs and pooling resources.

2.2 ICT METHODOLOGIES AND COURSEWARE IN EDUCATION AND TRAINING

2.2.1 SYNCHRONOUS AND ASYNCHRONOUS LEARNING

Distance learning via the Internet is presently based on two main teaching methodologies, which can exist separately or can be used to supplement each other [16].

- Asynchronous learning – Learning offline at any time and in any location. Using the Internet, contact can be made with the facilitator and other learning colleagues through forums, chat rooms, or e-mail.
- Synchronous learning – Learning online within the learning environment of a virtual classroom, in which the student can observe the teacher and the material being taught. Learning involves continuous two-way communication between the learners and the teacher, and among the learners themselves, using audio or visual media, or a combination of both (point to point, point to multipoint, or multipoint to multipoint).

Mr Roni Dayan, in charge of ICT in the education system [17], notes that there are two dominant technologies in synchronous computerisation in Israel: one is provided by the Interwise Company, and the other is provided by the Centera Company. Several private enterprises operate on the basis of these technologies to provide synchronous online courses such as eTeacher and I-Teach-U.

During interviews conducted with experts in the ICT field in Israel [17] [18] [19] [20], most of them related that synchronous learning and teaching amounts to no more than 10% of eLearning, while asynchronous courses constitute some 90% of eLearning. They also predict that this ratio will not change much in the future, particularly because of the Internet's added value as a means for asynchronous learning, which is not restricted to a particular chunk of the learner's time, enables shared study with colleagues in learners' groups, and creates a documented collective memory of the learning process and its outcomes (for example, in forums) [17]. We may also assume that the cognitive level reflected in the questions, responses, and opinions expressed through asynchronous interaction is generally higher than those reflected in synchronous teaching.

Synchronous learning is, for the most part, a solution to certain default situations: teaching pupils who have been hospitalised and need to remain confined; learning for populations located in isolated or geographically remote areas, or in places with no supply of good teachers; and synchronous events with specialists, experts in a particular field, for specific, relevant audiences. Synchronous learning,

which combines two-way audio and video interaction, is generally more expensive than asynchronous courses, in terms of infrastructure and operating costs.

Asynchronous learning enables the learner to be more active and take more of an initiative in the learning process between himself and his peers, and himself and the teacher/instructor, and is also more suited to the non-linear and non-hierarchical character of learning via the Internet. Asynchronous courses are common in Israeli universities; some are based on the web infrastructure known as HighLearn (software developed as a platform for web design and management) from the Britannica Company. The ORT Aviv Virtual School operates on a technological infrastructure used to develop and operate educational websites, known as Clickit, which was developed by the ORT Israel Network of schools and colleges for advanced technologies and sciences[1]. Courses are given through the Alpha and Kaveret programmes of the Centre for Educational Technology; websites belonging to educational networks such as Amal (Amalnet) and AMIT; Snunit, founded by the Hebrew University in Jerusalem; professional communities for various subjects [18]; and the Kushia system, which is a dynamic information navigating system involving a series of questions and answers developed at Haifa University [20]. It would appear that a suitable combination of synchronous events and asynchronous courses could be the best solution for studying and teaching using eLearning courses, which integrate the added values of both synchronous and asynchronous methodologies [21].

2.2.2 ICT COURSEWARE AND WEB-BASED LEARNING ENVIRONMENTS

The interaction between the learner and the material being studied primarily takes place through educational software and courseware. This is available on diskettes, CDs, and the computer's hard drive, and, naturally, through websites.

The courseware that had been combined with Computer Assisted Instruction (CAI) and Computer Assisted Learning (CAL) methodologies was very important some decades ago, but its importance has been declining. Nevertheless, it should be noted that when purchasing a sophisticated computer, it is usual to receive added educational software and courseware aimed at boosting sales.

In the national Computer for Every Child project [11], each child receives, in addition to a computer for their home, a comprehensive basket of different educational software and courseware that allows them to continue to enrich themselves in order to advance in their various subjects. This basket includes 25 software and courseware programmes, such as Windows, the Microsoft Office package, courseware for teaching mathematics and science from the Centre for Educational Technology, science courseware from the Computers Company, and English courseware at various levels from Edusoft. The courseware is particularly suitable for elementary school pupils, from first to sixth grades.

From the project evaluation report [12], it appears that the children, as well as other siblings in the family, made extensive use of the courseware. The scope of their usage did not decline over time, and the pupils and their families had wanted to receive additional enrichment and educational software.

The article by R. Nachmias [22] provides a description of the development of frameworks and tools for characterising, classifying, and analysing educational websites, relying on six different empirical research studies (carried out in the Knowledge Technology Laboratory at Tel Aviv University) conducted on 1 004 educational websites, mostly in the fields of science and technology.

In this section, we will discuss only the content-related aspects of the sites (section 6 will deal with the research aspects of the methodological tools that

1 It should be noted that the author of this report is the deputy director general for R&D and training of the ORT Israel Educational Network.

were developed and the characteristics of the sites examined). The article goes on to say:

> 'Pre-web digital educational materials present fascinating examples of the multiple ways in which educators succeeded in harnessing the new technologies for educational needs and goals (e.g. constructivist environments, intelligent tutoring systems, sophisticated multimedia learning environments).
> Against this rich background, the vast majority of educational sites at issue here prove to be the unripe yield of the promising, but still pioneering, web technology.' [22]

The vast majority of the sites reviewed in this article are still text-based (over 90%). Over half the sites use still images extensively, and around one fifth of the sites contain no visual images at all. Many of the sites do not include interactive images (95%), animated images (83%), or audio capability (97%).

We can assume that a period of transition is required to adjust the development of computer courseware to Internet courseware, naturally with options for broadband and fast communications.

With regard to the structure and organisation of the subject matter in these educational sites, we could have expected, perhaps, models of hypertext or hypermedia, non-linear structure, complex links between information units, and navigation and search tools that are the more common characteristics of ICT. But in this article we find that only around 60% include links to other information units contained in the same site, and some 20% include links to relevant information units found at other sites.

Thus it would appear that we have not yet reached that adjustment period of adapting, developing and transmitting content material for study and teaching via the Internet in order to maximise the rich and varied capabilities of ICT.

2.3 FAST INTERNET IN ISRAEL, FOR RESEARCH, EDUCATION AND CULTURE

In 2001, the then minister of science, culture and sports, Matan Vilnai, appointed a committee to prepare for the establishment of a national network for research, education, and cultural needs. The network constitutes a physical infrastructure and has a hierarchical structure – that is, a central network to which several secondary networks are connected, such as university networks, college networks, educational networks, and cultural networks [23].

The network is based on fast Internet connectivity, where the user is given a relatively large bandwidth by his Internet provider, thereby enabling the transmission of a fairly large quantity of data in a short time. The rate at which data can be downloaded using the different technologies ranges from 60 to 300 kilobytes (kb) per second, and in the future we expect to be able to reach a rate of up to one megabyte (Mb) per second (1 Mb = 1 000 kb) [7].

There are three basic technologies that enable broadband data transmission: ADSL, cable, and satellite. Data transmission using cellular technology has not yet reached the speed mentioned above, and cannot compete with fast Internet at this point for learning and teaching needs.

We must differentiate between the infrastructure provider, which supplies the physical infrastructure (modem, network card, and wiring that enables connection to the Internet), and a content provider, which enables access to the databases found on the Internet. According to the policy of the Ministry of Communications, the companies that have been awarded franchises to provide infrastructures are not permitted to serve as content providers, and therefore the final rates for fast Internet connection packages becomes the sum of the rates of the infrastructure providers plus those of the content providers. The present rate for obtaining a fast Internet connection package is about $40 per

month for home usage, and may be a very significant factor in a customer's decision whether or not to obtain broadband for educational purposes.

In the opinion of most of the experts interviewed [24], rates in the future will come down, but not significantly (the prices are certainly reasonable when compared with cable television rates or cellular telephone services). We may expect that those prices will include packages for fast Internet connections that will provide more effective and efficient services for the end user, as we have witnessed with the costs of computers.

In the past two years, the Ministry of Communications has promoted the rapid penetration of fast Internet in Israel, by enabling both Bezeq, which is the largest phone communication company in Israel, and the cable companies (Matav, Tevel, and Golden Channels, as well as the Yes satellite infrastructure) to provide fast Internet services [7].

The rate at which fast Internet has penetrated in Israel has gone from 2% of Israeli households in 2001 to 11% in 2002, and 15% in 2003. One third of the educational institutions connected to the Internet are connected using ADSL fast Internet technology. The Communications Ministry hopes to finalise and allocate frequencies for use by the Local Multipoint Distribution System (LMDS) and the Wireless Local Area Network (W-Lan) in order to promote Internet use in households, and to upgrade the present policy in order to enhance Internet penetration to other, more scattered sectors of the population.

3. LEARNING AND TEACHING IN AN ICT ENVIRONMENT

3

Aviram [25] begins with the assumption that the forces that characterise the integration of ICT in education contradict the forces representing the traditional school structure. The Hebrew word for 'school' literally means 'the house of the book', and the house to which everyone goes to participate in the learning process that uses books as a source of knowledge and information, and all of the cognitive and personality skills involved in their use, are losing to some extent or other the dominance they have enjoyed for the past 400 years in the reconstruction and transmission of knowledge. Aviram continues by claiming that we can assume that ICT will conquer the educational arena just as printed books did in the 16th century.

ICT requires and enables the following didactic changes:

- interactivity – greater involvement, both active and interactive, by the learner in planning his or her own curriculum;
- individuality – interpersonal differences in the learning process;
- non-linearity – processes that are not linear, lateral, or associative;
- sociality and a non-hierarchical character – personal relationships that are more intense and more equitable.

In the report submitted to the Ministry of Education of Luxembourg, the chapter on ICT in Israel states [2]:

> 'The focus of learning has shifted from the acquisition of knowledge to the development of students' ability to acquire and process knowledge, to draw conclusions from that knowledge and to produce the original thoughts, ideas and capabilities that will be indispensable in the new world.'

The report goes on to state:

> 'There appears to have been a shift of focus from subject to process, so that in areas where ICT is more widely used, teachers give more attention to the learning process and skills than to the particular content being studied… The relationship between

> teachers/parents/pupils/hierarchy has been considerably modified by the integration of ICT, mainly through the availability of easily-accessible information on the school website (administration and learning activities) which permits more parent involvement.'

In the study by Liran on web-based instruction and learning [26], it is reported that the Illinois online network refers to online interactions using the term 'synergy'. The claim is that the most meaningful learning, which has an immediate impact on student success, takes place in a synergistic environment that is open and direct, leads to learning, is directed by the teacher, and encourages the sharing of different types of individual and content-based knowledge with peers. The teacher's job is to serve as a model, through the messages he or she sends to discussion groups, and by offering encouragement and frequent feedback.

In an effective virtual course there is interaction between the learner and the subject matter, between the teacher and the students, among the learners themselves, and between all these actors and members of the community (parents, subject specialists, graduates, and so on). Interactions take place via e-mail, forums, chat groups, electronic bulletin boards, and video conferencing, both synchronous and asynchronous.

From statements made in this paper regarding virtual courses (and based on the experience of the author of this report in South Africa and Israel) in conducting synchronous distance learning courses using point to multipoint two-way transmission of audio and visual material, it appears that students located on remote sites generate much more interaction among themselves for mutual assistance and shared learning (both before and after the lesson) than students participating in frontal lessons with a teacher in a classroom.

