TEACHERS AND COMPUTER-TECHNOLOGY: FROM TRAINING TO IMPLEMENTATION

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By

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Thesis submitted to the Faculty of Education, University of Leicester in partial fulfillment of the requirements for the degree of

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Supervisors: Dr. Marianne Coleman and Dr. Mark Brundrett

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Abstract

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The Israeli Ministry of Education launched the “Tomorrow 98” programme in 1994 to integrate computer-technology into the educational system. Training the teachers for this change was one of the main goals of the programme. This study examined the integration of computer-based technology of 167 ESL teachers who had participated in the course “Integrating Computers into the English Class” organised since 1994 by the Israeli Ministry of Education.

This two phased study included a questionnaire sent to all the ESL teachers who participated in the course and in-depth interviews conducted with five teachers (three users and two non-users of computer technology in their teaching) and five leading figures in their schools (three computer coordinators who work in the users’ schools and two school principals in whose schools the two non-users teach).

The analysis of the findings shows that 70 per cent of the teachers who participated in the course integrate computer technology in their teaching. A majority of these teachers have changed their teaching methods both in the computer environment and the regular classroom. They enjoy working in the computer room more than in the normal classroom and believe that their learners feel the same. The teachers state that their main obstacles are lack of time and access. Technical problems ceased to intimidate them as they have learnt to overcome them with the aid of their learners or peers. Of the 30 per cent who do not use computers in teaching, 93 per cent use computers to prepare their lessons and worksheets. The main reason they do not integrate computers in their teaching is lack of access to computers in school. The study shows that school principals and school cultures have a distinct influence on the success or failure of computer integration in their schools. Collegial school management and supportive school culture encourage teachers to use computers in their teaching and to experiment new teaching methods.

It is the hope of the researcher that this study will help teachers, principals, course developers, and other professionals working to integrate technology into instructional settings to understand the issues which accompany this process and lead it to success.
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Table of Contents

Abstract..................................................................................................................................iii
Acknowledgements.......................................................................................................................iv
Table of Contents..........................................................................................................................vi
List of Tables..................................................................................................................................xi
List of Figures..................................................................................................................................xiii

CHAPTER 1: INTRODUCTION .................................................................................................1
Background of the Study ..................................................................................................................1
Computer-Technology in Education – ET, IT or ICT .................................................................2
Integration and Implementation of IT in Education.................................................................4
Effectiveness of ICT in Education...............................................................................................5
The Role of School Management in the Implementation of ICT in Schools..............................6
Educational Reform and ICT.........................................................................................................8
Educational Reform and ICT in Israel.......................................................................................11
Computers in the Tel-Aviv District Schools..............................................................................13
Teacher Training............................................................................................................................16
About the Course - “Integrating Technology in the English Lesson”........................................18
Intensive in-service teacher training.........................................................................................18
Main objectives of the course.......................................................................................................18
Topic...........................................................................................................................................20
Rationale and Purpose..................................................................................................................22
Rationale of Study........................................................................................................................22
Purpose Statement.........................................................................................................................23
Research Questions......................................................................................................................24
Summary......................................................................................................................................25

CHAPTER 2: REVIEW OF RELATED LITERATURE................................................................26
Introduction..................................................................................................................................26
Part 1: Teacher Training and Information Technology.............................................................27
The Debate on Technology Effectiveness and Potential...........................................................27
Teacher Training for ICT..............................................................................................................33
Learning Theories and Teaching Strategies in Computer-Technology.................................37
Computer Technology in ESL....................................................................................................41
Major Obstacles and Barriers to Computer Use........................................................................41
# Contents

<table>
<thead>
<tr>
<th>Time</th>
<th>43</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>43</td>
</tr>
<tr>
<td>Support</td>
<td>44</td>
</tr>
<tr>
<td>Access</td>
<td>45</td>
</tr>
<tr>
<td>Teachers' Attitude to Computer Technology</td>
<td>45</td>
</tr>
</tbody>
</table>

Factors that Predict Computer Use | 47 |

Teachers' perceptions, beliefs and attitudes | 47 |
Continuous training – Life-long learning | 49 |
Acceptance of change | 49 |
Age of teachers | 50 |
Grade level | 50 |

Summary of Part 1 | 50 |

Part 2: The Impact of Leadership and School Culture on the Infusion of Change in Schools | 52 |

Change in Education | 52 |

Change and Computer Technology | 55 |
Diffusion and Adoption of Innovation and Change | 57 |

Effective Leadership | 61 |

Characteristics of Transformational Leadership | 62 |
Collaboration in Transformational Leadership | 65 |

School Culture | 67 |

School Culture and School Improvement | 68 |

Professional Development | 70 |

Professional development and computer technology | 71 |
Learning Organisations | 74 |

Learning styles and teaching methods | 77 |

Summary of Part 2 | 80 |

Summary of Literature Review | 82 |

CHAPTER 3: METHODOLOGY | 87 |

Introduction | 87 |

The Research Outline | 88 |

Research Paradigms | 89 |

The Mixed Approach | 91 |

Justification of the Mixed Approach | 92 |

Research methods | 93 |
The survey............................................................................................................93
  Justification of choice..................................................................................94
  The Questionnaire.......................................................................................94
Case Study ...........................................................................................................98
  Justification of Choice.................................................................................101
  Interviews....................................................................................................101
  Observations...............................................................................................104
  Diaries..........................................................................................................105
The Process and Purpose of the Case Study..................................................107
Stages of the Case Study Investigations .........................................................108
Sampling...........................................................................................................110
  Survey.........................................................................................................110
  Case Studies...............................................................................................110
Access and Ethical Considerations .................................................................112
Data Analysis and Presentation .......................................................................113
  The Survey Questionnaire Analysis ..........................................................113
  The Case Study Analysis.............................................................................114
  Validity, Reliability, Generalisability and Triangulation............................116
Conclusion.........................................................................................................120

CHAPTER 4: FINDINGS OF THE SURVEY ........................................................121
Has the training teachers received influenced their use of computers in their
instruction?.......................................................................................................122
  Teachers' training and implementation ......................................................123
  Purposes of usage.......................................................................................128
  Teaching strategies.....................................................................................128
To what extent do school leadership and school culture influence the teachers’
incorporation of computers in their teaching?................................................131
  The principal - the leader of infusion of change .......................................131
  School culture - a supportive environment ..............................................133
  Staff development - the school as a learning organisation .......................136
  Access to computers and software..........................................................139
What limitations and obstacles do teachers have in their attempts to incorporate
computers into classroom lessons?................................................................140
Which of the following factors are associated with computer use in classroom
instruction?.....................................................................................................144
Attitudes of teachers toward computers in the classroom .............................................. 144
Continuous training of teachers in computer use – lifelong learning ......................... 148
Age of the teacher ....................................................................................................... 149
Grade level in which the teacher teaches ...................................................................... 150
Teacher’s acceptance of change .................................................................................. 150
Demographics ............................................................................................................. 155
Summary of the survey findings .................................................................................... 157

CHAPTER 5: CASE STUDY RESEARCH .................................................................... 158

Teacher Profiles .......................................................................................................... 158
User 1 ......................................................................................................................... 158
School profile ............................................................................................................. 160
Interviewed Leader’s Profile – Computer Coordinator .................................................. 160
User 2 ......................................................................................................................... 160
School profile ............................................................................................................. 162
Interviewed Leader’s Profile – Computer Coordinator .................................................. 162
User 3 ......................................................................................................................... 163
School profile ............................................................................................................. 164
Interviewed Leader’s Profile – Computer Coordinator .................................................. 164
Non-user 1 ................................................................................................................... 164
School profile ............................................................................................................. 165
Interviewed Leader’s Profile – School Principal 1 ...................................................... 165
Non-user 2 ................................................................................................................... 166
School profile ............................................................................................................. 166
Interviewed Leader’s Profile – School Principal 2 ...................................................... 167
The Case Study Findings ............................................................................................. 167

Research Questions: ................................................................................................. 167
Has the training teachers received influenced their use of computers in their instruction? .................................................................................................................. 168

Teacher training and implementation ........................................................................... 168
Purposes of usage and teaching strategies ...................................................................... 175
Teaching Strategies ..................................................................................................... 181

To what extent do school leadership and school culture influence the teachers’
incorporation of computers in their teaching? ............................................................. 187

The principal as the leader of infusion of change .......................................................... 187
Infusion of change and school culture ........................................................................ 191
What limitations and obstacles do teachers have in their attempts to incorporate computers into classroom lessons? ................................................................. 198

Which of the following factors predict computer use in classroom instruction? 214

- Attitudes of teachers toward computers in the classroom .................................................. 214
- Continuous training of teachers in computer use – lifelong learning .......................... 215
- The Process of Change ................................................................................................. 217
- Age of the teacher ....................................................................................................... 221
- Grade level in which the teacher teaches ....................................................................... 222

Summary of the Case Studies .......................................................................................... 223

CHAPTER 6: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS 224

Introduction .................................................................................................................. 225
Discussion .................................................................................................................... 225
Conclusions .................................................................................................................. 243

Impact of the study and recommendations ...................................................................... Error! Bookmark not defined.
Implications for Further Research .................................................................................. 254

APPENDICES .................................................................................................................. 254

Appendix A: Correspondence ....................................................................................... 256
- Teacher Consent Form ................................................................................................. 256
- A Principal Consent Form .......................................................................................... 257
Appendix B ..................................................................................................................... 258
- Survey Questionnaire .................................................................................................. 258
Appendix C ..................................................................................................................... 267
- Interview schedule - Teachers .................................................................................... 267
- Interview schedule – Leaders ..................................................................................... 269
Appendix D ..................................................................................................................... 270
- E-Mail Diaries – Opening messages ............................................................................ 270
Appendix E ..................................................................................................................... 274
- The Computer - Based Lesson Plans and Lessons ......................................................... 274
Appendix F ..................................................................................................................... 293
- Definition and Glossary of Terms ................................................................................. 293

BIBLIOGRAPHY ............................................................................................................. 296
List of Tables

Table 1-1: A comparison between the number of schools in Israel and Tel-Aviv 13
Table 1-2: The main Topics of the course “Integrating Computers into the English Class 18
Table 2-1: Barriers to computer use 47
Table 2-2: Adoption categories for information technology 56
Table 3-1: Research paradigms 90
Table 3-2: Interview types 98
Table 3-3: Meeting schedule with teachers 109
Table 3-4: Meeting schedule with leading figures 110
Table 3-5: Case studies participants’ characteristics 112
Table 4-1: Impressions concerning training 123
Table 4-2: Teachers who marked ‘yes’ for implementation statements 124
Table 4-3: Implementation divided by group 125
Table 4-4: Percentage of teachers who marked yes for areas of training 126
Table 4-5: Percentage of teachers who frequently, rarely or never use the applications 127
Table 4-6: Purpose of using computers in classes 128
Table 4-7: Use of strategies in the computerised classroom. 129
Table 4-8: Most frequent strategies in computer versus regular environments: 130
Table 4-9: Scale of the strategies used in the computer rooms compared to regular classes. 131
Table 4-10: Our principal uses a computer in his/her office. 132
Table 4-11: Our principal encourages computer use among teachers 132
Table 4-12: Our school principal shows his appreciation of my computer instruction 132
Table 4-13: Our principal is supportive of computer instruction 133
Table 4-14: School principal influence mean difference between users and non-users 134
Table 4-15: Computers and school culture 135
Table 4-16: School culture mean difference among users. Non-users 136
Table 4-17: Forms of support teachers get. 137
Table 4-18: Description of courses taken during the last five years 138
Table 4-19: The organisers of the course 138
Table 4-20: Access to computers

Table 4-21: Barriers (order based on the number)

Table 4-22: Barriers - means by groups of users versus non-users

Table 4-23: Teachers' reports of obstacles for computer usage

Table 4-24: Teachers' attitudes towards computer usage

Table 4-25: The way teachers feel about teaching in a technological environment.