3.1 THE ONLINE STUDENT

Students learning in virtual courses occupy a significant amount of space in the educational research literature on distance learning. Researchers and educators mention the student-centred learning environment as a classic learning environment that is most suited for the purpose of motivating students in a high-tech environment and through distance learning. In student-centred learning, the focus shifts from the teacher to the student. The learner is perceived as independent and active, with the right to choose and the freedom to decide on their own learning process, and to manage their study time independently [59].

We should differentiate between traditional distance learning and distance learning via the Internet. Distance learning using a book, radio, television, or courseware, which requires a particular procedure to process the information it contains into knowledge, is different from learning using an information site on the Internet. Navigating the worldwide sea of information requires for the learner to critically examine the information, process it, organise it, and present it using the appropriate means and methodologies.

Therefore, the qualities required from a learner in an ICT environment are, among others: independence, high motivation, confidence in and awareness of their own capabilities, and high self-control and problem-solving skills.

These qualities are not found in many learners, at least not during their early years in school, and there are many more pupils who need a social framework for their individual learning process. A pupil's sense of loneliness can be reflected in an unfocused meandering through the tremendous variety of information available on the Internet. And, of course, there are those who still suffer from technophobia, and find it difficult to deal with computer and Internet technologies.

In this context, we read in Liran's article [26] that a pupil's level of mastery of computer skills has an impact on his or her

performance in an online course. Thus, for example, students who lack technological skills and knowledge such as the ability to add attachments to e-mail messages do not do well with the subject matter of the course and have difficulty carrying out assignments. Furthermore, students who attempt an online course for the first time invest additional time adjusting to the demands and expectations that the new learning environment places upon them, and their level of skills interferes with the learning process.

In the study conducted by Nachmias and Shany [27] that examined the relationship between the success of lower secondary school pupils in a virtual course and their cognitive styles, it appears that virtual courses are not appropriate for every pupil. The study showed that the pupils were divided into two large groups: a group of 55% of the pupils that did well, and a group of 31% of the pupils who failed. The findings indicate that pupils with a liberal cognitive style (who do things in new ways) and pupils with an introverted cognitive style (who prefer doing things themselves and are focused inward) functioned better in the online course, achieved better results, and had more positive attitudes towards the course.

As stated previously, it appears there is also a significant positive correlation between the level of experience the pupils had working in an ICT environment and their success and satisfaction with the course.

A study conducted by the School of Education at Tel Aviv University [28] on the characteristics of Internet usage among young people (aged 12 to18) shows that the most common usage of the Internet among youth is for communication purposes (e-mail and chat), and the second most important usage is for information purposes – downloading resources, collecting data, and writing papers for school.

The main reason for using the Internet noted by the pupils was curiosity – 21% of pupils cited this reason. Some 18% of them noted the importance, interest, and fun aspects of using the Internet. The place where the pupils preferred using the Internet was at home (82.4%), at the homes of friends (33%), and in school (17%). More than half of the users learned to surf the Internet on their own and using instruction manuals, around one fourth learned from their friends, and one tenth learned these skills at school.

The main reasons for using the Internet for school were to prepare schoolwork (70%), for enrichment (about 60%), preparing for tests (17%), and participating in school-related discussion groups (10%).

Only 31% of pupils stated that their teachers encourage them to use the Internet, but as the pupils become older, the percentage of teachers who encourage them to use the Internet for school-related reasons increases.

A significant difference was found with regard to Internet use between boys (56%) and girls (38%). This difference remains consistent for most of the research variables. A key question that comes out of these findings is whether the perception of Internet usage as a male tendency is something that is unavoidable, or simply a cultural difference that will balance out as ICT becomes more widely integrated into people's lives. We will discuss this question in section 3.

Another study, conducted by Cohen [29], aimed to examine the characteristics of learning via the Internet beyond the regular classes taught in school. Seven schools in the central part of the country – four kibbutz schools and three urban schools – were sampled, and pupils from grades 4 to 12 (aged 9 to 18) were interviewed. An interesting finding that came from this study is that based on the pupils' feelings, meaningful learning is learning that addresses their individual needs and which begins with their own personal interest in a particular subject. This contrasts with a minority of pupils who feel that learning is more meaningful when it supports the school-based learning process. Therefore, in order to properly take advantage of the potential of the Internet in the learning process (both that which supports school

study and that based on the learner's individual needs and interests), it must be implemented within the school curricula. Such a process must begin with teachers, and we will expand on this concept in the next section.

Characteristics with regard to the needs and usage by university students of sites for academic courses are reported in a Tel Aviv University study on activities of academic learning on the Internet [30], which is based on work carried out for a master's thesis. The findings reveal the following.

- The vast majority of students (91%) report that they possess the skills needed to learn through a course site.
- Places from which the students logged on to the site (more than one response was permitted): about 80% did it from home, about 50% from the university, and 21% from work.
- Reasons for entering the course site: to check messages and updates – 70%; to access study materials – 56%; because the material on the site helped them to study – 47%; course assignments could only be found on the site – 41%; the lecturer had encouraged them to use the site – 34%; using the site was part of the course grade – 15%; opportunities for social encounters – only 3%.
- No less interesting were the reasons for not entering the course site: lack of time – 40%; technical difficulties in using the site – 34%; lack of access to a computer – 17%; lack of interest – 12%.
- The students' questionnaires revealed that their satisfaction with the course sites was high. The sites increased the availability of study materials, contributed to a better understanding of the content given at the lectures, and enhanced the students' enjoyment of the course. 83% of the students would like other courses to have Internet sites.

3.2 THE ONLINE TEACHER

The teacher constitutes a key factor in students' experiencing success in online courses. The teacher's role changes dramatically, from a transmitter of information – a 'sage on the stage' – to one who guides and facilitates according to the constructivist approach to learning – a 'guide at the site'. The online teacher must create a focused environment for co-operative learning, and ensure a high level of interactivity and participation by developing activities that engage the learners in authentic and strategic problem-solving tasks [26]. The role of the online teacher is defined as the facilitator of the process that will enable information to become knowledge by asking questions, providing examples or modelling, and giving advice and suggestions. He or she must encourage students to investigate sources of information, explain and detail their ideas, and organise the knowledge they have built for presentation purposes.

In terms of administration, the online teacher has a greater responsibility than the conventional teacher in planning and managing the schedule, maintaining the pace of progress, setting goals and checking student achievement, and managing assignments, papers, and examinations.

The job of the online teacher as a facilitator of a virtual course was studied by Nir-Gal [59] from the perspective of the needs and expectations of students from an academic college. In her research, she identified and defined four spheres of facilitation: facilitation in the technical-operative sphere (37%); facilitation in the task-orientated sphere (31%); facilitation in the personal-emotional sphere (26%); and facilitation in the social sphere (6%).

Most of the students (56%) in an online course prefer combined facilitation (virtual with face-to-face); 34% prefer virtual facilitation only; and 10% prefer just face-to-face facilitation. One interesting finding was that students participating in an online course were prepared to actively assist in facilitating their peers, alongside the formal facilitation of the teacher, both in the technical-operational sphere and the task-orientated sphere.

Another finding, no less important, was the need for facilitation of discussion groups in

the personal-emotional sphere for the members of the group. Examples of meaningful emotional behaviours that were appreciated by the students in an online course included: 'The encouragement you sent me… I needed that very much'; 'The (personal) support and assistance, you have no idea how much better they made me feel'; and 'The quick (individual) response to this need was very heartening and encouraging, and gave me lots of motivation'.

Shamir [31], in her study on the characteristics of Internet usage in a teachers' course, examined a heterogeneous group of 193 teachers, which constituted 76% of all teachers working in the five primary and secondary schools that were examined. The study findings indicated that the degree to which the Internet had become part of their teaching was closely related to the degree to which the teachers used the Internet for their own personal needs, the strength of their attitudes regarding the effectiveness of Internet usage, and easy access to the Internet from home and school. The teachers recognised the Internet as a tool that allows them to expose the pupils to rich, varied, and attractive information, but they claimed that disadvantages such as difficulty in classifying, organising, and evaluating information, the pupils' telecommunications skills for meaningful learning, and the fear of lack of control in terms of discipline and the types of information to which the students are exposed, can all delay the process of integrating the Internet into the classroom.

Shamir's findings indicate that teachers do not attribute sufficient importance to the role of the Internet as enabling educational dialogue and communications among themselves, and between themselves and their pupils. Furthermore, teachers who teach sciences use the Internet in their teaching more often than teachers who teach humanities. The group of teachers who feel most comfortable in using the Internet in their teaching are those who have between 6 and 10 years of seniority in their position. It is obvious that with the change in the role of a teacher running an online course, the organisational and structural difficulties of the traditional, hierarchical, and linear school contrast with the Internet culture, which is democratic, open, and limitless.

The priorities of lecturers who have operated academic course sites [30] regarding the goals of integrating the sites into their courses can be summarised as follows (more than one response was permitted): students' access to the course study material – 95%; enriching students with knowledge in the subject area – 64%; course management and administration – 57%; generating motivation and curiosity – 29%; reviewing material – 25%. Only 13% responded that the online course supplemented their lectures, and a mere 4% categorised the eLearning course as a full replacement for classroom lectures.

The findings also show that the course sites, from the lecturers' perspective, had advantages in three key areas: the ability to update and reorganise learning materials, improving the lecturer's relationship with students, and increasing the amount of enjoyment gained from teaching. It seems that the most significant factor in terms of motivating the lecturers to integrate Internet sites into additional courses was the response of the students. Another key factor was the possibility of obtaining professional technical advice, and reducing the burden of frontal lessons with the introduction of computerised teaching and learning. Some 95% of the lecturers responded that they intended to continue operating course sites in the future.

The characteristics of teachers who should integrate ICT into their teaching more easily than others, according to the ICT experts interviewed [17] [19] [24] [32] [33], are flexible thinking, openness to change, focus on process rather than outcomes, curiosity, interest, independence, and self-confidence – in short, a teacher who is a good pedagogue will also be a good online teacher. This is a teacher who constantly searches for, develops, and applies innovative and quality teaching methods to improve his pupils' learning. Undoubtedly, in the experts' opinion, ICT places a greater burden on the teachers

due to the academic dialogues they conduct from their home with pupils, colleagues, and school administration, and changes are needed in the occupational, organisational and physical structure of teaching and learning systems in schools so that ICT can be integrated naturally and will contribute to the pupils' progress.

Amit [33] emphasises the decentralisation aspect of the autonomy of the Internet, which fosters more independent activity by the learner in identifying information and turning it into knowledge. Dayan [17] and Poor [34] support his position by arguing that teachers must be inculcated, both in their training as students and through in-service courses, with the skills they need to instruct their pupils to locate, categorise, and process information into knowledge. Thus we read in the mission statement and objectives of the Administration for Science and Technology for integrating ICT into the school system [35] (Recommendation #32):

> 'Training programs and in-service courses for teachers shall be directed towards:
> - cultivating teachers with knowledge about computerized information to be used by a learner who can use information and communications technology (ICT) in an autonomous fashion and constantly grow as an independent learner;
> - enabling practical experience in integrating the use of different types of information and communications technology in learning activities, while taking into account the didactic considerations suited to each subject area;
> - instilling knowledge to bridge new and innovative teaching needs with computerized information technologies…'.

This has ramifications for the work of teacher trainers who train student teachers at colleges and universities. Recommendation #33 puts it as follows:

> 'Teacher trainers with leadership abilities, professionalism and responsibility, shall be trained to instruct teachers with vision, who strive towards promoting autonomous and moral pupils, with a sense of belonging and social responsibility and who are capable of generating a process of change.'

Another factor, no less important, is the method for formative and summative evaluation used to assess pupils' achievement, both at the national level and the institutional level. This assessment, as with national matriculation examinations in high schools and national 'positioning' examinations in lower secondary schools and elementary schools in Israel, has a real and direct impact on the implementation of the curriculum, in terms of both content and methodology. We are convinced that alternative assessment methods that stress the process and not merely the outcomes, and which include projects and portfolio-style papers using computers, should be included, even through administrative decisions at the national level by the Ministry of Education. At present there are several schools [2] and technological educational networks [36] that have integrated methods for computerised feedback and alternative evaluation methods, and that have accelerated the process of integrating ICT in teaching and learning various subjects on the one hand while at the same time instilling an ICT culture in the school.

4. THE DIGITAL GAP

4

Information and communication technology has turned information and knowledge into one of the most sought-after commodities in the world economies. The gap between those who are fortunate enough to enjoy the benefits of ICT and those who do not get to eat from the fruit of the tree of knowledge is known as 'the digital gap'. The digital gap is expressed within countries and between different countries. Boaz [37] claims that the digital gap can be measured using four main parameters:

- ownership – ownership of technology equipment, such as a computer, telephone line, modem, and Internet;
- degree of use – access to equipment without ownership;
- intensity of use – frequency at which the equipment is used;
- identity of the user – is there a particular group within the population that ranks higher or lower in each of the parameters?

Reasons for the digital gap vary, claims MK Michael Eitan [38]. Purchasing technology and learning the skills to use it is an investment that requires, as does any other investment, allocation of resources. There are those who do not have the means to invest the necessary resources, and others who have the resources but who do not properly appreciate the need to invest in this area. There are those with a psychological fear of innovation, and the phenomenon of 'computerphobia' is particularly well known. In addition, there are obstacles of physical limitations, prejudices, religious motives, and the justified fear of technology's negative side effects, such as loss of privacy, Internet addiction, exposure to explicit advertising, and the risk of computer-related crime.

In the next few paragraphs we will survey some of the issues related to the digital gap: socioeconomic status and place of residence, gender, immigrants, native language and English, senior citizens, and special needs populations.

4.1 THE SOCIOECONOMIC ISSUE

Table 2 presents percentages of computer and Internet ownership according to net per capita income decile for 1999 and 2000 [4].

Table 2: Percentage of computer and Internet ownership according to net per capita income decile – 1999 and 2000

	Lower decile		Fifth decile		Upper decile		Average for population	
	1999	2000	1999	2000	1999	2000	1999	2000
Home computer	16.1	22.8	39.5	46.5	62.0	71.7	40.7	47.1
Internet subscription	2.3	3.6	8.6	15.4	31.2	47.6	11.9	19.8

Source: Central Bureau of Statistics, Ownership of durable goods, by deciles of net income per standard person, Jerusalem, Israel, 2002. www.cbs.gov.il.

In table 2 we can see that there is a significant gap in computer ownership and Internet subscriptions between those with high incomes and those with low incomes. However, the most worrying finding is that the gap widened between 1999 and 2000. The digital gap is one more expression of the lack of social equity and lack of equal opportunity in society, but it also exacerbates the country's socioeconomic inequality.

An examination of the percentage of households connected to the Internet according to place of residence and in relation to the locality's socioeconomic ranking is presented in table 3 [38], which shows that there is a direct correlation between the two parameters. The percentage of households connected to the Internet is very low in cities where many of the residents come from lower socioeconomic strata, and this percentage increases as the population's socioeconomic status rises.

The effect of the gap in computer ownership among the different deciles of households is particularly pronounced in households with children up to age 17. The findings indicate that in 1999, 53% of households in the lower decile had children under age 17 (2.3% were Internet subscribers), and only 23% of households

Table 3: Percentage of households linked to the Internet in large cities, and their socioeconomic ranking for the year 2000

Locality	Percentage of households with Internet connection	Socioeconomic ranking
Bnei Brak	5.6	60
Ashdod	6.0	110
Bat Yam	7.8	133
Beersheva	12.2	107
Netanya	16.7	123
Jerusalem	19.2	113
Entire country	20.3	
Petah Tikvah	22.3	144
Haifa	24.9	155
Tel Aviv	26.6	162
Holon	27.1	147
Ramat Gan	29.1	170
Rishon Lezion	31.2	161

Source: Eitan, M., Bridging the gap in rehabilitated suburbs, submitted to the Economic Committee of the Knesset, Jerusalem, Israel, 2001 (in Hebrew).

in the upper decile had children under age 17 (31.2% were Internet subscribers). This gap regarding the younger generation is liable to lead to a lag in various spheres of education and employment, leaving the weaker sectors of the population on the fringes of society.

This is why national and public programmes that have been developed and implemented to promote computerisation for populations from low socioeconomic strata and in peripheral localities have been aimed primarily at pupils and youth, such as the Computer for Every Child, Tapuah, and Lehava projects described in section 2.1.

4.2 THE GENDER ISSUE

Israel's *Statistical annual* No 53 – 2002 [4] presents findings regarding the percentage of men and women who use computers for various needs (not including for work or school). The percentage of people 'who used the computer during the past week' were: men – 34.6%; and women – 25.2%. When broken down by needs, the figures are as follows:

- word processing, graphics, courseware, electronic spreadsheets, and so on: men – 14.8%; women – 11.3%;
- games: men – 20.3%; women – 15.4%;
- Internet (total): men – 17.1%; women – 9.1%;
  - entering Internet sites: men – 14.7%; women – 6.3%;
  - e-mail: men – 9.1%; women – 4.5%;
  - discussion groups, chat rooms: men – 5.4%; women – 3.3%.

According to the data, it is obvious that there are significant differences in computer and Internet usage between men and women in Israel.

Cohen's research [29] on the way pupils use the Internet for study purposes also points to differences between boys and girls. Boys use the Internet more hours per week, surf more freely, visit games sites more frequently, participate in more courses using distance learning techniques, and download more resources than girls.

Boys use the Internet more than girls for the purpose of: delving into a particular subject area that interests them personally; acquiring information on hobby-related topics; catching up on news and current events; gaining information on futuristic subjects; and games and learning that are not related to school.

Nevertheless, it was also found that in general, girls more than boys attribute greater importance to the Internet as a tool that supports learning in subject areas that are related to school, because the teachers encourage them to use the Internet for study purposes.

In the article published about the study conducted by Nachmias, Mioduser, and Shemla [39] (in addition to [28]), a relatively large number of findings are presented regarding the differences between boys and girls and the use of ICT.

In general, boys spend more time (an average of 9.45 hours per week) than girls do (an average of 5.59 hours per week) using ICT. A significant difference in time of usage in different locations was found between genders:

- from home: boys – 6.67 hours; girls – 3.35 hours;
- from school: boys – 1.40 hours; girls – 1.32 hours;
- from other places: boys – 1.38 hours; girls – 0.72 hours.

With regard to reasons for using ICT, we also find that boys use computers more than girls for purposes such as word processing, games, information sites, presentations, electronic spreadsheets, and so on.

Another finding is the significant difference regarding young people's perception of their own mastery of ICT skills. Boys saw themselves as being more ICT proficient than girls did (40.9% and 15.9% respectively). In addition, 14.2% of the boys considered their ICT competence to be very high, while none of the girls did so.

One of the key questions that must be addressed is whether ICT is perceived as a masculine occupation, and whether this is a cultural phenomenon that can be overcome. In the past, and perhaps in the present as well, as an outgrowth of the industrial revolution, technology was perceived as a field that attracted men more than women. But the expectation is that in this era of information and knowledge, there will be no gender difference.

It is interesting to note that most experts on ICT in education interviewed stated intuitively that in their opinion, there is no difference in the degree of usage or the manner in which ICT is used, between boys and girls.

In my opinion, and personal experience developing and implementing large, system-orientated projects, both in Israel and overseas, to encourage girls' interest in science and high-tech subjects, the public in general – and the education community in particular – are not aware of the gender gaps that exist. Even if we assume that, particularly in the ICT sphere, knowledge and skills must be taught to every girl and boy, there is still a need to continuously study and examine the digital gap between the genders, as we do not know when this cultural gap will be closed.

Moreover, educators must be charged with developing and implementing programmes, methodologies, and means that will ensure equal involvement by both boys and girls in the exciting sphere of ICT.

4.3 THE DIGITAL GAP AND SENIOR CITIZENS, ENGLISH AND THE INTERNET, AND THE SPECIAL NEEDS POPULATION

Data concerning the age factor in the digital gap is presented in table 4, taken from the Israel Statistical annual No 53 – 2002 [4]. The figures show percentages of computer use for various purposes (not

Table 4: Percentage of computer users according to age group and new immigrants, and details regarding the type of usage – 1999

	Age groups								Native Israelis	Immi-grants since 1989
	14-17	18-21	22-24	25-34	35-44	45-54	55-64	65+		
Used the computer in the past week Total	58.4	44.6	40.8	32.5	31.9	21.8	13.4	5.7	40.7	27.2
Of these: word processing, graphics, courseware, etc.*	17.9	17.1	20.5	13.6	17.8	12.0	5.7	1.8	19.0	10.1
Games	48.2	33.4	20.3	19.9	16.7	8.3	6.3	2.0	24.5	17.8
Internet	23.6	21.0	22.0	15.6	12.2	8.5	5.3	2.6	19.1	11.9
Of these: entered sites*	19.2	16.5	15.9	12.9	9.6	7.2	4.3	-	16.3	7.6
E-mail	8.2	9.0	13.0	9.4	7.8	3.9	3.3	-	9.2	7.7
Discussion groups, chat rooms	12.5	10.6	9.4	5.1	-	-	-	-	6.4	4.4

Source: Central Bureau of Statistics, Ownership of durable goods, by deciles of net income per standard person, Jerusalem, Israel, 2002. www.cbs.gov.il.

** More than one option could be selected.*

including work or school), according to different age groups in the country, for native Israelis and those who have immigrated since 1989.

From the data presented in table 4, we can see that as people age, the percentage of those who use computers and the Internet declines. In a survey on consumer purchasing habits conducted in 2000 by the Target Group Index (TGI) [37], numbers of Internet users were examined by age; there too, the trend was similar, although it was actually the 25 to 34 age group that had the most number of Internet users. In any case, it is clear that senior citizens make significantly less use of ICT. This is in spite of the fact that in general, people of that age usually have more leisure time, can contact their family and friends, can do so from their homes without having to rely on physical mobility, and can find interest in a variety of different spheres. Hecht [40] and Salant [19], who were interviewed, claim that generally speaking, we may assume that the reason for the small number of users among the older population is the fact that they did not experience the ICT revolution during their youth, and that because of their advanced age it is apparently difficult for them to adapt, both cognitively and affectively, to changes and innovations, and to exhibit flexibility and openness to new technologies.

In order to overcome this digital gap, we have seen the development of several local initiatives by schools, more system-orientated initiatives from educational networks such as ORT and Amit, and a comprehensive programme from the Ministry of Education – the Multigenerational Connection programme [41].