Table 4-26: The way teachers feel about teaching in a regular class

Table 4-27: Teachers' beliefs

Table 4-28: Number of courses associated with computer usage

Table 4-29: Other computer courses as predictor to computer usage

Table 4-30: Age and computer usage interaction

Table 4-31: Grade level and group interaction

Table 4-32: Teacher's reluctance to change

Table 4-33: Open ended question results

Table 4-34: Open ended question results grouped according to research questions

Table 4-35: Age of participants

Table 4-36: Education

Table 4-37: Type of school

Table 4-38: Mean of "experience", "home access" and "computer use in teaching"
List of Figures

Figure 1-1: The numbers of computers in schools in the Tel-Aviv district 14
Figure 1-2: The number of pupils per computers in the Tel-Aviv district 15
Figure 1-3: Total number of computerised schools in Tel-Aviv 15
Figure 2-1: Stages of curriculum change and the importance of dissemination 57
Figure 2-2: A model of stages in the innovation-decision process 60
Figure 2-3: Kolb’s Learning cycle 78
Figure 2-4: Integrating computers in teaching – based on the literature 85
Figure 6-1: Integrating computers in teaching – based on the study conclusions 247
CHAPTER 1: INTRODUCTION

Background of the Study

It has been stated that the human race has undergone three major waves of change, which reshaped the understanding of concepts such as time and space held by many civilisations (Idan, 1998; Mor. 2001). The first wave was the transit from hunting to agriculture. This shift took place over thousands of years. The second wave was the introduction of industry in what is known as the 'Industrial Revolution'. It took around one generation for this change to occur. The third wave is the one experienced by the current generation. It began in the 1960s and has been named "The Information Age" (Toffler, 1990; Mor, 2001; Munns, 1997). There are those who predict that the fourth wave (Idan, 1998; Kirby et al, 1996; Munns, 1997), referred to as The Knowledge Age (Idan, 1998), will occur during the first few decades of the 21st century. It is this fourth wave that is challenging educators (Toffler, 1990; Passig, 1998; Idan, 1998; Aviram, 2000; Munns, 1997). Educators realise that today's educational system should provide the learners with a new kind of knowledge that will prepare the citizens of tomorrow to successfully cope with new social, financial, industrial, and technological demands. (Toffler, 1990; Passig, 1998; Idan, 1998).

Both the information and knowledge ages pose a whole new set of challenges and questions to the goals of the educational system in modern societies. The quality of a nation's political, social and economic future will largely depend on the ability of young people to become functioning members of society who understand how to access information (and determine its significance), manipulate data, draw independent rational conclusions and communicate findings (Israeli Knesset Report, 1996; Harrari, 1993; Peled, 1986; DfEE, 1997; OTA, 1995).

"A democracy requires contributing citizens who are informed and capable of independent, critical thought... In the Information Age the citizen is the focus and his/her abilities to access information are the essence of a successful future. (Israeli Knesset Report, 1996 p1) (Hebrew).

The characteristics of the 21st century society are different from that of the 20th century (Toffler, 1990). Assuming that the school reflects society, then it is reasonable to claim that
the mission of the 21st Century school is different from that of yesterday’s school. (Passig, 1998).

"The duty of every generation, throughout the history of the human existence, is to prepare the next generation for the future. However, the future that we face is very different than those past generations faced. Social, financial, industrial and technological changes pose our generation with challenges that the human race has never encountered". (Passig, 1998, p 1) (Hebrew)

Students today need a higher level of academic, technical, communication and information-processing skills in order to function effectively in society (Salomon, 1996; Israeli Knesset Report, 1996; Passig, 1998; Chen, 1995; Mevarach, 1996). The contemporary workplace requires that employees be adaptable, team players with strong problem-solving and decision-making skills. Schools have to accommodate a variety of learning styles, interests and life experiences if they are to educate today’s students and prepare them for tomorrow’s workplace (DfEE, 1997; OTA, 1995; Israeli Knesset Report, 1996; Harrari, 1993; Peled, 1987). Leading experts (Kulik, 1994; Salomon, 1996; Passig, 1998; Chen, 1995; Harrari, 1993; Peled, 1986; Shahar and Sharan, 1998) have suggested that an organisation’s ability to learn, and to keep improving the way it learns, may be the ultimate means to deal with competition. It is not surprising, therefore, that during the last two decades many governments around the world have been investing in educational reform and the introduction of information technology (IT) into the educational systems.

**Computer-Technology in Education – ET, IT or ICT**

The terms “instructional technology (IT)”, “educational technology (ET)”, “information technology (IT)” and “information and communication (computer) technology (ICT)” are often used interchangeably to refer to the same field. However, they can be delivered independently of each other. The differences of definition stem from a difference in focus.

The American Educational Computer Technology (AECT) Task Force (1977) defined educational technology as:
"a complex, integrated process involving people, procedures, ideas, devices and organisation, for analysing problems, and devising, implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning" (p. 164).

Educational technology, in the past, approached learning from a learner's perspective. It took into account what it was the learner needed and tried to adapt the technology to make learning more meaningful for him/her.

Instructional technology is defined by having a more scientific background than educational technology. It focuses more on technological hardware and its ability to solve human problems, rather than merely trying to enhance the learning experience.

Information Technology (IT) or Information and Communications Technology (ICT) ICT is the terminology used at the time of writing, mainly as a result of the rapid increase in the number of schools all over the world integrating the use of the Internet into their curriculum. It is referred to as either IT or ICT depending on the part communication plays in the process. It generally refers to:

"the application of technological methods to solving human problems concerning the collection, transmission, storage and analysis of Information." (Hunt, 1996, p1).

However, today, there is:

"a tendency to emphasise the modern, electronic information technologies such as video, telecommunications and, particularly, computers." (Hunt, 1996, p1).

For many people ICT means computer technology, and this is the way in which the term is usually used in business. It is, perhaps, to make the wider sense more explicit that the term ICT has been widely adopted in education (Hunt, 1996 p.2).

The differences in the past between the definitions lie in their initial focus. At the present time the definitions are practically interchangeable, because each has shifted onto common ground. Educational/instructional/information technology can now be defined as rooted in education and committed to the furthering of education through the use of practical technological
applications. The primary focus is on the learner, but the practical use of the technology in the classroom is essential. The terms will thus be used interchangeably in this thesis and will be mostly referred to as IT or ICT.

Integration and Implementation of IT in Education

The introduction of IT in schools is a significant, global and urgent issue which occupies many governments (The Israeli Knesset Report, 1996; Salant et al, 1998; DfEE, 1996; Idan, 1998). There are many factors involved in the process: economic issues, technology, pedagogy, teachers' roles and attitudes, students' outcomes, strategic planning, policy issues, models, research assessment and evaluation, access (Israeli Knesset Report, 1996; Passig, 1998; Chen, 1995; Mevarech, 1996). Yet, in spite of the complexity, many governments, aware of the urgency and necessity of a wide implementation of educational technology for future progress and the economy are actively involved in the process of integrating IT into schools. The terms “implementation” and “integration” are mostly used in their basic dictionary meaning. According to the World Book Dictionary, “implementation” means “carrying out, getting done.” (p. 1061). The term “integration” is defined as “putting or bringing together to a whole” (p. 1096). Integration of computers in education is based on the assumption that computers should be an integral part of the learning process, both for servicing curriculum needs and as an object for study (Harrari, 1993; Chen, 1995). The manner and extent of the process will be discussed in further detail in other sections of this study.

There are a few factors that help technology succeed in bringing about learning and teaching benefits, according to Idan (1998) and Mevarech (1996). Evidence of a detailed technology plan which considers funding, installation and integration of equipment, ongoing management of the technology and which expresses a clear vision of the goals of the technology integration is one such factor (Harrari, 1993; Peled, 1986). Another factor emphasises the importance of teacher training and continuing education. Teachers should know how to operate the technology and how to integrate it into the curriculum (DfEE, 1995; Harrari, 1993; Peled, 1986; OTA, 1995; Crawford, 1999). Support from administration, in the form of funding, or in restructuring schedules and physical space to reflect the new learning environment is also essential for successful implementation of computers in schools (Harrari, 1993; Peled, 1986; OTA, 1995). Support from government, adequate funding and appropriate policy making can help to assure that technology is accessible to all schools on an equal basis.
and all teachers are receive the adequate training and support (Harrari, 1993; Peled, 1986; OTA, 1995). These factors suggest that to succeed, computers, like any educational tool, cannot exist in isolation, but must be made an integral part of the entire instructional process (Idan, 1998; Salomon, 1996; Chen, 1995). For that to occur, the potential of using technological in teaching and learning has to be reviewed and analysed.

**Effectiveness of ICT in Education**

"Thinking about the computer's role in education does not mean thinking about computers; it means thinking about education" (Crawford, 1999, p. 42).

James Kulik (1994) summarised the work of more than a decade analysing the effectiveness of computers used for instruction. Meta-analysis allowed him to aggregate the findings of more than 500 individual studies of computer-based instruction. The studies, conducted independently by research teams using different methods at eight research centres, focused on different uses of the computer with different populations. Kulik drew several conclusions from his work. One conclusion was that students usually learn more in less time when they receive computer-based instruction. Another important finding was that students like their classes more and develop more positive attitudes toward computers when their classes include computer-based instruction (Kulik, 1994).

For the most part, the computer programmes reviewed in Kulik's analysis were developed before 1990 and tended to emphasise drill and practice. More recently, the Software Publishers Association released a report (1996), prepared by an independent consulting firm that analysed 176 studies conducted from 1990 to 1995 on the effectiveness of technology in schools. The report showed that students in technology-rich environments experienced positive effects on achievement in all major subject areas, from pre-school through higher education, for both regular and special-needs students (Sivin-Kachla et al, 1996). Most students, although not necessarily low-achieving students, who tended to require more structure were better able to pace themselves when technology was used. Student attitudes toward learning and the students' own self-concepts improved consistently when computers were used for instruction. The report concludes that the use of technology as a learning tool can make a measurable difference in student achievement, attitudes, and interactions with teachers and other students (Sivin-Kachla et al, 1996).
In the last decade, students have used multimedia to learn interactively and work on class projects. They regularly use the Internet to do research, engage in projects, and to communicate (Mor 2001; Mevarech, 1996; Kulik, 1994; Katz et al, 1996. The new technologies allow students to have more control over their own learning, to think analytically and critically, and to work collaboratively. This "constructivist" approach (discussed in Chapter 2, page 51), is one effort at educational reform made easier by technology, and perhaps even driven by it. Traditional lecture methods are often left behind as students collaborate and teachers facilitate (Darling-Hammond, 1995; Mevarech, 1996; Katz et al, 1996). Students, who often know more about technology than the teacher, are able to assist the teacher with the lesson. Since this type of instructional approach, and the technologies involved with it, is recent developments, it is hard to gauge their educational effects.

In an attempt to determine the effectiveness of educational technologies, there are methodological and practical issues. For example, technology is only one component of an instructional activity, therefore assessments of the impact of technology are really assessments of instruction enabled by technology, and the outcomes are highly dependent on the quality of the implementation of the instructional design (Salomon, 1996). This further emphasises the importance of the role teachers play in successfully introducing computers in their teaching. The quality of instruction often depends on the standard of the teachers’ teaching and technological skills, the effectiveness and relevance of the technological training and support they are provided with, the extent of their ability and willingness to accept change and adapt their teaching strategies to new environments (Aviram, 2000; Becker, 1994; Chen, 1996). Nevertheless, issues such as availability and access to computers, school management that encourages and supports teachers who use computers in their teaching, school cultures that provide a sympathetic environment, are all crucial to achieving the goal of successful implementation of computers in schools (Becker, 1994; Hargreaves and Fullan, 1998; Mor, 2001; Sivin-Kachla et al, 1996)).