The Multigenerational Connection programme is aimed at recruiting pupils who have mastered ICT technologies to teach senior citizens from their communities the secrets of the computer and the Internet. The pupils' work with the seniors focuses on computerised documentation, a special website, and personal biographies of each adult, with their family background and history. Working in this way helps foster encounters with different population groups, enables them to give something to one another, and reduces the development of prejudices that stem from children's stereotypes about adults and adults' stereotypes about children. The project involves some 1 000 lower secondary school pupils throughout the country.

From table 4 we can also see that there is a gap in ICT usage between those born in Israel and those who immigrated to Israel since 1989. In the opinion of the ICT experts in Israel who were interviewed as part of this study, it is reasonable to assume that the reason behind the digital gap between new immigrants and native Israelis stems from socioeconomic and/or cultural factors, but is not related to the fact that they have immigrated to a new country. To the best of my knowledge, there is no research literature dealing with this issue in Israel.

No one disputes the fact that the language of the global Internet is English. There are those who claim, including this author, that a user's mastery of English contributes to their access and increased usage of the Internet, especially when the Internet is used to search for the rich and varied information that does not always exist in Hebrew. However, this issue can also be examined as a 'chicken and egg' dilemma – does frequent usage of ICT contribute to the user's improved mastery of the English language? In his article, Richardson [2] reports that in schools that excel in ICT, teachers who had a clear mastery of English had an obvious advantage over other teachers regarding Internet usage. Shamir's study [31] also points out that difficulties with English, and the small number of relevant sites available in Hebrew, are an obstacle to ICT usage.

Taking this perspective, national programmes aimed at reducing the digital gap, such as the Tapuah and Lehava projects [8], have included in their training course methods for improving English language mastery, especially basic concepts.

A large proportion of the population with physical impairments (blind and visually impaired, deaf and hearing impaired, motor disabilities), and those with cognitive impairments and learning disabilities, have trouble using the Internet because access is not easy for special needs populations. This can be due to a physical problem using the computer itself, or to the fact that sites are not user-friendly for special needs populations because the text is too small, navigation is not clear, colour is used to transmit information, and so on.

The Israel Internet Association has set up an Accessibility Task Force dealing with all aspects of promoting access to Internet sites for the disabled. In early 2002 the main forum established a project, Internet Accessibility, through which an Internet site was launched to deal with issues relating to Internet access, challenges, and possible means for coping with these challenges.

The Internet Accessibility site [42] presents standards in Hebrew for accessible sites, a forum for exchanging opinions and discussions on Internet access, and a list of experts, companies, and programmes in the field. The site also has professional tips on how to make a site more 'accessible', referrals to sites and databases in Israel and around the world relating to the subject, and instructions on obtaining an 'accessible site' standard based on the rules of the World Wide Web Consortium (W3C), an international consortium for developing Internet standards.

In order to enable people with disabilities to surf the Internet, efforts are usually needed in two directions.

- Website developers need to meet certain standards and carry out certain actions that will enable those with special needs to use the Internet (such as text explanations for graphic objects, and the ability to control the size and colour of texts).
- Some special needs users require supportive technologies (such as screen courses, text processors, a mouse or keyboard with specially designed structural components, and the ability to control the size and colour of texts).

It should be noted that the vast majority of organisations in Israel that have joined the Accessibility Task Force initiative are educational bodies: Snunit, the Centre for Educational Technology, ORT Network, Hebrew University's Learning Centre for the Blind, and more.

In fact, ICT has tremendous potential for helping pupils with learning disabilities and difficulties to organise information, acquire learning skills, and restructure the learning process. Darel [43], national director for special education in the Ministry of Education, together with her colleagues and those responsible for ICT at the Ministry, are working to introduce training courses and in-service training for special education teachers in all parts of the country, to help them integrate computers with the teaching and learning methods they use in their classrooms.

For the sake of brevity, we will describe one case study where ICT was integrated into the learning culture of a special education class in Israel.

Raviv [44], the class teacher, reports that computers enabled her to turn all of her teaching aids from 'dry' material into dynamic teaching aids. Regular worksheets became interactive worksheets. The pupils used search engines to find information and suitable illustrations. Use of a forum gave pupils a great deal of freedom, from many perspectives: time, place, and the ability to enter under an assumed name. Thus, says the teacher, the forum became a therapeutic tool as social uncertainties were neutralised and the pupils were able to let their feelings flow.

With regard to the question why learning disabled pupils have been so attracted to the process, the teacher responds as follows.

- Working on the class website helps the pupils overcome some of their learning difficulties, such as dysgraphia, and they have the chance to correct, rewrite, and improve their work.
- There is increased interaction between the pupils and the teacher, and among

the pupils themselves, both in school and especially after school hours. 'Each one gives whatever he can and takes whatever he needs.'
- Work on the site has helped raise the pupils' self-image in their own eyes – 'I'm just like everyone else' – and in the eyes of other pupils and teachers.
- There are fewer discipline problems during class because the pupils are busy with the assignments given to them on the class website.

The teacher sums it up in this way: 'When I was offered the chance to manage a class Internet site that would be just ours and just for us, I jumped at it. Since we started this, I'm like Alice in Wonderland'.

Every expert on ICT in education who was asked about the issue of computers for special needs populations noted that in their opinion, integrating ICT into the teaching and learning methods used for pupils with learning difficulties and disabilities would bring about a tremendous and significant change in their achievements and self-image as individuals, and would contribute to the community in general.

To sum up this section, we can say that the Israeli parliament [38], the Ministry of Education [35], and sections of the public are in the process of internalising the realisation that we must act on the national level in order to reduce the digital gap.

The government must present a policy on the matter of access to computerised information. We must intensify our investment in infrastructures of broadband networks and make them cost-effective, and operate special programmes within the education system, especially in those localities with populations from disadvantaged socioeconomic backgrounds. Employing tools to study the digital gap, and the application and operation of programmes and projects to reduce the digital gap, will have an impact on Israel's social and economic strength.

5. INNOVATION AND EXCELLENCE IN THE INTEGRATION OF ICT IN EDUCATION AND TRAINING INSTITUTIONS

5

The process of computerising teaching and learning and integrating computers and technology into education and training systems actually began about four decades ago, with the introduction of the Computer Assisted Instruction (CAI) and Computer Assisted Learning (CAL) teaching methods. Much money and effort was invested to develop courseware that enabled interaction between the learner and the content material stored on the central computer. Later on, these programmes were transferred to diskettes and CDs, as personal computers became more widespread within the education system. As the Internet entered universities, schools and training institutions, eLearning courses were developed and used to supplement or replace traditional frontal classes. But several years ago we began to understand that, apparently, we do not really understand the significance of the ICT revolution in general, and its impact on the education and training systems in particular. One way to help us understand this process is to enlist a methodology that can help analyse successful cases and pedagogic initiatives for integrating ICT in education and training institutions.

As part of a comprehensive survey at the end of the previous decade conducted by Richardson [2], based on case studies of schools that had succeeded with ICT integration in four countries, Israel among them, the criteria that characterised successful ICT integration in schools were analysed. These criteria can be summarised as three categories of inputs for the process of integrating ICT in schools, and one category of outputs regarding expected results, to create a model that was adapted in Israel by Ora Oz [2] and entitled 'Capacity for successful ICT integration'.

The categories of inputs are:

- school climate: shared ICT vision, ICT planning commitment, guiding

structures (standard policy, rules), level of information sharing between providers regarding users of ICT, centralised decision-making, and use of task force teams;
- ICT management: budget, work plan, technical support, professional development for teachers, monitoring of process;
- ICT knowledge: diversity of knowledge, awareness of knowledge sources, knowledge transfer, ability to utilise knowledge.

The output category includes, in terms of desired outcomes: cross-curriculum integration, judicious/pedagogically sound ICT application, equity of access, ICT literacy, and learning objectives attained.

It is worth mentioning several practices which could enlighten successful ICT integration in four Israeli schools that were chosen by the aforementioned study.

- Developing and implementing a school vision to educate school graduates capable of adapting to and integrating in a changing world of technology and information. The pupil should be capable of flexible thinking and be able to use advanced information technologies.
- Professional development for all teachers in the school, which included goals such as:
  - basic computer skills for the teachers – office and Internet;
  - the integration of ICT in the teaching/learning process;
  - the development of a group of leading staff members to develop ICT-integrated curricula.
- Technical pedagogic support for the school faculty: it seems critical that teachers have an onsite support team with whom they have constant dialog. The support team *must fully understand* the teachers' needs and the curriculum, they should be technologically capable of offering teachers ICT tools for fulfilling their needs, and supportive enough to help them implement the tools in the classroom. We think that this might be the single most important factor for successful ICT implementation, once the necessary condition of funding for hardware/software deployment is met (emphasis added).
- Teacher-prepared study materials that enable the pupils to learn independently either in their classes or at home, to ensure that the pedagogic goals the school has set for itself are achieved. The school is striving to integrate ICT as a means of encouraging students to become independent learner-researchers, skilled in using the learning material wisely.

The articles by Mioduser et al. [45] and Tubin et al. [46] report on comprehensive, in-depth studies conducted recently in Israel that examined pedagogic innovation in Israeli schools using ICT. These studies are combined in two international studies conducted in over 30 countries around the world. One is the *Second information technology in education study (SITES)* Module 2, conducted by the International Energy Agency (IEA) and focusing on innovative pedagogic practices of the classroom level. The other is the *Case studies of ICT and organizational innovation*, sponsored by the OECD/CERI, focusing on innovations at the school system level as a result of ICT implementation.

First we will briefly present the Innovation Analysis Schema for characterising ICT-based educational innovation [45]. The schema consists of two axes.

The horizontal axis is defined by three qualitatively different levels which constitute a progressive continuum of innovation:

- assimilation – ICT is integrated as a useful tool in common learning activities and in specific projects;
- transition – ICT is integrated within the school's everyday functioning, where new concepts and didactic and organisational solutions are employed side by side with the traditional ones;
- transformation – the school identity is mainly defined by the rationale and goals of the new operating guidelines, new teaching methodologies are

developed and implemented, and for particular activities the traditional time and space configuration is completely transformed.

The vertical axis refers to the domains of innovation:

- time and space configuration – physical space, digital space (virtual learning entities), and time (the degree of centralised school control of students' time);
- students' role – using ICT to complete curriculum assignments; development of ICT generic expertise; and personal assimilation of ICT as a learning, creative, and working tool;
- teachers' role – teacher/student interaction and teacher/teacher interaction;
- the curriculum – content (ICT-related knowledge, concepts, and skills incorporated in the curriculum), didactic solutions (new teaching methods and activities based on the use of ICT), and assessment methods.

It appears that the evaluation methods and means used in schools are likely to serve as an incentive for pedagogic change, and the researchers of this study [45] were right when they recognised three levels in this last dimension of evaluation:

- use of digital versions of standard and traditional assessment methods;
- attempt to develop particular criteria for the evaluation of students' work using ICT;
- creation of new assessment tools and procedures to suit the nature of ICT-based learning processes and products (e.g. digital portfolios, computer-log analysis schemas).

Let us take a look at the main aspects of the research [46] and the presentation that Mioduser and Nachmias made before the SITES steering committee [47] regarding ICT-integrated pedagogic models in Israel.

From these sources we can identify and describe in a structured manner ICT-integrated pedagogic innovations; provide information to policymakers so that their decisions with regard to ICT integration in the education and training system are informed and well-founded; and expand the research knowledge base concerning factors that promote or hinder successful ICT integration in pedagogic innovation.

Firstly, a list was prepared of about 100 cases in which ICT was integrated using innovative methods in schools that had been recommended by the Ministry of Education, education networks, universities, and so on.

The research staff, based on certain criteria (similar projects, projects that were in the first phases of implementation, and so on) reduced this list to 40 cases. All of the cases were presented to consulting experts who, together with the research staff and based on the criteria for selecting cases, created a final list of 10 schools (see annex 3, paragraph 3).

Among the international selection criteria (IEA) that were adapted for the conditions of choosing ICT-integrated innovative models in Israel, we find:

- a significant change that was made in the roles of the teachers and pupils, the goals of the curriculum and/or teaching materials, and the infrastructures for ICT integration;
- evidence of measurable achievements by pupils using ICT;
- ICT-integrated pedagogic innovation that was stable (existing for at least two years) and transferable;
- in-depth organisational changes within the school in connection with staff development, community involvement, learning resources, and organisation;
- ICT-integrated innovation leading to significant changes in the quality, cost, and equality of education.

Research tools included questionnaires, interviews with agents in the school and with focus groups of pupils and parents, observations and analysis of outcomes using the Innovation Analysis Schema described earlier in this section [45].

Table 5: Frequencies of selected Israeli schools (N=10): Innovative practices, by innovation level and domain

Domains \ Levels		Assimilation		Transition		Transformation
Time and space configuration	Physical space	3	2	3		2
	Digital space		1	4	3	2
	Time	2		3	3	2
Student role	Main roles		2	2	5	1
Teacher role	With students		1	4	3	2
	With teachers	1	2	5	1	1
Curriculum	Content		2	2	2	4
	Didactic solutions		2	5	1	2
	Assessment methods	2		3	4	1

Source: Mioduser, D., et al., 'Analysis schema for the study of domains and levels of pedagogical innovation in schools using ICT', Education and Information Technologies 8:1, Netherlands, 2003.

Table 5 reflects the mapping in the 10 schools selected, by domain and level of components of ICT-integrated pedagogic innovation.

By looking at this table we can see that most of the researched schools leading in ICT-integrated pedagogic innovation in Israel are at the transition level in most innovation domains (72%), and in only a small number of domains (19%) did schools reach the level of transformation.

Among the domains in which schools reached a high level of ICT innovation, we can mention content and student role. The domains for which the level of innovation was low were physical space, the teacher's role in his/her interaction with other teachers, and innovative didactic solutions of ICT integration. A more in-depth analysis of these findings is available in the original article [46].

Among the ICT-integrated innovative pedagogic models, we should mention the following four practices.

1. **Changes in the roles of the students – Pupils as computer trustees**
   Pupils have become major players in leading the change in that they have enhanced the teaching staff with in-service training, offered in-class assistance to other pupils, participated in preparing lesson plans, and taken part in several projects in their communities, such as adopting special education children and teaching senior citizens ICT skills and knowledge.
2. **Alternative space for time and curriculum – The computerised incubator**
   This model stands out because of its leading staff, experts who guide children in research, tasks and activities that take place at any time of the day (beyond regular school hours), and most importantly, authentic ICT project-orientated study integrated in the school curriculum and the students' society and environment.
3. **System-orientated planning in the school – The school of the future**
   A physical and organisational structure that supports ICT-integrated pedagogic approaches, organisation in multi-age groups, teamwork among teachers to integrate ICT in all subjects, autonomous learning by pupils, and alternative assessment methods that involve ICT projects.
4. **Curricular innovation surrounding an Internet site**
   Developing a dynamic, Internet-based learning centre that includes pupils'

projects, a bank of textual and graphic content, learning activities, links to relevant sites, and consideration for the needs of special education and new immigrants.

The study also looked at factors involved in ICT-integrated innovations and their ranking according to their influence. They are presented below in descending order of their impact on ICT-integrated pedagogic innovation:

- infrastructures: computers and peripheral equipment, technical support and budgeting for innovation;
- officials within the school: principal, ICT co-ordinator, leading teachers, the school's teaching staff;
- organisational climate: vision and goals of the ICT, extent to which the innovation is disseminated, history of the school in leading innovative processes;
- ICT policy: national and regional/local;
- training and staff development: content and source of the training;
- officials outside the school: Ministry of Education, local authorities, parents, teacher-specialist, and intervening body;
- organisation of learning: teaching units and how children are grouped.

In general we can state that many factors are involved in innovation, and not all of them carry the same weight; internal factors within the school are more influential than external factors.

Who runs the school and the intervening body are more influential factors when it comes to innovation; the computer co-ordinator is a major player in disseminating innovation, but he/she does not necessarily lead it. Computerisation succeeds when the national policy provides infrastructures, technical support, and teacher training, and the school-based policy provides the overall vision regarding the role of ICT in the school.

Some conclusions from the comprehensive study described to examine models for ICT-integrated pedagogic innovations are as follows.

- When the school has a **history of innovation** and local policy is encouraging, three initiators – the school principal, people who are 'crazy' about the idea, and the computer co-ordinator – can work to implement innovation by recruiting infrastructures and external bodies.
- **Vision first** – In the process of implementing ICT-integrated pedagogic innovation you must formulate a vision, and harness it to innovation and ICT integration.
- **Institutionalise innovation** – Innovation is based on excitement, but its continuation and dissemination rely on the ability to make it part of the organisational network (with suitable budgeting and manpower).
- The claim that **teachers and teacher training** are among the most important factors in implementation turns out to be only partially correct. The teachers who are involved have the most power, but the teaching staffs in general have less power and their involvement is not essential to the success of ICT integration.

In the studies described in this section, and from interviews conducted with experts on ICT integration in education and training systems, we obtained the names of elementary schools, secondary schools, colleges, universities, education networks, local authorities, public bodies, and private companies that are considered to be pioneers and innovators in the field of ICT-integrated pedagogic innovation. This list of names is intended to be neither inclusive nor exclusive (see annex 3).

6. FUNDING

6

It would appear that the education market is neither profitable nor especially prestigious, but there is no doubt that it serves as an infrastructure for the existence and advancement of every human society. Computerised education has become a desired commodity that is characterised by rapid growth in a dynamic market. In recent years, says Hecht [16], the common wisdom was – and perhaps it still is – that if you do not adopt computerised learning in your organisation, others will do it instead of you. Optimistic forecasts made in 2001 predicted that the estimated scope of the eLearning market would reach $23 000 million in 2004, compared with $6 300 million in 2001.

Businesses related to the field of eLearning develop as separate market niches for elementary schools, secondary schools, teaching in academic institutions, and on-the-job vocational training.

Niches that relate to teaching in schools and education in colleges and universities are funded, for the most part, by government ministries, public bodies, and foundations. Other niches are usually included in budgets for professional manpower development in commercial companies.

Eizenberg [48] claims that in the years that the Ministry of Education's computerisation programmes were implemented as part of the Tomorrow 98 programme, $60 to 70 million was spent each year, funded by the Education Ministry, Mifal Hapayis National Lottery, local authorities, and parents (author's note: there are those who dispute this assessment and claim that the investment did not exceed $40 million per year). Dayan [17] states that in recent years of severe cutbacks in government ministry budgets, including in the Education Ministry, the computerisation budget for schools stands at approximately $30 million: about $10 million from the Education Ministry, $10 million from Mifal Hapayis, and $10 million from local authorities, foundations, and donations.

According to Dayan, only a comprehensive investment of some $150 million per year over the next few years to cover ICT integration in education and training systems (to fund infrastructures of

hardware and software, maintenance, pre-service and in-service training, special projects, and more) can prevent the digital gap that exists in ICT implementation between Israel and other developed and advanced countries (it seems that, regarding ICT research and development, there is no gap, and Israel leads in pedagogic initiatives and research).

Or [24] discusses utilisation of the budgets, small as they may be, that are invested by government ministries and public organisations. According to him, we must develop a structured and systematic plan for investing in the development of teaching and learning materials for ICT in education and training so as to prevent the waste and duplication of effort that currently exists in the development of ICT courseware by the different development bodies.

To the best of Poor's knowledge [34], there are no special budget allocations in the Ministry of Labour and Social Affairs for integrating ICT in its training programmes for youth and adults, except for allocations to pedagogic projects that also include computerisation and are budgeted by districts' authorities (of the Ministry of Labour and Social Affairs), and vocational training in computer-related professions.

In the national computerisation programmes described in section 2, government and other bodies participate in funding the costs of infrastructures and operations. In the Computer for Every Child project [38], in which $18 million was invested over the course of three to four years, funding was divided among the following sources: donations from commercial companies – 31%; government ministries – 31%; local authorities and parents – 16%; and Mifal Hapayis National Lottery – 22%. With the Tapuah project [49], the cost of establishing a community computer centre stands at about $160 000. The budget of the Tapuah Association for 2001 came to $2.8 million, which was divided among the following: infrastructure ($0.8 million), communications ($0.33 million), training at the 35 centres ($1.1 million), establishing and operating a mobile unit ($0.33 million), and administrative and other costs ($0.26 million). The Ministry of Education budgeted thousands of training hours, valued at around $440 000; the Ministry of Science budgeted infrastructures and a mobile unit at a cost of $570 000; the Ministry of Industry and Trade budgeted infrastructures worth $155 000; and the remaining budget, about $1.6 million, was funded by commercial companies. We could mention that the sum of a donation by a company entitling them to a 35% tax deduction was raised to $440 000. However, the rapid mobilisation of the companies and the size of their investment in the project was not based only on financial considerations but resulted also from their desire to invest in promoting education, society, and the economy in Israel, by reducing the digital gap.

The Ministry of Education as well, through the Science and Technology Administration [41], strives for co-operation with leading ICT companies in Israel that contribute resources of manpower and time for promoting ICT in the Israeli school system and training institutions. For example: Microsoft has offered web services training, the Sisco Systems project, the Sun Systems project for developing stations linked to a school server that was linked to a larger server network, and the eLearning project run by Oracle.

A budgeted programme to 'promote teaching and academic study using high-tech means' at universities and academic colleges, to be funded by the government, was proposed by the Planning and Budgeting Committee of Israel's Council for Higher Education [50]. The main goals of the programme were to encourage meaningful and practical development for the rational and effective use of learning technologies, particularly the Internet, by academic institutions, and to serve as an incentive for expanding the scope of classes.

One of the demands of the proposal was the establishment of an institution-wide support centre, one third of whose operating costs, as well as 50% of the direct support for courses, would be funded by the Planning and Budgeting Committee.

Tel Aviv University, for example [30], developed a project for two and a half years (up until August 2002) at a cost of $1.1 million, where approximately $440 000 came from the Planning and Budgeting Committee and about $660,000 was funded by the University (roughly 50% by the University administration and 50% from faculty funding). In the author's opinion, this programme led to significant progress in integrating ICT in Israel's academic teaching, both at the universities and in the academic colleges.

In the work that was carried out for this study, including interviews and meetings with directors of organisations, institutions and programmes for ICT integration in education and training, it appears that no one knows of any funding from sources outside of Israel, such as the World Bank, the Development Bank or others, for this field. There are several bilateral projects that are small, both in scope and funding, such as the project to train the unemployed to work in the computer field, between Israel and Germany.