The Role of School Management in the Implementation of ICT in Schools

There are a number of forces without which the teachers’ task of successfully and efficiently integrating technology into their teaching would be difficult and, in some cases, impossible. These forces may be either internal, relating to the individual teacher’s qualities or external, relating to forces that are external to the individual including what is going on in the school environment within which the individual teacher functions. The origin of some of these
internal elements exists within the teacher, constituting part of his/her character and
depending subjectively on his/her attitudes, beliefs, and anxieties (Dwyer, 1994; Fullan, 1999;
Chen, 1996). Successful implementation may thus be a result of the teacher’s age, number of
years left until retirement, general state of mind, willingness and readiness to change (Chen,
1996; Schofield, 1995). However, external forces have an impact on the achievement of a
successful programme of integration of technology into the curriculum. The informed actions
of the school principal, a supportive school environment, a concerned leadership, a
sympathetic school culture and strong backing from the school community are found to be of
critical importance for a successful programme (Schofield, 1995). Many aspects of the
school’s organisation can be affected by technology, including structures and personnel for
technical support, curriculum structure and timetabling, and financial priorities (Harrari,
1993; Hargreaves, 1994). There are implications for the organisation and management of
technical and other resources in the school if curriculum integration is to be successful.
Lawson and Comber (1999) performed a study in secondary schools in UK. They examined
non-technical factors which successfully lead to the integration of ICT into the curriculum of
those schools. They concluded that:

"the support of management was vital for the long-term future of ICT…As
a consequence, those involved with the project, both teachers and ICT
coordinators, had confidence that their efforts would not be cut short.” (p.
48-49)

Somekh (1998) draws upon a wide range of research that provides insights into the process of
innovation and change to see what can be learnt to support the innovation of ICT in higher
education. She claims that:

“ICT related activities need to become an integral part of modules by a
department or team.” (p.27)

Schools whose teachers have access to computers and computer rooms, to curriculum
specialists and technology experts, whose principals provide them with time allocations to
enable support of and collaboration with other teachers, appear to have a good chance to
succeed in implementing computers in the system (Schofield, 1995; Hargreaves, 1994; Fullan,
1990).
Educational Reform and ICT

Many believe that recent revolutionary changes in educational technology hold great promise for revolutionising education (Hargreaves, 1994). In fact, educational technology is often considered an important tool for bringing about the kind of systematic changes called for in recent educational reform efforts in most of the developed world. There are few areas of everyday life which are not touched by information technology in one form or another. The increasing pervasiveness of the use of IT is transforming the way the commercial world conducts business and how governments deliver their services to the community. In education, this world trend has the potential to cause a paradigm shift in the utilisation of new methods and media in teaching and learning, and in preparing students to face the IT revolution (Idan, 1998; Aviram, 2000; Kirby et al, 1996). Predicting the future, in education or any other field, is always a dangerous game. Yet even the most cautious would probably agree that whatever shape the curriculum of the future takes, information and communications technologies (ICT) will be central. As a result, harnessing the potential of ICT for learning is seen as a key policy issue by numerous governments around the world (US Department of Education, 1996; Korea Multimedia Education Centre, 1997; Malaysian Ministry of Education, 1997; Singapore Ministry of Education, 1998; Wong, 1999).

Hong Kong is among the nations that invest in promoting IT in their educational system (Wong, 1999). To improve education quality and the construction of an information infrastructure are two initiatives that seem to be crucial to the economic competitiveness of the Hong Kong SAR and the quality of life. In his policy speech delivered on 8 October 1997, the Chief Executive, Mr. Tung Chee Hwa highlighted the significance of these two initiatives. The Hong Kong Ministry of Education launched a five-year IT strategy through a policy paper entitled 'Information Technology for Learning in a New Era' (Wong, 1999), which sets out a challenging vision of how schools should be turned into dynamic and innovative learning institutions; enable students to acquire a broad knowledge base and a global outlook; develop in the students capabilities to process information effectively and efficiently; and inculcate in students the attitude and capability for independent life-long learning. (Wong, 1999).
Singapore's Masterplan for IT in Education (Hean, 1997) is another example of a comprehensive strategy for creating an IT-based teaching and learning environment in the educational system. In a speech made by Mr. Radm Teo Chee Hean, Minister for Education in Singapore, on April, 1997, he declared that

"Our Masterplan for IT in Education will have four goals: First, to enhance linkages between the school and the world around it, so as to expand and enrich the learning environment; Second, to encourage creative thinking and lifelong learning; Third, to encourage innovative processes in education; and fourth, to promote administrative and management excellence in our education system. The target for our Masterplan, to be achieved by the year 2002, is for students to have hands-on use of computers for 30 per cent of their curriculum time. This means providing 1 computer for every 2 pupils." (Hean, 1997, p. 2)

The United States governments in the last two decades have pursued the issue of computers in education with great enthusiasm. Bill Clinton's administration believed fundamental changes in education were necessary to infuse, coordinate, establish and ensure the implementation of educational technology integration in schools.

"We know, purely and simply, that every single child must have access to a computer, must understand it, must have access to good software and good teachers and to the Internet, so that every person will have the opportunity to make the most of his or her own life." (President Clinton, 1994)

These beliefs culminated in the "Educate America Act" that was enacted by Congress in 1994. The overall purpose of the Act was to provide leadership at the federal level, through the Department of Education, in developing a national vision and strategy to promote achievement of the National Education Goals (US Congress, 1994). This has led since to further legislation as a result of which the educational system in the United States is undergoing tremendous change involving educational technology. In explicit acknowledgment of the challenges facing the education community, on February 15, 1996, President Clinton and Vice President Gore announced the Technology Literacy Challenge, envisioning a 21st century where all students are technologically literate. The challenge was placed before the nation as a whole, with responsibility for its accomplishment shared by
local communities, states, the private sector, educators, parents, the federal government, and others.

This reform is still in process but its effect is already noticed as one parent claims:

"The school has offered things to students, my son included, which I never dreamed possible. The students use computers to perform homework, to explore new avenues. The academic programme here is unparalleled due to technology and the dedication of the staff." (Parent, quoted in, US Department of Education Report, 1996, p. 5)

Another example is educational reform in the UK. In 1996 a panel of independent experts was established at the behest of the then Labour Party Leader, Mr. Tony Blair, to look into the use of Information and Communications Technology (ICT) in primary and secondary education. The main aim of the Committee was to produce an objective report on the current usage of ICT in schools, and as a result of this analysis to suggest a workable set of priorities for Government after the election. The findings were clearly unsatisfactory. At first sight the hardware situation appeared to be healthy, however there were significant differences in the provision between schools, especially in the primary versus secondary sectors. The figures showed that in 1995-96 primary schools had only one computer to every nineteen pupils, and a high proportion of this equipment was over five years old and thus incapable of running the latest software. Another limitation was the lack of guidance and training teachers received on how to use ICT in the classroom. The extent to which ICT was used as a teaching tool in non-IT subjects varies enormously between schools. (DfEE, 1997). Many of these differences reflected varying policies between both schools and local education authorities. Schools needed a broader vision of how ICT could be employed beyond spreadsheets for mathematics and word-processing for English. This may have led to the foundation of the "National Grid for Learning" initiated by the present British Government. In his foreword to the "Government's consultation paper on the National Grid for Learning: Tony Blair (1997) promises:

"By 2002, all schools will be connected to the superhighway, free of charge; half a million teachers will be trained; and our children will be leaving school IT-literate, having been able to exploit the best that technology can offer." (p.2)
The National Grid was launched in 1998 and is available through the Internet. It provides links to information, advice and learning resources. Tailored facilities exist for each of the home countries of the UK.

**Educational Reform and ICT in Israel**

Getting Israeli students ready for the information age and the knowledge age (Passig, 1996; Toffler, 1990; Idan, 1998), ready to become working members of society who understand how to access information, manipulate data, draw independent rational conclusions and communicate findings, has been the main concern of all the Israeli Ministers of Education in the last twenty years. Elad Peled (1986) was the chairman of the first Committee that dealt with the introduction of computers and technology in the educational system. He realised that ICT was expected to be the medium in the foreseeable future that would change many aspects of the educational system as it existed in the twentieth century (Peled, 1986), and should therefore be introduced into the educational system within a framework of a national computerisation plan based on a holistic and systematic understanding of the role of ICT in education (Peled, 1986; Harrari, 1993). The Peled Committee spearheaded the master plan for the computerisation of the Israeli school system. Dr. Elad Peled of Ben-Gurion University believes that:

"technology can change the learning environment...that children learn best by experience and doing and not by hearing and repeating" and that the "major factor in moving the learning process of the child is the teacher". (1986, p 7).

The Committee recommended that the educational system be computerised at a ratio of one computer per ten students (both primary and secondary schools) and that the computer be an integral part of the teaching and learning process.

The second report was the paper produced by the supreme Committee chaired by Professor Haim Harrari, President of the Weizmann Institute of Science. The final draft was handed to the Ministry of Education in 1993. This paper outlined how technology should be gradually infused in the schools in a plan known as "Tomorrow 1998". Some of the main goals of the "Tomorrow 98" programme were to:
"promote scientific and technological education and seek to expand the role of technology in all fields of study, for all pupils, and at all levels of schooling, in order to prepare the next generation of citizens for life in the era of science and technology" (Harrari, 1993, p.6).

The Ministry of Education with a budget of 300 million shekels per year set out to implement Harrari's suggestions with the help of the municipalities (33 percent of the budget) and the lottery (33 percent of the budget). Fifteen thousand computers were subsequently introduced into 450 schools in 1994; the plan was to introduce the same number every year for 5 years, and be completed by 1998, Israel's fiftieth anniversary, with the computerisation of the entire educational system. (The deadline has been since extended to 2003 as a result of budget problems). The Committee recommended training teachers and pupils, equipping schools with hardware and software and establishing a nationwide communication network. The report acknowledged the need for ongoing technology training and support as teachers learn how to integrate technology tools into their classroom teaching strategies. The report also stated that:

"if there is a single overarching lesson that can be culled from research about teacher professional development and technology, it is that it takes more time and effort than many anticipate" (p. 28) (Hebrew).

The Ministry of Education in Israel has been investing in computers and connecting buildings and classrooms to the Internet at a rapid rate. Municipalities have designated funding for schools to acquire technology for information access to benefit teaching and learning. Yet with all of this money being spent on educational technology, many policymakers (Almog, 1997; Eisenberg, 1997) are wondering about the evidence on its effectiveness. The purpose of providing technology to schools is to improve student academic performance and other educational outcomes, not to provide state-of-the-art equipment for its own sake (Eisenberg, 1997).

As a result of the introduction of computers into schools, many in-service teachers are being asked to re-think and re-design their instructional methods to utilise these new tools (Shahar and Sharan, 1998; Chen, 1995). Some teachers have been excited and motivated by the challenge of using technology in their lessons, but the majority of teachers seem to need encouragement, modeling, and extensive training to infuse technology into their teaching.
strategies (Shahar and Sharan, 1998). The use of technology represents a personal change (relearning), an increase in personal productivity through technology, insufficient release time to learn the technology and new instructional methods, and a personal threat to the importance of the job of teaching. The report (Harrari, 1993) encourages schools to spend up to thirty percent of the total computerisation budget for teacher training and on-going support to use technology effectively. This money and teachers' time needs to be well spent on effectively designed in-service training to achieve the objectives of creating a profession of technologically literate teachers and learners (Chen, 1995).

Computers in the Tel-Aviv District Schools

Getting accurate numbers concerning the computerisation of the Israeli educational system has not been possible. No statistical information concerning the “Tomorrow 98” programme has been published yet and the Ministry was reluctant to provide the writer of this paper with any official numbers. Since the conductor of this study works in the Tel-Aviv District and is acquainted with the numbers from internal records, the following charts have been organised to provide the reader with an idea of the process of computerising the educational system in this part of the country.

Some Information about the Tel-Aviv District

The Tel-Aviv District is located in the centre of Israel and includes twelve neighbouring towns - Tel-Aviv- Jaffa, Bat-Yam, Holon, Or-Yehuda, Kiryat-Ono, Ramat-Gan, Givataim, Bnei-Barak, Herzelia, Ramat-Hasharon, Azur, Ramat-Efal. Table 1-1 provides a comparison between the number of schools in Israel and the Tel-Aviv District which will enable an approximate estimation of the complete status of computerisation in Israel although the numbers refer to the Tel-Aviv District alone (as explained above).

<table>
<thead>
<tr>
<th></th>
<th>Tel-Aviv District</th>
<th>Israel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary schools</td>
<td>232</td>
<td>1885</td>
</tr>
<tr>
<td>Secondary schools</td>
<td>138</td>
<td>792</td>
</tr>
<tr>
<td>Special education schools</td>
<td>86</td>
<td>212</td>
</tr>
</tbody>
</table>
In 1994, before the “Tomorrow 98” programme began, there were less than three thousand computers in the four hundred and fifty six schools in the Tel-Aviv District. During the first year, 1994-5, the number increased to four thousand three hundred and twenty. The second year added almost three thousand additional computers. By the third year almost ten thousand computers were installed in the schools. In 1998-9 the Ministry added another three thousand computers thus increasing the numbers to more than fourteen thousand (Figure 1-1). In the year 2000 the number increased to more than sixteen thousand.

**Figure 1-1: the Numbers of Computers in Schools in the Tel-Aviv District**

The Harrari Report (1993) recommended “one computer per ten pupils”. This goal is gradually being reached. Figure 1-2 demonstrates the situation in the Tel-Aviv District where forty learners shared a computer in 1994 compared to eighteen in 1999 and if things go as planned, by the end of the year 2002 every twelve pupils will share a computer (Melamed, 1999). The initial aim of the “Tomorrow 98” project, one computer per ten pupils by the year 1998, seems to have been too ambitious for Israel’s limited budget, however, it may be reached by 2010.
Of the 456 schools in the Tel-Aviv District, 232 are elementary schools, 138 are secondary schools and 86 are special education schools. Figure 1-3 demonstrates the number of computerised schools (schools that were equipped with one computer per ten pupils) so far. There are 130 elementary schools, 76 secondary schools, 31 special education schools. By the year 2003, it is hoped, all the schools will have been computerised.
Nevertheless, research has often shown that hardware alone does not guarantee a successful diffusion and implementation of technology in schools (DfEE, 1997a; OTA, 1995; Schild, 1997). Training the teaching staff is one of the factors that is associated with success.