7. RESEARCH ON EFFECTIVENESS AND QUALITY OF ICT IN EDUCATION AND TRAINING

7

As part of the work carried out for this paper, articles and reports were examined regarding studies conducted for masters' and doctoral theses, surveys, and lectures given at conferences and seminars in the field of integrating ICT into the education and training systems in Israel during the last three and a half years (2000 to 2003).

Following a study of the aforementioned literature, we can say that most of the articles and reports deal with issues of understanding the processes for ICT integration in teaching and learning, on subjects such as: the scope and methods for using educational sites; characteristics of the online teacher and characteristics of the online pupil; features of the computerised learning environment; satisfaction among users; post-modern technology and/or pedagogy of the 21st century versus modern schools and training institutions of the 20th century; and an examination of case studies of innovative initiatives and successful ICT integration.

The findings of comprehensive and reliable quantitative studies which are carried out by government authorities regarding data on the use of computers and the Internet are usually published with a time differential of a year or two, and in a field that is so dynamic and growing so fast that it is difficult to analyse the impact of findings that are not up to date.

Our assumption is that we are at the beginning of a process of integrating ICT in education and training, and researchers and scholars are still trying to understand the phenomenon, the many different variables involved and how they interact, and the advantages, disadvantages, and ramifications of the various factors at work in ICT environments for teaching and learning.

Hecht [51] claims that the cost/benefit ratio of eLearning courses is, in his opinion, still too high compared with traditional training methods, and that these courses are not necessarily effective. He poses a challenging question: 'Do the tremendous investments in developing such courses really justify themselves, and do their optimistic forecasts actually come true?'

Measuring the effectiveness of teaching and training courses in general is complicated and depends on numerous different variables, particularly when trying to measure the efficacy of integrating technology/ICT pedagogy in these systems. On the issue of the effectiveness of training and teaching, there are still many contradictory opinions regarding the what, when, where, and how of the outputs that should be measured in relation to the inputs, and this is especially true regarding computerised education systems.

The activity report on the project for Academic Internet studies at Tel Aviv University [30] discusses research studies, which probably include relevant variables for measuring the effectiveness and efficacy of ICT courses carried out at three levels.

- At the macro level – Examined processes for implementing Internet teaching from the institutional point of view. How does the process for using lecturers for eLearning accompanying a course become prevalent over time? What are the characteristics of the group of independent factors, the connection between them, and their impact on the use of academic course sites?
- At the intermediate level – Examined teaching and study patterns that are emerging as a result of integrating the Internet in academic teaching, in spheres such as: flexibility in time and place for learning, information and content, communication and interaction between participants in the learning process, and changes in the roles of lecturer and student.
- At the micro level – Examined the teaching and learning processes of specific courses, and it is here (so state the authors of the report [30]) that they investigate the effectiveness of specific pedagogies, implementing case study research methodologies.

In the aforementioned report and in other literature sources that were surveyed (e.g. [22], [26]), we found a large number of bibliographic sources regarding research and studies that describe processes and findings on ICT integration in education and training systems, but we did not find, to the best of my knowledge, much research on the subject of the effectiveness of eLearning courses in Israel.

While writing this report, we learned from Hacohen [52] about the establishment of the Centre for Internet Studies of Tel Aviv University, which will deal with researching the different aspects of the effect of the Internet on the various spheres of our lives, and which will provide policymakers and decision-makers with available, up to date information to help them make the best possible decisions. We can assume that over time, we will better understand ICT in education and training, there will be more studies and research on the effectiveness and efficacy of their integration in schools, colleges, universities and training systems.

8. CHALLENGES AND KEY ISSUES FOR FURTHER DISCUSSION

8

Solomon [53], in his article entitled 'Pedagogy and technology: Is the tail wagging the dog?', states that pedagogic perception must be open to technological innovation, but that does not mean we should let them 'lead us by the nose'. When pedagogy ignores what technology has to offer, it becomes anachronistic and self-defeating because it is obstructing something that should enable its realisation. On the other hand, technology that assumes the privilege of dictating to pedagogy turns it into a system of empty learning tasks decorated with computers, merely to justify its existence.

Below we will discuss the challenges and major issues that should be discussed in the future so we can focus and clarify the ways in which we should be headed in order to integrate ICT into the education and training systems in the most effective and efficient manner. Oren [54] claims that if we summarise the innovation demanded of educational institutions in light of the impact of ICT, our focus is drawn to a process of flexibility. The issues the school and teacher training institution must address are rooted in a perceptual change with regard to the flexibility of the school's organisational structure; flexibility in teaching and learning processes and methods for training both teachers and teacher trainers; flexibility in dealing with information and turning it into meaningful and relevant knowledge; flexibility in methods for feedback and curricular assessment; and flexibility in including parents and the community in the educational processes taking place in schools.

8.1 FLEXIBILITY IN THE ORGANISATIONAL STRUCTURE OF THE EDUCATION/TRAINING INSTITUTION

Schools and training institutions are charged with realising their objective, which is to prepare the graduate to properly

function in society. Aviram [58] claims that the language we use to speak about education expresses the existing social reality, which is already 'post-modern' to a large extent, while the reality that exists within the schools and training institutions is essentially part of the 'modern' period – and the gap is vast. Thus there is a gap between the dialogue of decision-makers, principals, and teachers who speak the post-modern language (ICT integration, autonomous learners, breaking down the barriers of time and place), and the traditional implementation of the modern school, which is a product of the industrial revolution. In another article [25], Aviram states that there are those who describe the computer revolution as 'defining technology' – in other words, technology whose very use leads to change in the nature of the users and organisations through which such use is made. A deep and systematic lack of understanding regarding the organisational and pedagogic significance of ICT integration in schools not only wastes time and money in the technical implementation of computers in education and training, it can also lead to the waste of resources that are no less important – the trust of teachers and school administrations in initiatives and pedagogic innovation on the one hand, and the trust of pupils and parents in the system on the other.

Melamed [55] agrees with Aviram and states that we must 'break' the existing organisational system of the school – by changing the formal class schedule, changing the employment structure of the teachers, and changing the physical and economic structures of the school.

Oren [54] clarifies that there are, it seems, several options for developing a relationship between the two cultures: the contemporary school culture and the ICT culture.

- The ICT culture is rejected and the school toughens its attitudes and values.
- An intermediate culture is created, which allows educational activities to continue while adapting to certain characteristics that the ICT culture has to offer.
- The ICT culture gradually takes over, and will cause an essential change in the culture of education and training.

This author suggests that the last two options should be discussed in order to point towards the best (perhaps not ideal) option to be implemented in the education and training system.

8.2 FLEXIBILITY IN THE TRAINING OF TEACHERS AND TEACHER TRAINERS

In section 2 we discussed at length the cardinal change in both learning processes and teaching processes that leads, naturally, to different functioning for both pupils and teachers, when ICT is integrated in education and training. Hecht [16] claims that eLearning requires a new generation of teachers who have undergone different socialisation and training than was customary under the traditional training ethos. Eizenberg [48] states that the talents of good teachers must include good didactics, knowledge in the discipline they are teaching, knowledge in planning lessons, and, of course, knowledge in integrating computers in teaching and learning. In order to train such a teacher, he claims, we must invest time, effort, and a great deal of money. Richardson [2] reports that:

> 'A further area of concern underlined by national authorities is the need to develop teacher trainers with a double expertise in pedagogy and ICT. Certain schools are overcoming an insufficient ICT-integrated pedagogy knowledge base, by hiring ICT coordinator/directors, to work in collaboration with pedagogical adviser/directors appointed by subject area specialists within the school'.

It is reasonable to assume that this solution is appropriate for schools and training institutions that are rich in resources and financing, and this certainly does not include the entire education and training system.

It is clear that the challenge of suitable training for teacher trainers, and the teachers themselves, should be discussed because of their direct impact on the quality of their graduates.

8.3 FLEXIBILITY IN WAYS OF DEALING WITH INFORMATION AND TURNING IT INTO KNOWLEDGE THAT IS UNIVERSALLY ACCESSIBLE

Information can be transmitted, but knowledge must be constructed, claims Solomon [53]. This construction is not done by the teacher for the pupil – rather, it is done by the pupil himself, with the teacher's assistance. Technology can provide information and create a situation that enables activities that support the construction of knowledge and the inculcation of skills. ICT can enable the transition to a new pedagogy, and without it, constructive learning environments may not be realised. However, technology is merely the midwife in this process, not the mother, Solomon concludes.

Nor is the process for changing information into knowledge final, and there is another stage of turning knowledge into know-how, which includes the skills for implementing the knowledge: How do you solve the geometry problem? How do you plan an electronic system? How do you fix the car?

The innovative article by Bergman, Beyth-Marom and Nachmias [56] proposes the user-subjective approach to personal information management (PIM) systems. The PIM method is aimed at helping the user find the information item again, recall it when needed, and use it effectively in the next interaction with the item.

Nachmias and Mioduser [3] say that we are in the midst of a process of presenting information using digital technology (alongside books?, instead of books?). This process presents us with questions such as: How do we clarify the information we need from among the wealth of information located on the global Internet? What is the effect of the large number of media and forms for representing knowledge? What are the ramifications of changing the organisation of knowledge from a linear and hierarchical structure to a structure resembling a multilayered network?

These and other questions must be asked when we discuss the integration of ICT into education and training systems, because processes of identifying, processing, presenting, managing, and using information are the very essence of teaching and learning.

Undoubtedly, in this era of the 21st century, knowledge and information endow their owners with power and control. Therefore, access to information and the skills to process the knowledge and present it are the right of every citizen of the country (as described at length in section 3 of this report). The nation's authorities must see to it that the digital gap is reduced for all residents: between men and women, between socioeconomic strata, between those residing in major urban centres and those living in the periphery, between those who were born in Israel and those who immigrated, and for special needs populations. This issue must continue to concern policymakers and decision-makers, particularly with regard to the development of programmes to bridge the digital gap among the younger generation of pupils learning in the education and training systems.

8.4 FLEXIBILITY IN CURRICULAR ASSESSMENT AND EVALUATION

The curricular aspects of ICT integration in teaching and learning in Israel have been discussed in detail in previous sections of this paper, and there are articles and reports on studies and surveys dealing with this issue. But there is no doubt that insufficient attention has been given to a key question regarding the implementation of any curriculum: What are the feedback methods and means of assessing short-term, intermediate, and long-term outcomes? Any activity, plan, or project for integrating ICT in education and training must be accompanied by quantitative and

qualitative evaluation, both formative and summative, which examines its efficacy and effectiveness. Both Regev [18] and Nachmias [32] claimed in interviews that this issue of alternative and computerised assessment methods on the one hand, and examining the effectiveness of various models of eLearning courses on the other hand, must be examined more extensively and thoroughly.

One more aspect with regard to ICT that was raised in various forums is the setting of standards, and even defining an 'ICT culture' index in the educational or training institution. The ORT Israel Educational Network [57] has recently developed an 'Index for school ICT literacy' and has distributed Internet questionnaires to about 8 300 pupils, 2 200 teachers and 120 administrators in some 40 high schools. The parameters that this index examines are: computer integration in teaching and learning; the ICT environment in the school (school website and communication between pupils, teachers, and administration); ICT resources (infrastructure, support, and availability of computers); and ICT integration in the school administration. Although this is a first step, it would seem that this is an important process, even if it develops and changes, for promoting ICT integration in schools, and this should be discussed in the future.

As noted in this report several times, we are at the beginning of a seemingly laborious process to integrate the innovative, chaotic, and ever developing world of ICT into the structured and conservative systems of educational and training institutions. There are those who claim that in order to generate such an essential change we must also involve the school communities and, first and foremost, the pupils' parents as a strategic objective. And there are others who believe that the change must come through a bottom-up process, from the pupils themselves, with an ICT infrastructure that would allow each pupil to have his own laptop computer with a wireless Internet connection, no bigger or heavier than a notebook, that is easy to use for both reading and writing – and inexpensive.

Whether one or the other of these groups is correct, we can argue in the future, perhaps even the not-too-distant future. But for now we must continue to examine, investigate, develop, implement, and assess the integration of ICT into the education and training systems. As the 20th century poet Antonio Machado put it: *'Caminante – no hay camino, se hace camino al andar'.* Which means, loosely translated into English: 'Traveller – there is no path, we make the path as we go'.

ANNEXES

ANNEX 1. GLOSSARY OF KEY ICT TERMS USED IN THE REPORT

Asymmetrical Digital Subscriber Line (ADSL): technology that enables the rapid transfer of digital information through regular telephone lines.

Asynchronous: communications in which data can be transmitted independently both by the transmitter and the receiver.

Broadband Internet: large bandwidth supplied by the Internet provider, enabling the transmission of a fairly large quantity of data in a short time.

Courseware: computer software intended for educational use.

eLearning (virtual learning): learning through computers and the Internet.

Hardware: the physical components of a computer system.

Hyperlink: a highlighted word (or graphic) within a web page, that when clicked on links to another place within the same page, another page within the same site, or another website.

Hypermedia: pictures, videos, and audio on a web page that act as hyperlinks.

Hypertext: text that includes links to other web pages. By clicking on a link, the user can easily jump from one web page to another.

ICT: information and communication technology.

Software: programmes that control the functions of computer hardware.

Synchronous: occurring at the same time, simultaneous, both at the receiving and the sending end.

Web page: a single document that can be accessed and displayed on the Internet.

Website: a location connected to the Internet that maintains one or more web pages.

Worldwide web: network of HTML (language used to write pages and sites for the Internet) documents which are linked together and located all over the world.

ANNEX 2. ISRAELI ICT EXPERTS INTERVIEWED FOR THE REPORT

Dr Gil Amit

Professional expertise: computers in education, eLearning, design and development of teaching and learning computerised environments. Received his PhD in Computers in Education, School of Education, Tel Aviv University. Thesis title: *Student control over open multiple tutoring styles computerized system*. Received his MSc and BSc at Tel Aviv University.

Professional appointments:

1999 onwards: head of the R&D Center, ORT Israel.

1996–99: head of the Unit for Innovations and Marketing, the Administration for R&D and Teacher Training, ORT Israel.

1994–96: head of the Unit of Computer Literacy, ORT Moshinsky Pedagogic Centre.

1983–93: research and development of computerised learning programmes and environment, Israeli Centre for Science Teaching, School of Education, Tel Aviv University.

1990–93: curriculum consultant and developer for pre-algebra computerised project, Edumatics.

1981–83: mathematician and analyst, TAMAM company, Israeli aircraft industry.

1978–81: assistant, Department of Statistics, Tel Aviv University.

Mr Roni Dayan

Mr Roni Dayan serves as the head of ICT in the Administration of Science and Technology at the Ministry of Education, Israel.

Dr Jacob Hecht

Received his PhD from the Hebrew University in Jerusalem, where he lectured between 1961 and 1975. Hecht consulted in the fields of vocational education and career selection. He was the director of the Manpower Training and Development Bureau at the Ministry of Labour and Social Affairs, and served as a member and as the head of many public and government committees. He has published many articles in the fields of training and vocational education and career consultancy, and in the last three years he has published various papers dealing with digital culture.

Dr Uzi Melamed

Dr Uzi Melamed received his PhD degree in Science Instruction at Tel Aviv University. He has worked in the field of education for the last 30 years, starting as a teacher of mathematics and physics. He later became headmaster and supervisor of a high school. In 1975 he became a manager of the Pedagogic Center for Research and Development in the ORT network of more than 100 schools and colleges. Between the years 1983 and 1996, he served as deputy director general and head of the Pedagogic Department of the ORT Educational Network. Between 1996 and 1999, he served as the manager of the Israeli Centre for Science and Technology Instruction, at the Weizman Institute of Science; and as the Academic Manager of the Department for Principals' Training, School of Education, Tel Aviv University.

Prof. Rafi Nachmias

Current responsibilities: faculty member of the School of Education in Tel Aviv University; head of the Science and Technology Education Centre (SATEC), Tel Aviv University; head of the Exact Science Education programme, School of Education, Tel Aviv University; national research co-ordinator of the OECD International Study of ICT in Education; head of the Virtual, Tau – Web-Based Academic Instruction at TAU.

Mr Ehud Or

Mr Ehud Or is the director general of Tel Aviv University Online, a new venture currently being established within the Economic Corporation of Tel Aviv University Ltd, aimed at reaching out to students who prefer online studies over other alternatives. He served as the director general of the Open University of Israel from 1989 to 1996, where he was involved in promoting the integration of advanced technologies into the distance learning study method of the university. He took active part in the initiation and realisation of a major call for grant proposals under the title *Learning technologies at the service of higher education in Israel*, which was issued in 1999 by the Planning and Budgeting Committee of the Council for Higher Education in Israel.

Mr Shmuel Poor

National inspector for computer and high-tech studies in the framework of the Manpower Training and Development Bureau at the Ministry of Labour and Social Affairs. Specialisations: teaching of computer studies in the fields of communication and computer languages.

Prof. Sheizaf Rafaeli

Sheizaf Rafaeli (BA, Haifa University; MA, Ohio State University; MA, PhD, Stanford University) is head of the Centre for the Study of the Information Society and a professor at the Graduate School of Business Administration, University of Haifa, Israel. Previously, he has been head of the Information Systems area at the GSB in the Hebrew University of Jerusalem, since 1986. His interests are in computers as media. He has published on this topic in journals such as *Behaviour and Information Technology, Communication Research, Computers and the Social Sciences, Computers and Human Behaviour, Journal of Communication, Information and Software Technology, Information Systems Journal, European Journal of Information Systems, International Journal of Electronic Business,* and *Journal of Broadcasting*. He has also been involved in building Internet-based activities such as online higher education, journalism, and political, governmental, social, and economic virtual organisations and schemes. He has authored software and books on graphics, electronic spreadsheets and statistical analysis, and a textbook on information systems for the Open University. He is co-editor, along with Fay Sudweeks and Margaret

McLaughlin, of *Network and netplay: Virtual groups on the Internet*, published by MIT Press, 1998. He served as co-coordinator of the international ProjectH. He serves as co-editor of the *Journal of Computer-Mediated Communication*, and is proud to have set up the Citizen's Advice Board online service. Professor Rafaeli is a long-time member of the Stockholm International Challenge Jury for Information Systems Projects. He has served in visiting research and teaching positions at Ohio State University, Michigan State University, IBM, Stanford University, Technion, the Israeli College of Management, and the University of Michigan. Over the past 15 years, he has taught courses on computers as media, and the social implications of new communication technologies, as well as numerous Information Systems courses.

Mr Israel Regev

Received his BA in Economics from the Hebrew University, Jerusalem. He is the general manager of the Centre for Educational Technology (CET). The CET is an independent non-profit organisation established in 1971 and initially endowed by the Rothschild Foundation. Its mission is to introduce innovation and large-scale change in education in general and educational technology in particular. The CET has been the leader of some of the significant breakthroughs in Israeli education and is acknowledged today as a leading professional institution in the field of education in Israel. It is the largest publisher of school textbooks and learning materials in Israel and is on the cutting edge of introducing technology into schools.

Mr Ami Salant

Received his MSc in ICT and Education from APU University, UK, and his BSc from Tel Aviv University. He is the director of the R&D Centre of the Amal Education Network. He lectures at the Bar-Ilan University and manages the content of the Portal Project at the MOFET Institute of the Ministry of Education. He was the head of many ICT and knowledge management projects and published professional books and various papers on ICT and education.

ANNEX 3. INNOVATIVE AND PIONEERING ISRAELI ICT INSTITUTIONS

This list of institutions is neither inclusive nor exclusive and represents only the information known to the author of this report.

1. Universities

Tel Aviv University, Virtual TAU, School of Education, Tel Aviv, P.O.B. 39040, http://virtual2002.tau.ac.il/

Open University, Tel Aviv, P.O.B. 39328, www.openu.ac.il

Bar-Ilan University, Ramat-Gan 52900, www.biu.ac.il

2. Academic colleges

Levinsky College of Education, Tel Aviv, 16 Shoshana Persitz St., www.levinsky.ac.il

The MOFET Institute, Levinsky College of Education, Tel Aviv, 15, Shoshana Persitz St., www.mofet.macam98.ac.il

Oranim-Kibbutz Movement School of Academic Education, Kiryat-Tivon, 36006, www.oranim.ac.il

Achva College of Education, Shkimim 79800, www.achva.ac.il

Shenkar College, Ramat Gan, 12 Anna Frank St., www.shenkar.ac.il

Kay College of Education, Beer-Sheva, 33 Yehuda-Halevi St., http://kaye.macam.ac.il/

ORT Braude College of Engineering, Karmiel, 51 Snunit St., http://braude.ort.org.il/

3. Schools

From Tubin, D. et al., 'Domains and levels of pedagogical innovation in schools using ICT: Ten innovation schools in Israel', *Education and Information Technologies* 8:2, Netherlands, 2003.

- Ohel Shem School, Ramat-Gan, 118 Rokach St., www.ohel-shem.com
- Cramim Primary School, Rishon Lezion, 2 Hayain St., www.cramim.rishon.k12.il
- ORT Megadim Comprehensive School, Karmiel, 71 Hapisga St., http://megadim.ort.org.il/
- Neot David State Religious School, Petah-Tikva, 8 Feldman St., www.tik-tak.co.il/neot-david
- Bar-Lev Junior High School, Kfar-Saba, 102 Tel-Hai St., www.bar-lev.org.il
- ORT Rogozin Migdal Ha'emek, Migdal-Ha'emek, Nesiim St., http://space.ort.org.il/rogozin/
- Mevo'ot-Eron, Kibutz Ein-Shemer, www.mevoot.eron.org
- Maale Shaharut, Kibutz Yotvata, http://shaharoot.kfar-olami.org.il/
- Harishonim High School, Herzliya, 30 Harav Kook St., http://space.ort.org.il/harishonim/
- Ironi Zain School, Jaffa – Tel Aviv, 10 Hidushei Harim

ORT Kiryat Bialik Comprehensive College and School, Kiryat Bialik, Nir Ami St., http://space.ort.org.il/bialik/

Har-Vagai Co-operative Educational Institute, Kibutz Dafna, www.har-vagai.org.il

Shaar Hanegev Education House, Ashkelon 79200, Doar-Na Hof Ashkelon, www.makash.ac.il/h_school

Metro West School, Raanana, 2 Hapalmach St., www.morshuv.raanana.k12.il

Blich Municipal High School, Ramat-Gan, 22 Hame'a Ve'ehad St., www.blich.co.il

4. Private companies

I Teach U, Ramat-Gan, Hateomim Tower 2, Jabotinski St., www.i-teach-you.com

eTeacher, Ramat-Gan, 8 Oholiav St., www.eteacher.co.il

Edusystems, Kfar-Saba, 21 Atir-Yeda St., www.edusystems.co.il

IBM – Knowledge Content Management, Petach Tikva, 94 Em-Hamoshavot Rd, http://www-5.ibm.com/e-business/il/

5. Educational networks and others

ORT Israel Network, Administration for R&D and Training, Tel Aviv, 28 Hatayasim Rd, www.ort.org.il

Amal Network, The Pedagogical -Technological Centre, Tel Aviv, 15 Kehilat Kiev St., www.amalnet.k12.il

The Smart City Project - Ariel, www.ariel.muni.il

IAF (Israeli Air Force) Training, www.iaf.org.il

Tlalim – Educational Support for the Sick Child, Jerusalem, 1Mish'ol Hakoranit St., www.tlalim.co.il

Snunit, Hebrew University, Givhat Ram, Jerusalem 91904, www.snunit.k12.il

REFERENCES

1 Levinson, B., *Proposal for a joint Israeli-European project in the field of Open and Distance Learning (ODL) and Information and Communication Technology (ICT) in Vocational Education and Training (VET)*, Ministry of Labour and Social Affairs, Jerusalem, Israel, 2002.