**Teacher Training**

As Internet and computer access for teachers becomes more available both at home and at school, in-service technology training is becoming more important. Teacher certification and re-certification requirements that include technology training could provide the catalyst for increased amounts of teacher training in technology. Governments that wish to promote technology in schools invest millions in teacher training realising that well trained teachers can integrate technology in their teaching (Harrari, 1993; The Israeli Knesset Report, 1994).

Mr. Hean, Minister for Education in Singapore, emphasises the importance of well trained teachers for a successful implementation of the Singapore plan for the computerisation of the school system.

"Teachers are the key to the success of this programme. The Masterplan therefore provides for a comprehensive teacher-training programme - all teachers will be trained to use IT in their lessons by 1999. In addition to the learning of basic information technology skills, computer usage skills, teachers need to understand the dangers and opportunities that IT is bringing to their profession. They must be emotionally and professionally prepared to accept the new challenges " (Hean, 1997, p.7)

The British Prime Minister, Mr. Tony Blair, (McKinsey, 1997) explained that the relatively poor results of a survey conducted at his request, to examine the effectiveness of ICT in schools was due to the lack of guidance teachers receive on how to use ICT in the classroom. In its various policy documents (DfEE, 1995, 1997a), the British Government committed itself to an ambitious programme of publicly and privately sourced investment.

The Israeli Government is also aware of the crucial role teacher training plays in increasing the chances of successful integration of technology in schools. Schild (1997) concluded that the insufficient training provided for both in-service and pre-service teachers may be one of the reasons for the relatively slow rate of adoption of computer technology in teaching. The
recent Israeli Minister of Education, like her predecessors, has allotted 30 per cent of the total technology sum to training in-service teachers and modifying pre-service training programmes (Nir-Gal, 2000).

However, the quality of the training process should not be overlooked. The different aspects of using technology to teach are all critical in planning and conducting training for classroom teachers. (Salomon, 1998; Chen, 1995; Shahar and Sharan, 1998). Learning to use the hardware and master the software tools does not necessarily mean that the teacher will use the technology effectively for instruction (Mevarech, 1996). Actually utilising the technology to achieve instructional objectives is a much more complex and lengthy process. The process is not hardware and software dependent, but is combined with pedagogy (DfEE, 1994; OTA, 1995; Rosso et al, 1998; Fullan, 1999). Traditional teaching strategies sometimes referred to as "chalk and talk" are likely to evolve and change to incorporate the new technology tools that governments are investing in.

This evolution depends upon the typical classroom teacher's use of technology for instruction (Chen, 1996; Harrari, 1993; Hargreaves and Fullan, 1998). The teacher's success is likely to be directly related to the effectiveness of the training provided to him/her, and his/her own perceptions of the value returned for the time invested in learning new technology skills:

"If the goal of using technology is to change how teachers teach and how children learn (for example, adopting more cooperative learning or more student projects), then teachers will need support and training to learn new pedagogical methods as well" (Harrari, 1993, p. 61).(Hebrew)

It is essential to understand how teachers perceive this process of integrating technology into their everyday classroom lessons. Their perceptions are of great value to other teachers, in-service coordinators, school administrators, and educational software designers. Introducing technology as a useful tool in instruction takes time and "hand-holding," and should be an ongoing process, not a static event (Rosso et al, 1998).

One way of improving the quality and effectiveness of training is by gathering information from the teachers. An account of teachers' perceptions of the process they experienced in learning how to incorporate technology into their classrooms would aid computer centres and in-service coordinators in designing effective training strategies that accomplish their
objectives (Schild, 1997). Many teachers encounter technical and logistical problems that they cannot solve themselves and often lack the training and support necessary to resolve the problems. Understanding how teachers hone their technology skills past the point of being "stuck" and advance themselves as technology-using teachers is important in successfully completing the task of retraining in-service teachers.

About the Course - “Integrating Technology in the English Lesson”

Intensive in-service teacher training

In 1994, the Israeli Ministry of Education initiated intensive in-service teacher training courses both in the schools and in special computer centres for teachers. The main purpose was, and remains, to prepare teachers to use the technology available in their schools as part of their teaching routine. Many courses provided by the Ministry of Education are held in one of the four Computer Centres in the Tel-Aviv District. The courses cover a wide variety of disciplines, are given to teachers of all grade levels, are held in a technological environment and are mostly hands-on.

The researcher has been giving such courses to ESL teachers in the Tel-Aviv District Computer Centre since 1994 (167 teachers). Although the project “Tomorrow 98” has been continually assessed by Dr Gili Schild, head of The Department of Assessment and Measurement in the Israeli Ministry of Education, the report (1997) mainly provided general information (see Chapter 2) and did not check the extent of influence of teacher training courses on the implementation of technology in the field. The focus of this thesis concentrates on one course “Integrating Computers in the English Lesson” in one district, Tel-Aviv, and its impact on the ESL teachers who participated in it.

Main objectives of the course

The course “Integrating Computers in the English Lesson” is a discipline-oriented course given in addition to the initial general computer training provided to all teachers as part of the “Tomorrow 98” project. Participation in the discipline-oriented course is voluntary and therefore held in the afternoons to enable working in-service teachers to take part. Participants
receive 112 hours of staff development on technology and pedagogy. The training project provides both basic training in the use of computers and a variety of instructional models from which teachers choose those most appropriate to the instructional units they are preparing for full implementation. The content is structured to offer activities that meet the teaching goals and objectives, and incorporates both technological and pedagogical experiences to enhance student learning in the English language.

This course tries to be faithful to the constructivist learning theory (further discussion on page 41), founded on Vygotsky’s theories for the concept of situated learning (Mor, 2001). These are consistent with task-based learning, project-based learning and problem-solving methods in language learning practice. The constructivist assumption is that knowledge is situated and is partly a product of the activity, context and culture in which it is used, thus, it cannot be taught in the abstract, it must be taught in context (Fosnot, 1996; Inge, 1996). The integration of technology and computers into ESL teaching can create this context and environment for students and teachers. The recent Computer Assisted Language Learning (CALL) activities (e.g., simulation, computer-assisted classroom discussion, and email key-pals telecommunication) underscore a view of learning as a collaborative act that happens in a social and political context, with learners and teacher working together in the new medium of networked interaction (Passig, 1998). The meaningful use of the target language forces teachers and students away from treating English language as an object, to rather practice it as a medium of communication, thus language learning or acquisition becomes more interesting and meaningful. Computer programmes that support collaborative language learning and interactive practicing in an authentic setting enrich this learning environment.

The approach used

The course is structured around the four learning areas: inquiry, communication, construction, and expression, focusing on the connection between technology and learning. This is based on what John Dewey identified as the greatest educational resource - the natural impulse to explore and inquire, to use language and enter into the social world, to build or make things, and to express one’s feeling and ideas (Bruce and Levin 1997). In this environment the participants become familiar with various aspects of the technology involved, they join in the investigative process as adult learners, occasionally reverting to the role of teacher to reflect on how their own learning had taken place and how technology helped or hindered the
learning process. They explore the relevance of technology to their areas of instructional
design and learn about best practices in using the technology, they consider how they will
make use of what they have learned by trying an approach, reflecting on what occurred, and
assessing how well it went. They develop connections with one another and learn how to get
help as they take what they have learned back to their classrooms.

Since the in-service teacher learning groups are heterogeneous, both in computer skills and
grade level, the coverage is adjusted to the competency levels of the individual participants.
The overall training during these activities is designed to meet the needs of teachers at their
own level of expertise, ranging from those with very little knowledge of technology and no
experience of its use in teaching, to those with some knowledge of technology who do not
currently incorporate it into their teaching, to those currently using technology to some degree
in their classroom instruction. All sessions encourage teachers to address their own specific
needs and interests, and to help be a resource to each other following the session. The
intention of the technological training is to help participants gain confidence in operating
computers, word processors, Internet (from 1996), CD ROMs, and software applications.
Pedagogical development includes sessions on simulations, higher order thinking skills, and
integrative curriculum.

Table 1-2: The min topics of the course "Integrating Computers into the English Class"

<table>
<thead>
<tr>
<th>Topic</th>
<th>Number of hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processing functions-MS Word</td>
<td>12</td>
</tr>
<tr>
<td>Possible implementations for class use class – preparing work sheets, writing activities, computer activities</td>
<td>10</td>
</tr>
<tr>
<td>Preparing presentation slide shows – MS PowerPoint</td>
<td>10</td>
</tr>
<tr>
<td>Possible implementations for class use – preparing slide shows on relevant teaching topics, preparing computer lessons that demand pupils create slide shows to encourage oral proficiency as well as one form to present project work products, research findings and more.</td>
<td>10</td>
</tr>
<tr>
<td>Electronic worksheets – MS Excel – for personal administrative purposes - e.g. calculating grades.</td>
<td>5</td>
</tr>
<tr>
<td>Possible implementations for class use – e.g. organising survey results and presenting them as graphs</td>
<td>5</td>
</tr>
<tr>
<td>Internet – as a teaching resource (surfing, searching, evaluating the</td>
<td>20</td>
</tr>
</tbody>
</table>
data, and more) and a means for communication, both synchronic (chat, MOO) and a-synchronic (e-mail, forums, newsgroups)

<table>
<thead>
<tr>
<th>Possible implementations for class use class – participating in international projects, performing relevant research (with collaboration with teachers of other disciplines in school), communicating both with peers from around the world and field experts,</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software – getting acquainted with ESL software, developing skills to evaluate the available software</td>
<td>5</td>
</tr>
<tr>
<td>Possible implementations for class use class – integrating software into the regular lessons</td>
<td>5</td>
</tr>
<tr>
<td>Alternative assessment - developing appropriate criteria for evaluation, preparing personal computerised portfolios, practicing peer assessment and self assessment</td>
<td>5</td>
</tr>
<tr>
<td>Reflection (at the end of every session) on the learning process, the teaching strategy used, alternative approaches</td>
<td>5</td>
</tr>
</tbody>
</table>

Initially, teachers are all provided with basic instruction regarding the use of a networked microcomputer laboratory along with its software (Table 1-2). Since the sessions are mostly hands-on and mostly collaborative teamwork, the teams are given time to adapt materials to match their own grade levels, themes, topics, and instructional styles. Each team designs a thematic learning unit containing a simulation surrounded by activities to expand upon it. Units incorporate hands-on activities, research, narrative writing, internet communication and presentations using technology such as PowerPoint. During the sessions, the participants develop projects that utilise the technology relevant to their respective areas of expertise. Eventually, the intercession training sessions become more individualised, focusing upon specific needs and the interests of participating learners. The thematic units the teams develop throughout the course are published in the English Teachers’ section of the Ministry of Education Internet site http://www.education.gov.il/tel-aviv/english and are available to all the ESL teachers who may use them whenever it fits their teaching plans.
Rationale and Purpose

Rationale of Study

This study attempts to investigate the extent and manner of the implementation and integration of computer instruction in the Tel-Aviv district schools whose teachers had attended the course “Integrating Computers in the English Class”. The teachers involved in the research (one hundred and sixty seven) have all participated in one of the 112 hour courses, “Integrating Computers in the English Class”, provided by the Ministry of Education since 1994. This course is one of many similar courses based on different disciplines organised for teachers teaching different grade levels. These teacher-training courses were established as recommended by the Harrari Committee (1993), as part of the national educational reform project “Tomorrow 98”. In the first stage of the research, a survey questionnaire was sent to all one hundred and sixty seven participants. An analysis of the findings was undertaken. The second stage was an in-depth case study of five of the teacher participants of the first stage. Both the survey and the case studies attempt to understand the process by which ESL teachers incorporate computer technology into their lessons and the main factors that determine their success or failure. It should be pointed out that the study population was taken from a single subject group, all of whom had attended the same course over a period of 6 years, which had a particular pedagogical approach. This course was taught by the author of the thesis who is aware that this ‘association’ with the respondents may represent a potential weakness in the study, since this group cannot be regarded as a ‘representative’ sample in terms of generalising the findings to other populations.

This study concentrates on the teachers and their integration of computer technology in their teaching. No attempt was made to check the effect of the computer technology on the learners in the schools.
**Purpose Statement**

In this information age, technology is the symbol of progress, and the growth of information technology is inevitable. The motivation for the rush to purchase computer-based technology without fully understanding what purpose it serves and the ultimate consequence of the adoption of this technology is unclear (Almog, 1997).