2 Richardson, J., *ICT implementation in education – An analysis of implementation strategies in Australia, Canada, Finland and Israel*, Ministry of Education, Luxembourg, 2000.

3 Nachmias, R., and Mioduser, D., 'Integration of Internet in education' (in Hebrew), *Eureka – A Journal for the Teaching of Sciences and Technology* 14, Israel, 2001 (www.matar.ac.il/eureka/newspaper14).

4 *Ownership of durable goods, by deciles of net income per standard person*, Central Bureau of Statistics, Jerusalem, Israel, 2002 (www.cbs.gov.il).

5 *1.7 million Israelis surf the Internet* (in Hebrew), Ynet, 2003 (www.ynet.co.il/articles/0,7340,L-1948140,00.html).

6 Kirkman, G., Osorio, C., and Sachs, J., 'The networked readiness index: Measuring the preparedness of nations for the networked world', *The global information technology report 2001-2002: Readiness for the networked world*, Center for International Development at Harvard University, USA, 2002, pp. 10-29 (www.cid.harvard.edu/cidspecialreports).

7 Olenik, U., *An overview of the development of the Last Mile Competition and in the Internet market in the year 2002* (in Hebrew), Seventh Conference of the Israeli Internet Association, Israel, 2003.

8 Azaria-Frenkel R., Bensason-Forstenberg S., *Bridging the digital gap in the education system* (in Hebrew), background paper submitted for discussion with the Education and Culture Committee of the Knesset, Jerusalem, Israel, 2001.

9 *The ICT master plan* (in Hebrew), Administration of Science and Technology – Ministry of Education, Jerusalem, Israel, 2002.

10 *Education for sciences and technology* (in Hebrew), presentation given to the Education and Culture Committee of the Knesset, Administration of Science and Technology – Ministry of Education, Jerusalem, Israel, 2003.

11 *Computer for every child project* (in Hebrew), project for social development – Computer for every child, 2003 (www.maly.co.il).

12 Ben-Zvi, N., et al., *Evaluation of the project – Computer for every child: Final report* (in Hebrew), Administration of Research and Planning of the National Social Institution, Jerusalem, Israel, 2001.

13 *The Tapuah project* (in Hebrew), Tapuah – The NGO for the Advancement of the Information Age in Israel, 2003 (www.tapuah.org.il).

14 *Lehava project – Community Internet centres in neighbourhoods and development towns for bridging the digital gap* (in Hebrew), Centre for Research and Information of the Knesset, Jerusalem, Israel, 2003.

15 *The Lehava project* (in Hebrew), Lehava – bridging the gap in Israeli society, 2003 (www.lehava.gov.il).

16 Hecht, J., 'eLearning – Promising idea or commercial failure', *Nihul (Management) Journal* 143 (in Hebrew), 2001.

17 Dayan, R., Interview with the writer of this report, Head of ICT in the Administration of Science and Technology, Ministry of Education, Jerusalem, Israel, 2003.

18 Regev, I., Interview with the writer of this report, Director general of the Centre for Educational Technology, Tel Aviv, Israel, 2003.

19 Salant, A., Interview with the writer of this report, Head of ICT, Amal Educational Network, Tel Aviv, Israel, 2003.

20 Rafaeli, S., Interview with the writer of this report, Haifa University, Haifa, Israel, 2003.

21 *Meeting summary on the subject of synchronous activities* (in Hebrew), ORT Aviv – The First Israeli Virtual School, ORT Israel Educational Network – Colleges and Schools for Advanced Technology and Sciences, Tel Aviv, Israel, 2001.

22 Nachmias, R., 'Website story: Descriptive and prospective analysis of web-based learning environments', submitted to *International Journal of Educational Communication*, 2001 (nachmias@post.tau.ac.il).

23 Mezer, O., *Bluetooth – The National Network for Research, Education and Culture – National deployment data of fast Internet* (in Hebrew), Centre for Research and Information of the Knesset, Jerusalem, Israel, 2002.

24 Or, E., Interview with the writer of this report (in Hebrew), Administration Department, Tel Aviv University, Tel Aviv, Israel, 2003.

25 Aviram, R., 'Three views on ICT in education', *Halacha Journal* 15, Department of Curricula Planning and Development, Ministry of Education, Israel, 2000 (http://cms.education.gov.il/educationcms/units/tochniyot_limudim/portal).

26 Liran, M., *Web-based instruction and learning* (in Hebrew), paper submitted to The Curricula Track – Centre of Teaching and Learning in Technological Environment, Ben-Gurion University, Beer-Sheva, Israel, 2002.

27 Nachmias, R., and Shany, N., 'Learning in virtual courses and its relationship to thinking styles', *Journal of Educational Computing Research* 27:3, New York, USA, 2002.

28 Nachmias, R., Mioduser, D., and Shemla, A., 'Internet usage by students in an Israeli high school', *Journal of Educational Computing Research* 22:1, New York, USA, 2000.

29 Cohen, L., *Internet usage modes for learning by Israeli students* (in Hebrew), 2000 (www.amalnet.k12.il/sites/hadshanut).

30 Nachmias, R., et al., *Activity report – Virtual academic studies in Tel Aviv University* (in Hebrew), Tel Aviv University, Tel Aviv, Israel, 2003 (http://virtual2002.tau.ac.il/).

31 Shamir, T., *Usage characteristics of Internet among teachers* (in Hebrew), summary of master thesis submitted to the School of Education of Tel Aviv University, 2003 (www.amalnet.k12.il/sites/hadshanut).

32 Nachmias, R., Interview with the writer of this report, Head of Science and Technology Education Centre, School of Education, Tel Aviv University, Tel Aviv, Israel, 2003.

33 Amit, G., Interview with the writer of this report, Head of R&D Department in the Administration of R&D and Training, ORT Israel, Tel Aviv, Israel, 2003.

34 Poor, S., Interview with the writer of this report, Head of ICT and Computer Studies at the Ministry of Labour and Social Affairs, Jerusalem, Israel, 2003.

35 Melamed, U., *Vision and aims of ICT in education* (in Hebrew), Administration of Science and Technology, Ministry of Education, Jerusalem, Israel, 2000.

36 *Project report – Assistance to students studying for national matriculation exams through the Internet* (in Hebrew), R&D Moshinsky Centre at the Administration of R&D and Training of ORT Israel, Tel Aviv, Israel, 2003.

37 Boaz, D., *The digital gap in Israel* (in Hebrew), Sixth Conference of the Israeli Internet Association, 2002 (www.isoc.org.il/conf2002).

38 Eitan, M., *Bridging the gap in rehabilitated suburbs* (in Hebrew), submitted to the Economic Committee of the Knesset, Jerusalem, Israel, 2001.

39 Nachmias, R., Mioduser, D., and Shemla, A., 'Information and communication technologies usage by students in an Israeli high school: Equity, gender, and inside/outside school learning issues', *Education and Information Technologies* 6:1, Netherlands, 2001.

40 Hecht, J., Interview with the writer of this report, Jerusalem, Israel, 2003.

41 Dayan, R., *Report on WSIS project to the Administration of Science and Technology* (in Hebrew), Administration of Science and Technology, Ministry of Education, Jerusalem, Israel, 2002.

42 *Information and issues of Internet accessibility in Israel* (in Hebrew), Internet Accessibility, 2002 (www.nagish.org.il).

43 Darel, M., *Information and issues of ICT and special education*, 2002 (www.levinsky.macam98.ac.il).

44 Raviv, Y., 'The wonders of the Internet in special education' (in Hebrew), *Iyunim Issues in Technology and Sciences Journal* 36, ORT Israel, Israel, 2002.

45 Mioduser, D., et al., 'Analysis schema for the study of domains and levels of pedagogical innovation in schools using ICT', *Education and Information Technologies* 8:1, Netherlands, 2003.

46 Tubin, D., et al., 'Domains and levels of pedagogical innovation in schools using ICT: Ten innovative schools in Israel', *Education and Information Technologies* 8:2, Netherlands, 2003.

47 Mioduser, D., and Nachmias, R., *ICT integrated with innovative pedagogical models* (in Hebrew), presentation given to the Steering Committee of the Israeli SITES Project, School of Education, Tel Aviv University, Tel Aviv, Israel, 2002.

48 Eizenberg, Y., 'Computers in education – Put the genie back in the bottle' (in Hebrew), *Computers in Education* 42, Jerusalem, Israel, 1997.

49 'Information and Issues of the Tapuah NGO' (in Hebrew), Tapuah NGO, Tapuah Website, 2003 (www.tapuah.org.il).

50 *The advancement of academic instruction and studying through advanced technological means* (in Hebrew), Planning and Budgeting Committee, Council for Higher Education, Jerusalem, Israel, 2000 (www.che.org.il).

51 Hecht, J., 'The Missing Aspect of eLearning' (in Hebrew), *Mashabey Enosh (Human Resources) Journal* 169, Israel, 2002.

52 Hacohen, E., *The Centre for Internet Studies of Tel Aviv University – Mission and outline*, Tel Aviv University, Tel Aviv, Israel, 2003.

53 Solomon, G., *Pedagogy and technology: Is the tail wagging the dog?* (in Hebrew), lecture given to the Academy and Ministry of Education, Haifa University, Haifa, Israel, 2000.

54 Oren, A., *Between two cultures: Internet and the school* (in Hebrew), School of Education, Tel Aviv University, Tel Aviv, Israel, 2000.

55 Melamed, U., Interview with the writer of this report, Tel Aviv, Israel, 2003.

56 Bergman, O., Beyth-Marom, R., and Nachmias, R., 'The user-subjective approach to personal information management systems', *Journal of the American Society for Information Science and Technology* 54:9, USA, 2003.

57 *Index for school ICT literacy* (in Hebrew), Administration of R&D and Training of ORT Israel, Tel Aviv, Israel, 2003.

58 Aviram, R., *The double tongue* (in Hebrew), Centre for Futurism in Education, Ben-Gurion University, Beer-Sheva, Israel, 2000 (www.intellimanage.co.il).

59 Nir-Gal, O., *Distance learning: New aspects of the teacher's role, emerging from students' needs* (in Hebrew), Mofet Institute, Tel Aviv, Israel, 2001 (http://vcisrael.macam.ac.il/site/heb/show_file.asp?propid=H5A011&subjects=de&pages=topics).

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