A better understanding of how and why computers are being used in education could assist schools in using them more effectively. Insight into the benefits and limitations of the use of IT could assist teachers in incorporating computers where they can be most advantageous to the teaching and learning process.

The primary purpose of this study is to investigate the use of computer-based technology by the ESL teachers that participated in the course "Integrating Computers in the English Class". The study seeks to understand when, why and how teachers use computer-based technology. Understanding when, why and how computers are best used and the support needed to incorporate them into the curriculum could aid teachers in using them more effectively. The integration of computers into everyday classroom activity has proved to be slower and more difficult than expected (Schild, 1997), creating the notion that there are incentives enhancing the adoption of technology in some schools and barriers or organisational constraints blocking wider acceptance in others. The study attempts to reveal both incentives and barriers in order to accelerate the process and ensure its success.

The study investigates the extent of the influence of the training the teacher received on the actual implementation of technology and on the teaching methods used in a technological environment. Constructivist teaching methods and strategies used throughout the course attempted to serve as a model in the hope that they be adopted by the in-service teacher participants in their teaching in similar computer environments. Changing teaching methods is often a complicated process which requires flexibility and openness from the teacher but the environment within which the teacher works may be very influential. The study attempts to ascertain whether educational management, school culture, the attitude and behaviour of school principals and the approach of colleagues, play any role in determining the success or
failure of the individual teacher's use of technology in school. Since attending the course was voluntary, it may be assumed that the participants were willing to advance their knowledge and improve their skills in IT and that their attitude towards using computer technology in their teaching was mostly positive. It is, therefore, important to identify barriers teachers face in their attempts to use computer-based technology in the classroom. Identifying major barriers could lead to the development of solutions for overcoming these barriers and could encourage the use of computers where they are found to be most effective. Other factors such as teachers' attitudes towards computers, the teachers' age, the grade level taught, readiness to undertake continuous training and attitude to life long learning, and the need for constant moral and professional support are also be examined in this study.

Research Questions

1. Has the training teachers received influenced their use of computers in their instruction?
   In terms of:
   • training and implementation;
   • purposes of usage;
   • teaching strategies.

2. To what extent do school leadership and school culture influence the teachers' incorporation of computers in their teaching?
   In terms of:
   • the principal as the leader of infusion of change;
   • school as a learning organisation;
   • support – leadership, professional, technical, environmental

3. What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?

4. Which of the following factors predict computer use in classroom instruction?
   • attitudes of teachers toward computers in the classroom;
   • continuous training of teachers in computer use – life long learning;
   • teacher's acceptance of change;
   • age of teacher;
   • grade level in which the teacher teaches
Summary

This chapter provides an introduction to this study and a general overview of technology in education with an emphasis on the role of teachers in computer integration in teaching. It provides the reader with the broad aims and the significance of the study designed to investigate the extent and manner of the integration of technology in teaching after a 112-hour course on the topic. The issues of context of the research are then presented. IT was first introduced into the Israeli educational system in 1994 in the “Tomorrow 1998” programme initiated by the Ministry of Education.

Since all the participants in this study have been provided with similar training on integrating computers in the ESL class, this study is an effort to understand the influence of both internal (attitude toward computers, resistance to change) and external (school leadership, school culture) factors in determining the success or failure of technology implementation in the school environment. A particular aim is to investigate whether the participants adopted new teaching methods and strategies as part of the process of integrating computers in their teaching. Teachers often come across a series of barriers which they have to overcome before successfully implementing what they have learnt in the training course. Some of these barriers can be alleviated through school leadership and culture. The information and conclusions from this research may make it possible to determine alterations in the course programme as well as identify where additional support and resources are needed to continue technological advancement in the Israeli schools.

In order to aid the reader, a short glossary of term was prepared to clarify the main terminology used in this paper (see Appendix F).

The next chapter presents a comprehensive review of the literature that focuses on the factors that influence successful technology implementation in schools – the teachers’ preparedness, school leadership, school culture and staff development.
CHAPTER 2: REVIEW OF RELATED LITERATURE

Introduction

Since this study attempts to investigate teachers' use of computer-based technology in their professional practice, this chapter, the literature review, has two main sections. The first refers to the influence that technology training has on teachers' adoption, implementation and integration of computer technology in their teaching, the teachers' ability and willingness to alter their teaching strategies to fit the new environment, and the obstacles and barriers that they may need to overcome in the process. The second section discusses the introduction of change in general and computer technology in particular into the schools, the role of the school principal in determining successful integration of computers, the role school culture plays in the process and finally the need for efficient staff development programmes to enhance the change culminating in the importance of turning schools into learning organisations in attempt to satisfy current and future needs.

While reviewing the literature related to this study, the writer has realised that many of the topics discussed, the problems mentioned and the empirical studies performed are similar in those countries where computer technology has been introduced to the educational system. Since the writer refers in her work mainly to British, Israeli and American bibliography, the literature from the different countries will be often treated interchangeably.
Part 1: Teacher Training and Information Technology

Three Israeli governments, since 1994, have invested large sums of money to purchase and upgrade educational technology. Additional funds have been spent on training school staff, on providing professional and technical support and on connecting schools to the Internet. Despite all this activity, however, examples of school-wide use of technology have been comparatively rare and isolated (Schild, 1997; Salomon, 1996; Gooden, 1996). Most schools have not introduced Information and Communication Technology (ICT) into their teaching environments and in those schools which have integrated ICT in some of their lessons, ICT has not always brought about changes in learning and teaching methods and it has apparently not led to meaningful increases in students' achievements (Aviram, 2000; Russell, 1995; Riffel, 1997). ImpaCT2, one of the most comprehensive investigations into the impact of ICT on attainment is conducted in 60 UK schools. The interim findings from the research data report that many teachers lack confidence and experience difficulty in integrating ICT into lessons. Observed lessons show that ICT is most frequently used for drill and practice. ICT is not being used to its full potential to transform learning and teaching. Teachers need opportunities for reflective practice to embed innovation and change (Becta, 2001). However, teachers do not appear to be negative towards ICT. ICT has been recognised as a technology that often changes the environment and the organisations in which it is being used and hence its users and as such, has an enormous impact on the educational environment (Aviram, 2000; Givon, 1997; Levin and Riffel, 1997).

The Debate on Technology Effectiveness and Potential

There is still an ongoing debate among educational researchers on the effectiveness and potential of computer technology in schools. Salomon and Perkins (1996) point out:

"just because we can do something with technology, doesn't mean we should ...It is the whole culture of a learning environment, with or without computers, that can affect learning in important ways" (p. 112-113).

Hargreaves and Fullan (1998) claim:
"Ensuring that technology change will really benefit student learning depends on its being driven by its critics as much as its most ardent advocates" (p. 74)

Critics of Computer Based Technology

The introduction of novel practices into a society or an organisation very often arouses objection, opposition and protest. Some researchers have been quite critical of computer technology in education (Russell, 1995; Almog, 1997, Eisenberg, 1996). Some critics claim that teachers are unwilling to adopt computers in their teaching (Almog, 1997; Lieberman and Rozenholz, 1997; Loveless, 1996) and the teachers who use computers in their teaching very often refuse to transform instruction methods to suit the new environment (Eisenberg, 1996; Levin and Riffel, 1997; Fullan, 1992). Larry Cuban (1993) is critical of ICT in schools because he believes teachers appropriate new technologies and incorporate them into their traditionally held views of teaching and learning. He argues that the overhead projector and video made very little impact on teaching styles, so why should computers be any different? Others point out that there is no clear indication that academic achievement improves when the teaching and learning take place in a computer setting (Almog, 1997; Russel, 1995; Kulik 1994) and in fact such a setting often limits opportunities for social interaction thus interfering with the learning process (Eisenberg, 1996). In a study conducted by Neil Selwyn (1999) on the inclusion of IT in A-Level exams in UK, he discovered that many teachers and students are largely hostile, or, at best, indifferent to using IT. The issue of cost effectiveness is often raised by those who oppose the use of computers in education arguing that when some gains in academic improvement are made apparent, they do not justify the costs of purchasing and maintaining the computers (Eisenberg, 1996; Almog, 1997)

Critics often agree with the advocates that the goal of spreading educational technology is to use it to transform instruction; the critics, however, view this effort as being doomed to failure. Their indicator for the success of technology programmes is not the amount of technology available, but whether teachers are willing to use it and whether technology is likely to improve academic achievement or indeed any other educational outcome of students (Selwyn, 1999; Almog, 1997; Eisenberg, 1996; Becker 1994). Studies suggest that teachers who are currently using technology in their classroom are using it to support their existing teaching practices or to provide students with practice and skills in basic computer literacy, such as keyboarding, word processing, and database applications (Loveless, 1996; Eisenberg, 1996). So it appears that when technology is adopted and used by classroom teachers it does
not necessarily result in changes in teaching practices that many advocates of technology might argue are possible and necessary for technology to reach its potential benefits for students.

Hargreaves and Fullan, (1998) detect a number of weaknesses in how schools use technologies. Levin and Riffel (1997) studied how school and system administrators in five school districts responded to computer technology. Their conclusions carry profound messages concerning the introduction of new technologies into schools. They found that among all the possible uses only 54 per cent of administrators felt computers would help to see teacher-student relationships in different ways.

"Technology can transform the work of people, but often doesn’t... It is often used to do old tasks; it takes time to discover new possibilities... (yet) there are significant barriers to inquiry-oriented instruction in schools – traditional models of learning and teaching are deeply embedded in the structure and culture of school.” (p.213)

Another claim is that cognitive theories of education suggest that learning may include a social, non-cognitive element as expressed by Vygotsky (1976) in his theory of the 'zone of proximal development' which will be discussed in further detail later in this chapter (page 41). Students learn not only because they process information, but also because of the complex reinforcements they receive from teachers and the socialisation process in which learning is embedded (Fullan, 1995). As computers move from being mere supplements to being the core of the learning environment, they limit opportunities for social interaction, thus interfering with the learning process. Hence computers should not be expected to increase student learning and, in fact, may decrease it (Almog, 1997; Eisenberg, 1996).

There is a fear that extensive use of technology will decrease the human contact which is essential for the development of children (Stoll, 1995).

"Computer networks isolate us from one another rather than bring us together. We need only to deal with one side of an individual over the net. And if we don’t like what we see, we just pull the plug... There’s no need to tolerate the imperfections of real people... we lose the ability to enter into spontaneous interaction with real people... All of us want children to experience warmth, human interaction, the thrill of discovery, and solid grounding in essentials: reading, getting along with others, training in civic values... Only a teacher, live in the classroom, can bring about this
inspiration. This can’t happen over a speaker, a television or a computer screen.” (p. 58)

Research on the cost-effectiveness of computer instruction shows that while there may be some gains to academic achievement, these are not proportionate to the costs of buying and maintaining computers; tutoring, for instance, was found to produce greater gains for less money (Eisenberg, 1996; Almog, 1997).

“Ninety-five per cent of the development budget of the Ministry of Education is spent on five per cent of the lessons held in the computer rooms…Nothing can justify such action.” (Almog, 1997, p.33) (Hebrew)

In support of this view Eisenberg (1996) presents three pieces of evidence: the history of technological innovation, research on the cost-effectiveness of computer instruction, and evidence on theories of learning (p.46). First, he notes that:

“teachers have historically been resistant to technological innovations when those innovations have made it more difficult for them to get through the typical school day. Early technologies, such as blackboards and desks, were supported by teachers because they made it easier for them to manage the classroom and convey information. Later innovations, such as films and educational television were resisted because they would undermine the teacher-student relationship; to the extent that these technologies would substitute for teachers, teachers would have less time to interact with students. Indeed, the only situations in which teachers embraced this technology were those in which teachers wanted to reduce interaction with students; for instance, when teachers wanted to waste time during low-energy periods of the day (e.g. after lunch) they might show a film.” (p. 45) (Hebrew)

Computers, Eisenberg (1996) claims, pose similar difficulties such as resistance to technology and the fear that technology might replace the teacher, and therefore are marginalised or not used at all by teachers.

“In a few years the computers in schools will join the dusty television sets in the store room” ( p.46) (Hebrew).
Advocates of Computer-Based Technology

On the other hand, educators and researchers are gradually discovering the positive impact that computers have on education. From recent research it appears that the computer can add pedagogical value (Aviram, 2000) and give greater control over the learning process (Munns, 1997) when the right classroom situations exist. Reformed classrooms focus on student-centred learning (Darling-Hammond, 1997; Dede, 1997), rely on teachers as facilitators (Means and Olson, 1994; Chen, 1995), and allow analysis and synthesis of authentic, real world projects (Gooden, 1996; Hargreaves and Fullan 1998; Means and Olson, 1994; Levin and Riffel, 1997). In the reformed classroom, work takes place in heterogeneous, collaborative groups (Chen, 1995; Means and Olson, 1994).

"Students experience intensive computer-based qualitative analysis during class time which allows more time for interpretation and discussion and visualisation of numerous and complex images in a self-selected order" (Anderson et al, 1995, p 169).

The use of technology costs little when compared with the great learning experience most students gain (Anderson et al, 1995; Dede, 1997). In 1997, a report commissioned by the Software Publishers’ Association and conducted by an independent educational technology consulting firm, Interactive Educational Systems Design, Inc., summarised educational technology research conducted in USA schools from 1990 through 1995 (Bialo et al. 1996). The firm chose one hundred and seventy six best studies from an original set of more than one thousand. The report concluded that technology is making a significant positive impact in education. Important findings in this study indicated that educational technology had demonstrated a significant positive effect on achievement in all major subject areas in preschool through higher education, that educational technology had a positive effect on student attitudes toward learning since they were more motivated to learn and had increased self-confidence, and better self-esteem when using computer-based instruction. The report also pointed out that teachers were more effective after receiving extensive training in the integration of technology with the curriculum (Bialo et al, 1996).

"Positive changes in the learning environment brought about by technology are more evolutionary than revolutionary. Courses, which used computer-based networks, increased student/student and student/teacher interaction, increased student/teacher interaction with lower-performing students, and did not decrease
traditional forms of communication. On-line telecommunications between different geographic locations improved academic skills”. (Report on the Effectiveness of Technology in Schools, p. 95-96: Executive Summary).

Means and Olson (1994) from the USA note that research results from settings which couple computer-based technology with educational reform suggest that technology amplifies what teachers are able to do and what they expect from students. In these settings teachers see complex assignments as feasible, and technology appears to provide an entry point to content areas and inquiries that might otherwise be inaccessible. They seem to lend authenticity to school tasks resulting in projects that are more polished. Schoolwork seems more real and important, and the introduction of technology has given teachers the opportunity to become learners again (Means and Olson, 1994).

Hargreaves and Fullan (1998) point out that:

"educators equipped with a clear and sophisticated approach to teaching and learning, can use technology to deepen, extend and invigorate students’ learning."
(p. 76)

Chen (1995) also sees the computer as a tool for learning when educators invite the use of technology, not only to produce answers, but also to formulate new questions. In this sense, educators aim at developing:

"students who grow as problem solvers by searching for the answers, students who are able to refine their strategies and to consider alternatives, students who are rewarded when they attempt to explain and describe what they have learned with technology, students who can reflect on the investigative process they have used to solidify and extend their understanding, students who move through intuitive, informal, and formal levels of understanding and abstraction, using the computer as one of many tools in that evolution, students who learn to value the work of others as well as their own, students who learn to value the processes used in problem solving and see the concepts and connections which will empower them to learn on their own" (Chen, 1995, p. 36-37). (Hebrew).
To summarise this issue, computer technologies are believed to lead to revolutionary type of transforming educational practice (Chen, 1995). The affordances of technology may simulate the situation in the real world so designing learning environment with technology that will bridge the differences in school learning and real world situation (Passig, 1998; Hargreaves and Fullan, 1998). ICT can be used to form a community of practice where students, teachers and experts engaged in knowledge construction through designing, producing, reflecting, giving and receiving feedback (Aviram, 2000; Gooden, 1996).

To conclude this controversial issue of proponents and opponents of ICT, Hargreaves and Fullan (1998) claim that:

"It is time we moved beyond the false dichotomy that we must choose between machines and people. New technology will insinuate itself into more and more aspects of our lives. The challenge for teachers is to turn this inevitable intrusion into a powerful tool for learning." (p. 76)

Schools are being, and should be computerised not because there is evidence they are better educational tools, but because computers and the Internet are both the representation and the medium of the new way of performing in the new era. If schools wish to survive, they have no option but to adapt themselves to the era in which they function and which they have to serve (Aviram 2000; Passig 1996; Gooden, 1996; Darling-Hammond, 1997).

Postman (1995) portrays a realistic attitude:

"To be against technology makes no more sense than to be ‘against food’. We cannot live without either. But to observe it is dangerous to eat too much food, or to eat food that has no nutritional value, is not to be anti food’." (Postman, 1995, p.191)

Teacher Training for ICT

As ICT becomes pervasive, more needs to be done to ensure personal ownership of the technology by teachers. A review of the literature supports the position that one of the main obstacles to the use of technology in education is the lack of adequate teacher training (Dede, 1997; Somekh, 1996; Harrari, 1993; Mor, 2001). For schools to adapt to the new era and
increase the widespread use of technology in schools, changes, in both pre-service and in-service training, and, more generally, changes in policies that govern the professional development of teachers are required (Dimmock, 2000; Lally et al, 1999; Fullan, 1995; Hargreaves, 1994; Darling-Hammond, 1997). Technology training expects from teachers far more than the acquisition of computer hardware and software (Ager, 2000; Almog, 1997; Hargreaves and Fullan, 1998). The view of teaching and learning needs to change in order to revitalise teaching. ICT can be the catalyst for that change. Today's teachers are taking on new roles within the school and need to be able to teach young people from diverse backgrounds by drawing on a large repertoire of subject matter and teaching skills (Fullan 1995; Shahar and Sharan, 1998; Mor, 2001). In addition to the above, expecting teachers to use computer technology as part of their professional work adds to the burden. When teachers explore technology, they often feel as though they are entering an alien world, leaving behind their expertise and confidence (Mor, 2001; Loveless, 1996; Hargreaves, 1994; Comber et al, 1997). The challenge of teacher educators and technology resource professionals is to connect teachers to the possibilities of educational technology in a way that builds confidence, as well as competence (Comber et al, 1997; Mevarech, 1996; Mor, 2001).

In the attempt to fulfill the challenge, training programmes should provide teachers with an opportunity to familiarise themselves with new technologies (NCET, 1996; Dede, 1997; Chen, 1995). Educators have offered suggestions regarding proposed objectives and instructional strategies for teacher education in technology (Mor, 2001; Givon, 1997; Rhodes, 1989; Rosso et al, 1998). These range from self-paced, self-taught modules to lecture-type technology demonstrations. However, experience shows that training programmes should go beyond teaching about the technology; they should also help teachers understand how technology relates to learning processes both their students' and their own (Dimmock, 2000; Salomon, 1996; Fullan, 1995; Hargreaves and Fullan, 1998; Chen, 1995). Dimmock (2000) states:

"There is a pressing need for training to exploit the potentialities of technology - not just the procedures and technical operation of the equipment but also making connections between the technology, curriculum, teaching method and materials."

(p.170)

Thus, although teachers are taught about new technologies, they cannot see how these technologies can be used to improve their teaching or their students' learning. As Dede (1997) points out:
"those who assume that teachers and administrators who use new media are automatically more effective than those who do not ... are misguided. Unless other simultaneous innovations occur in pedagogy, curriculum, assessment and school organisation, the time and effort expended on instructional technology, will produce few improvements in educational outcomes." (p. 13)

ICT may influence the choice of didactic materials and methodology. The need to provide teachers with training which will facilitate such use of ICT may be regarded as an investment aimed at enhancing teaching styles. Katz and Ophir (1996) stress the need for:

"changes in thinking and knowing, attitudes, perceptions, ways of doing and being a teacher, and schooling culture." (p. 219). (Hebrew)

Dede (1997) proposes that the inclusion of computer assisted learning packages be accompanied by:

"investments in sophisticated curriculum, assessments and educators, because using technology to implement new types of content and pedagogy attracts a new generation of teachers with a broad range of skills." (p. 16)

Lally et al (1999), recognise the need to introduce ICT into higher education teaching environments:

"The convergence of rapidly evolving Information and Communication technologies with educational contexts is impacting on many aspects of these contexts. Curricula, pedagogic practices, and learning materials are all being affected."(Lally et al, 1999, p.6)

One of the problems with computer use is that it is so versatile a tool that it is not always easy to know exactly how it is being used (Ager, 2000). Bridget Somekh (1997) identifies three approaches which can be taken: the computer as a tutor which may teach the learner, a neutral tool which helps the learner perform tasks and the cognitive tool which can be used to enhance learning by allowing the learner to do things that are realistically possible to do on a computer (p.116-126). Proper teacher training should reflect all these facets and provides the teacher with the skills to make the appropriate choice (Russell, 1995). Training should be
tailored for individual needs rather than burdening the individual teacher with the responsibility of putting the course into context for his/her class (Russell, 1995). Technology will be used successfully in the classroom when an individual teacher identifies a relevant application (Russell, 1995; Chen, 1996) and is able to connect it to his/her curricular needs.

As seen above, teacher-training issues are often a major roadblock to technology use in class. The Harrari Commission (1993), aware of the importance of teacher training to the process of computerisation of the educational system in Israel, recommended spending at least thirty percent of the total “Tomorrow 98” project funds on teacher training. More than fifty percent of the teachers in Israeli schools participated in at least one basic technology-training course or workshop (Schild, 1997). However most of the training was based on drill and practice and word processing and fewer than one in ten teacher trainees said that they felt prepared to use technology as part of their teaching.

“The kind of technology training provided is as important to teachers as the availability of training. Some teachers observe that the content of the training received is inadequate. There seems to be a focus on basic training in the mechanics of operating the machines, with little training about integrating the technology into various subjects or learning to use it as a pedagogical tool. “ (Schild, 1997, p 43) (Hebrew).

The study performed in the Israeli computerised schools clearly shows a direct correlation between the number of training hours and the influence it has on the use of computers by the participants. Teachers who took longer courses (56 hours and more) used computers in their teaching more often (Schild, 1997). Other studies have also shown that courses provided over long periods of time prepare teachers for the use of computers in their teaching (Dwyer, 1994; Hargreaves and Fullan, 1998). When inadequately trained teachers use computers, it is often just to build mastery of basic facts. Teachers with not enough training typically see computers as a non-essential source of enrichment and far from being integral to classroom learning and therefore the exploitation of information and communication technology is very limited (Dede, 1997; Aviram, 2000; Becker, 1994).

Other issues concerning teacher training are further discussed in this chapter in the section on “Professional Development” on page 70.

The main issues concerning teacher training deal with ways to introduce new teaching
techniques to teachers and convince them to apply them successfully into their work. Teachers should internalise the fact that to make effective use of technology advances, they need to become more learner-oriented and less teacher-centred (Darling-Hammond, 1996). The difference between these approaches is discussed below.

Learning Theories and Teaching Strategies in Computer-Technology

Behaviourism and Constructivism

Behaviourism takes a relatively simple view of learning based on stimulus and response (Bruner, 1995, p. 8). This form of teaching is sometimes called "knowledge transmission" (Kintsch et. al., 1996 p. 30) in which the teacher is the "knower" and designs all tasks for the student learner. The student then is the passive receiver. As a result of the ascendancy of the behaviourist designer centred view of teaching and learning, school teachers are traditional regarded by their pupils as 'gods of knowledge' (Phillips, 1997) who have total mastery of the subject content they teach, and design and control all the learning that takes place within their classrooms. The dominant educational paradigm is didactic instruction where learning is viewed as an information transmission process' (Soloway, 1997), and teaching consists of the transfer of knowledge from teacher to pupil. Teachers develop linear sequences of tightly structured, highly focused learning materials, and assess pupils' learning in relation to the specific learning outcomes built into them (Fosnot, 1996, p9). This model of teaching and learning reflects objectivist assumptions that the world is external, unchanging and structured (Von Glaserfeld, 1996); and that there is one world with ultimately one valid explanation of it. Consequently, learning is considered to be told what is known about the objects in this external world and the relationships between them, and teaching is the transmission of this knowledge to passive learners (Fosnot, 1996, p205).

Behaviourism, however, does not explain all that is seen happening in the learning process. With the development of more advanced methods to study the neurological, social and cognitive aspects of learning the scientific study of learning has evolved as "cognitive science." In the mid-1950's psychologists began to realise that the learning process was more complex then simple response-stimuli (Bruer, 1995, p. 8). Out of this work has grown a large body of literature on other ways of knowing and learning. A currently popular learning theory which has grown out of the work of cognitive scientists is the constructivist approach to teaching - often called "constructivism" and following in the work of Piaget. Constructivists
believe that knowledge 'does not exist outside a person's mind' (Von Glaserfeld, 1996) and believe that learning is the organisation of the individual's internal cognitions and experiences not the discovery of an external, objective reality. Learners create their own knowledge and understanding through active engagement with realistic tasks in authentic contexts using actual tools, and as there are many learners, there will be a multiplicity of understandings, though these will be moderated through social discourse. Learning is seen as the process of 'assimilation, augmentation and self reorganisation of incomplete mental structures' (Soloway, 1997), and is considered to be most effective where learners are pro-active in and control the construction of their own explanations (Philips, 1997). This theory, as it implies, rests on the assumption that learners can more readily understand and assimilate new things if they are provided a context in which they can explore the new information and construct the meaning. Learners go from passive receivers of information (behaviourism) to active construction agents.

The constructivist view has been influenced by the 1920/30's work of Vygotsky. In 1978 an English translation of his work, “Mind In Society: The Development of Higher Psychological Processes”, was published. Two of Vygotsky's prominent ideas are that learning takes place in a social context which does have an impact and that learners must have a conceptual scaffold provided to them to support their learning. The idea is that in any domain a learner has a "zone of proximal development". The goal of the teacher should be to provide an environment and experiences (i.e. scaffolding) that enable the learner to be challenged enough that he or she will learn but not be so challenged that the goal is cognitively beyond his or her grasp. The zone of proximal development is where most learning occurs. The idea that the social context is critical to what a learner learns has given rise to an educational model that Kintsch et. al. call social-constructivism (1996, p. 32). This pedagogical model employs practices of constructivism but is mediated by the social and cultural processes that surround the learning environment.

From the constructivist perspective, the role of the teacher and the purpose of learning materials is to facilitate active learning, during which learners construct their own holistic knowledge and understandings, rather than design tightly specified, linear teaching programmes that impose given knowledge structures on the learner (Fosnot, 1996). Teachers cannot transfer meanings or concepts direct to passive learners but can only orientate their conceptual construction process (Von Glaserfeld, 1996, p7). Learners are expected to have ownership of the learning process, experience with construction of their own knowledge, and
self-awareness of the knowledge construction process (Boyle, 1997, p76). There is an emphasis on process rather than specified outcomes, and in these circumstances, it is likely that learning outcomes will be less predictable and may vary from learner to learner.

To summarise the argument, behaviourists/objectivists believe that the world is 'out there'; that there is only one 'true' world; that teaching is telling learners about this external world; and that learning occurs only when some observable behavioural change is demonstrated. In contrast, constructivists believe that knowledge is 'inside'; that there are multiple individual representations of the world which are moderated through collaborative, social engagement; that teaching is providing authentic tasks, tools and contexts to facilitate each individual's process of conceptual construction; and that real learning is always at a deeper conceptual level than mere behaviour. Evidently, behaviourism/objectivism and constructivism are indeed inimical paradigms, and are at least in contention as alternative and opposite understandings.

Implications for IT

In many schools where IT is implemented behaviourist and constructivist models of teaching and learning are often in contention. The dominant educational paradigm is likely to be didactic instruction where learning is viewed as an information transmission process (Murphy, 1997), and teaching consists of the transfer of knowledge from teacher to pupil. Teachers develop linear sequences of tightly structured, highly focused learning materials, and assess pupils' learning in relation to the specific learning outcomes built into them (DfEE, 1998) and are most likely to adopt software for drill and practice and tutorials which centres on student's efforts to gain the knowledge and on teacher's efforts to transmit it. Research done by John Anderson (1995) and colleagues points out that well designed computer tutorials can enable students to reach the same proficiency level as "traditional" lessons in a shorter amount of time (Anderson et al, 1995, p. 167).

However, teaching and learning using IT encourages a different approach. There are general characteristics of IT that facilitate a constructivist approach (Inge, 1996). Learning with computers is almost always likely to involve an element of collaborative learning, and teachers must expect to learn at the same time as pupils and to take the lead in learning with them (Mor, 2001). From the constructivist perspective, the role of the teacher and the purpose
of learning materials is to facilitate active learning, during which learners construct their own holistic understandings, rather than design tightly specified, linear teaching programmes that impose given knowledge structures on the learner (Murphy, 1997). Teachers cannot transfer meanings or concepts direct to passive learners but can only orientate their learning (Von Glaserfeld, 1996). Learning occurs best under certain conditions.

"Whether learning is individual, or social, there are necessary conditions for it to occur. The learner (whether an individual or a group) must be able to try out the new ideas or behaviours, having had the opportunity to construct or develop them. There must be opportunity to test, refine and select from among these ideas or behaviours, and this will require feedback and guidance from other sources (for example a peer, teacher/mentor or book) as well as internal ones (for example critical reflection). There will need to be a sufficient level of challenge in the learning task, as well as motivation (which may involve reward of some kind). Any teaching context that is designed to be an effective stimulus for intentional learning must take the creation of these conditions into account." (Lally et al, 1999 p. 7)

Carroll (in Boyle, 1997, p102) developed an approach to the construction of learning materials which seems to suit the computer room environment although it was intended for a broader purpose. This approach seeks to support the natural strategies of learners:

"the learning environment should be user centred; get learners started on real tasks as quickly as possible; mistakes are an essential part of the learning process; error recognition and recovery should be strongly supported; intrusive instructional material should be reduced to a minimum; the learning materials should be structured and modular but users should not be constrained to a particular sequence when working through the learning materials; users should be free to access those learning materials they require and ignore those they do not ." (From Boyle, 1997, p.13-14 and p103):

However, there are suggestions that constructivist approaches do not work for all pupils. (Fosnot, 1996). These methods may well be helpful in certain cases, and although some case studies have been done, there is a need for more extensive study of their effectiveness in practice.
Computer Technology in ESL

Computer technology may have special relevance to teaching English as a second language. Its integration into ESL teaching can create a relevant context and environment for students and teachers, especially those who live far from an English language environment, where students can be guided to construct their own language ability and develop their communication proficiency (Kitao, 1996; Nozawa et al, 1993). An authentic language learning environment and a substantial amount of comprehensible input and output can foster foreign language learning and understanding (Kitao, 1996; Nozawa et al, 1993). ICT can take students beyond the classroom walls and cultural barriers, and connect them directly to English speakers. Based on the theory that success can be motivating and learning comes from learners' involvement (Kitao, 1996), ESL educators are creating ICT activities which take advantage of the Internet and networks. Constructivism attaches great importance to interaction and context. These concepts are apparent in the popular CALL (Computer Assisted Language Learning) activities (e.g., simulation, computer-assisted classroom discussion, and email key pals telecommunication) which often occur in a social and political context, with learners and teacher working together in the modern medium of networked interaction (Bruner, 1997). The meaningful use of the target language forces teachers and students away from treating English language as an object, but rather practice it as a medium of communication, thus language learning or acquisition should become more interesting and meaningful. Computer programmes that support collaborative language learning and interactive practicing in an authentic setting enrich this learning environment.

Teachers who have internalised the contribution of technology to their profession are often considered ready to proceed with the actual implementation. How are they likely to perceive the use of technology in education? What are the likely obstacles they should overcome on their way to successful implementation?

Major Obstacles and Barriers to Computer Use

A host of factors have been found to negatively affect the adoption of technology (Cuban, 1997; OTA, 1995; Rhodes, 1989; Somekh, 1996; Rosso et.al, 1997; Schild, 1997; Mor, 2001). Traditional pedagogical beliefs, fear of technology, resistance to change, lack of suitable
training, lack of technical and administrative support, lack of systemic incentives, lack of time, lack of access are among the most widely cited (Somekh, 1996; Rosso et al., 1997; Schild, 1997). Accessibility, scheduling and availability (e.g., not enough computers or peripherals) are problems for teachers wishing to use computer-based technology (Dimmock, 2000; Somekh, 1998; Rosso et al., 1998). Rhodes and Cox (1990) studied the use of computers in a group of twelve London primary schools from 1985 to 1989, with particular emphasis on the influence of teacher training upon uptake. They found the development of computer use in the schools to be influenced by four major factors: the attitude of the head teacher, timetabling arrangements, teachers' attitudes to the technology and the fabric of the school building. Teachers' acceptance of the value of computers for teaching did not lead, in their study, to regular use. Teachers mentioned several obstacles to the use of computers: the increase in workload they believed would result, the lack of good quality software, and physical difficulties such as finding the right plugs and reorganising the classroom for co-operative learning (Rhodes and Cox 1990).

Plomp et al (1990) applied a combined case study and survey methodology to investigate the use of computers in 28 Dutch junior secondary schools. They identified a number of factors as barriers to a more integrated use of computers in teaching: the lack of a clear school policy on what the institution wants to achieve with the new technology and how it should be achieved, lack of hardware, software and curricular materials, lack of time for the teachers to get acquainted with the new technology, and lack of a continuous process of staff development. Schild (1997) in her assessment of the technological implementation in Israel reached a similar conclusion. She found that the majority of the teachers (fifty seven per cent) had failed to implement the technological innovation due to:

"the teachers' lack of clarity about the innovation, their lack of the skills needed for implementation, the unavailability of required instructional materials, the incompatibility of organisational arrangements lack of staff motivation." (Schild, 1997, p 22) (Hebrew).

Many studies concerning the use of computer-based technology for instruction conducted and reported in the last decade list a number of common obstacles. The following section will discuss the main obstacles mentioned in these studies.
Time

Time is a major barrier to using computer-based technology. Studies indicate that appropriate use of technology requires more time for teacher planning and skill development than traditional techniques: time to practice, time to plan, preparation time, and unencumbered time (Lieberman and Rosenhertz, 1997). Watson (2000), in studies performed in UK schools, found that teachers cite time factors and lack of access to resources as prohibitive factors. Teachers are not provided with the time to learn hardware and software operation and to develop lessons using computer-based technology (Becker, 1994). In the survey performed by Green (1998), teachers used a five-point scale to rate the significance of twenty barriers to the use of computers for teaching and learning in the school environment. The most common explanation for non-adoptions was the perceived lack of time to learn how to use technological tools as well as learning new methods for teaching.

Training

As discussed in an earlier section, continuous and effective training is essential to achieve goals such as mentioned by Hargreaves and Fullan (1998).

"The biggest weakness of technology is the absence of sophisticated instructional designs required to take advantage of the available information. Developments in cognitive science…are creating new pedagogical possibilities in what it means to teach and learn for deep understanding and to apply what we know …They (teachers) must become the pedagogical experts of the future" (p.78)

In a study on the positive and negatives factors that influence the implementation of IT in primary schools in UK (Longley, 1997), one of the conclusions reached was the need for a variety of training initiatives which:

"are at various positions along the continuum of confidence and competence of IT…Training have often been delivered to disseminate details of the latest technologies rather than meeting the needs and stages of development of their intended audiences" (p.70 -71).
Research (Routine, 1999; Schild, 1997) examining the contribution of “Tomorrow 98” project in enhancing the computerisation of the Israeli educational system emphasises the need for constant and continuous teacher training. Criteria for training, such as that produced in England by the National Council for Educational Technology (NCET) in 1994 provide a sound framework for any in-service and pre-service IT training.

Support

Few teachers are able, unassisted, to integrate computing technology successfully into their teaching (Rhodes, 1996a; Chen, 1995; Schild, 1997). Technical support in the computer rooms is an essential factor that determines successful implementation. Schild (1997) reported that in Israel, teaching in the computer rooms became almost routine in schools that had a laboratory technician who supported the teacher with all the technical details, working with the net, uploading programmes, preparing the computers for the lesson, taking care of any technical problem during the lesson and more. However, this is not the case in many schools. In her survey of Israeli teachers, Faba-Sack (1998) says that only ten per cent of the participating teachers felt that there was adequate support in their school in Israel. Another study in the USA, performed by the Field Research Corporation (1995), reported that 18 per cent of elementary teachers in the United States considered insufficient technical support to be a drawback to using computers in the classroom. Fifty-four per cent believe the school does not provide enough support to integrate personal computers into curriculum. For the successful integration of technology, schools should provide in-service professional support, such as computer coordinators (Chen, 1995, Somekh, 1998; Rosso et al, 1998). It is most important that in-school educational computing expertise be available to provide assistance and advice when needed by classroom teachers, including classroom consultation (Ringstaff et al, 1997; Symes, 1997). It is clear that availability of such experts within a school increases the likelihood of successful curriculum integration of the technology. Aviram (2000) believes that successful implementation of an innovation requires not just technical support, but also support that addresses the affective concerns of those instituting the change, such as school principal and other leaders. Teachers who are not praised by their school principal for their use of technology tend to gradually lose their enthusiasm (Shahar and Sharan, 1998). The extra time and effort involved in the planning, preparation and implementation of computer based lessons are mostly compensated for by self satisfaction and appreciation of others in the organisation, preferably the leading figures Shahar and Sharan, 1998).
The role of the principal will be further discussed in later sections of this chapter.

Access

Although the number of computers has grown in schools, these computers are frequently located in computer rooms and scheduling access is difficult if not impossible (Becker, 1994; Sheingold and Hadley, 1993). The definition of access to technology, as defined in the OTA (1995) report, has multiple connotations: computers in the classroom, ratio of students to computers, computers at home, current hardware and software, and location of computers. Studies show that for efficient implementation of ICT, computers must be available for teachers to use at school and home (Comber et al, 1997; Dede, 1997). Peled (1986) emphasised the need for teachers to use the computer in everyday life in order to internalise its benefits. The ImpaCT2 research (2001) conducted in 60 UK schools point out that:

"having a computer at home has a significant impact on teachers’ ICT capability. Teachers who have access to a relatively new computer at home (one that can handle multimedia and web graphics) report growing confidence and competence.” (p.13)

Harrari, (1993) initiated a portable computer project in two teacher training colleges in Israel, Levinsky and David Yelin, which provided portable computers to pre-service teachers and their teacher trainers in order to achieve a similar goal. Heppel (1996) extends the issue of access to all teachers in UK (approximately 420,000 computers) who “need a computer of their own, to take home and work with, and time to explore it”. Access to technology is critical for its successful implementation in schools.

Teachers’ Attitude to Computer Technology

Teachers generally accept computers as valid educational tools, while they also experience an anxiety about personal use of the machines (Russell, 1991; Katz et al, 1997). Faba-Sack (1998) in her research of Israeli teachers’ implementation of ICT and attitudes towards their doing so, found that most teachers (81 per cent) said they would not wish to exclude computers from their teaching. (p.55) So while most teachers appear to have a favourable
attitude toward computers and recognise the need for them in the classroom, there is, at the same time, an anxiety about them (Bowles, 1999). IT seems big and amorphous to some teachers and there is a feeling of it being imposed on them. IT keeps changing and the temptation is to leave it until the "goalposts stop moving" (Bowles, 1999, p. 38). IT seems threatening since as a teacher one should know more than the students, which is very often not the case when technology is involved. Teachers' anxieties are a complicated obstacle to overcome. Research, however, has indicated that:

"teachers who had regular access to computer technology in their classrooms over several years time experienced significant changes in their instruction, but not until they had confronted deeply held beliefs about schooling" (Dwyer et al, 1991, p. 45).

Table 2-1 summarises the barriers to a successful implementation of technology in education mentioned in this section.

Table 2-1: Barriers to Computer Use

<table>
<thead>
<tr>
<th>Major Themes</th>
<th>Sub-themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Time to practice</td>
</tr>
<tr>
<td></td>
<td>Time to plan</td>
</tr>
<tr>
<td></td>
<td>Time for training</td>
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<tr>
<td></td>
<td>Preparation time</td>
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<tr>
<td>Training</td>
<td>Adequacy of Teacher Skills</td>
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<tr>
<td></td>
<td>Technology Training</td>
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<td></td>
<td>Teacher Initiative to Take Training</td>
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<td></td>
<td>Timing of Training</td>
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<tr>
<td>Support</td>
<td>Technical support</td>
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<td></td>
<td>Professional support</td>
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<td></td>
<td>Organisational support</td>
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<tr>
<td></td>
<td>Administrative support</td>
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<tr>
<td></td>
<td>Principal support</td>
</tr>
<tr>
<td>Access</td>
<td>Student/Computer ratio</td>
</tr>
<tr>
<td></td>
<td>Internet access</td>
</tr>
<tr>
<td></td>
<td>Quality of hardware</td>
</tr>
<tr>
<td></td>
<td>Access from home</td>
</tr>
<tr>
<td>Attitude</td>
<td>Fear of Computers</td>
</tr>
<tr>
<td></td>
<td>Teacher Resistance to Computers</td>
</tr>
<tr>
<td></td>
<td>Teachers Resistance to Change</td>
</tr>
</tbody>
</table>
Factors that Predict Computer Use

Teachers' perceptions, beliefs and attitudes

There is a range of perceptions of teachers in relation to the use of computer-based technology that may be significant. Teachers who adopt the computers in their teaching often perceive that technology supports superior forms of learning (Means and Olson, 1994, Salomon, 1996). They understand that computer-based technology can change the way teaching/learning occurs (Dwyer, et al, 1994; OTA, 1995; Sheingold et al, 1990, Chen, 1995). Teachers who adopt computer technology realise that computer-based technology enhances teacher/student productivity (OTA, 1995; Sheingold et al, 1990, Givon, 1997), and prepares students for the world of work (Hargreaves and Fullan, 1998). Teachers who hold these perceptions tend to be successful in adopting and using computer-based technology (Chen, 1995; Dwyer, et al, 1997).

Teachers' beliefs play an essential role in their practices and shape the learning that goes on inside and outside their classroom (Putnam and Borko, 1996). These beliefs shape the learning that teachers do as they work to improve their teaching and act as filters through which teachers view educational change (Fullan, 1994; Hargreaves et al, 1998). In order for teachers to adopt new educational innovations such as technology, they need to "think in new ways about students, subject matter, and the teaching-learning process." (Putnam and Borko, p. 38). Rosso et al, (1998), too, conclude that:

"the extent to which teachers understand and use new curricular approaches appears to be influenced by the similarities between the new approach and the teacher's initial beliefs about teaching, learning and content" (p.47).(Hebrew).

Existing experience also has a strong influence on developing teachers' practices and teaching strategies. Teachers are very much inclined to teach in the way that they were taught and to model their practices on those that they judged to be effective from personal experience (Hargreaves and Fullan, 1998). Even when teachers are presented with new possibilities, there is evidence that they filter and select from among the large amounts of information they are presented, those parts that fit their personal perspectives and intuition (Rosso et al, 1998).

“Entry: teachers struggle to cope with technology and new learning environments;

Adoption: successful use of technology at a basic level

Adaptation: discovery of the potential in a variety of applications

Appropriation: mastery over the technology; it is used to accomplish various classroom goals

Invention: active development of new active techniques using the technology.”
(p.45)

The other dimension consists of the stages that represent changing attitudes towards the innovation, which move from concern about its immediate impact, through those which relate to introducing it, to concerns about its impact on students and working with other colleagues. The affective and behavioural components of this model are closely connected, so that each stage of concern is associated with a level of use. Comber et al (1998) suggest that a third dimension could be added to this model – building in appropriate intervention strategies that will enable users to move to a more sophisticated level of use.

Up until the 1990s, most research on educational uses of technology focused on how technology impacts on teachers’ beliefs and practices, not vice versa. In recent years a growing number of researchers have begun to examine the role of teachers’ beliefs in their implementation of technologies (Blease and Cohen, 1990; Veen, 1994). Current literature on this issue is quite inconsistent. Some suggest that technology often amplifies rather than transforms practices (Loveless, 1996) and that teachers’ pedagogical beliefs and practices often determine how they use or do not use technology (Hargreaves and Fullan, 1998; Means, 1994).
Continuous training – Life-long learning

The one certainty regarding information and communications technology is that it is ever changing. To keep abreast of this change practitioners of every stripe must endeavor to keep pace in order to derive any real benefit (DfEE, 1998; OTA, 1995; Schild, 1997). The overall aim as far as teaching is concerned is to improve the teachers’ skills radically through initial teacher training and regular follow-up training. Rhodes and Cox (1990) performed a study in UK schools. They found that short INSET courses were not very effective in promoting uptake and that teachers need an ongoing training programme. Even teachers who used computers regularly felt the need for additional training. Sarason (1990) argued that it is not the amount of in-service training but the nature of it that counts and recommends:

"a task-focused continuous professional development combining a variety of learning formats and a variety of trainers" (p. 76).

Further discussion on the issue may be found in the section “Professional Development” on page 90.

Acceptance of change

The ability of the teachers to accept change is another factor that may predict successful integration of computers. Blease and Cohen (1990 suggest that the fundamental change required to use computers for teaching is to change teachers' existing conception of the teaching and learning process and of their pedagogic role within it. Teachers' beliefs and practices are very stable and extremely difficult to change (Cuban, 1986; Fullan, 1994), and change only occurs incrementally (Loveless, 1996). Since an application that requires pedagogical changes for its use poses significant challenges to teachers, teachers may well resist adopting the application. Loveless (1996) maintains:

"If the past is any guide, educators will hardly flock to this message... In their various incarnations, progressive reformers have tried to fundamentally redefine the role of the teacher by emphasising child-centred practices and active learning. Technology experts and software designers now join this parade and, by enlisting
computers in the progressive cause, embrace an educational philosophy that the vast majority of teachers have consistently rejected" (p. 459).

Age of teachers

Age is often assumed to be a factor related to computer use. The survey conducted by Russell and Drew (2001) for the British Ministry of Education to discover the uptake of, attitudes towards and barriers to use of ICT, found that use of the ICT is greater among younger age groups, 70 per cent of 16-34, compared to 14 per cent of those aged 55 and older (p.4). However, there is no evidence to support this assumption in Schild's study of Israeli teachers (Schild, 1997)). While seniors (teachers older than 50) have other interests, more than fifty per cent of those surveyed were interested in learning more about computers.

Grade level

No relevant studies on grade level as a predictor of computer use were found for the literary review. The only reference to the topic which is relevant to this study was discussed in Schild's (1997) research in which she found that 70 per cent of the elementary class teachers, 47 per cent of the Junior High teachers, and 34 per cent of the High School teachers use computers in their instruction.

Summary of Part 1

This section considered mainly with the teacher training and teachers' perceptions of using technology in their teaching. It started with a theoretical background of computer technology and teacher training in general. In spite of enormous budgets devoted to the computerisation of the educational systems in many countries around the world among which is Israel, there is still a debate among leading educational researchers concerning the effectiveness and potential of computer technology in the classroom. However, in the case of the population studied in this survey, ESL teachers, ICT has a variety of advantages which were pointed out in reference to leading learning theories, behaviourism and constructivism. Some of the major obstacles were then discussed, those that constitute a part of the attitudes of teachers, and those that surround the teachers’ professional existence. Among the former are teachers’
anxieties and inability to accept change. Training, support, access, time are among the latter. The next section analyses some of the factors that may predict computer use. Teachers’ beliefs and perceptions on the effectiveness and potential of technology in education was one of the factors discussed. Teachers who are willing to accept change and try it in their teaching, teachers who dedicate hours to training and self learning have a chance to successfully implement computers in their teaching since the process of learning is continuous and technology is constantly changing.

The next section discusses the introduction of change in general and computer technology in particular into the schools, the role of the school principal in determining successful integration of computers, the role school culture plays in the process and finally the need for efficient staff development programmes to enhance the change culminating in the importance of turning schools into learning organisations in an attempt to satisfy current and future needs.
Part 2: The Impact of Leadership and School Culture on the Infusion of Change in Schools

"The effective use of technology in schools can only be accomplished if leaders and teachers strategically initiate and support changes to modify or re-shape the existing cultures(s) in their schools." (Levine, 1999, p 2)

One of the main issues studied in this thesis is school leadership and school culture. The second research question in this study attempts to determine the extent to which school leadership and school culture serve as influencing forces on the teachers’ incorporation of computers in their teaching. This section reviews the literature dealing with the principal as the leader of infusion of change and the designer of the school culture. Relevant issues such as defining effective leadership for the infusion of computer technology in schools, changing school cultures to enable successful integration of computers and ICT into teaching, ways of turning the school into a learning organisation, providing the support required by teachers to enable successful computer incorporation, and enabling convenient and constant access to computers will be discussed in this section.

Introducing computers into a school system is a complex change process which requires a skillful and efficient leadership and a supportive and encouraging school culture. It is therefore important to understand the concept of change, the methods in which it is infused into school by the school leaders, the role school culture plays in the process and the importance of staff development to achieve success.

Change in Education

Managing change is perceived as being a difficult and complex process that enables progress (Cuban, 1990; Fullan 1993; Hopkins 1994). Glickman et al. (1998) observe,

"although not all change represents progress, progress – by definition – is not possible without change" (p . 435).
The idea and evolution of change are reflected in the history of education. As each new paradigm relating to educational change appears, the organisational structure and culture in which it exists evolves. Change is continuous and a constant process of revitalisation and growth that takes time (Fullan, 1993). To understand the present, one must examine the past, which will help to define the future because of the evolutionary nature of change. This section of the literature review focuses on educational change, with the emphasis on introducing computers into the educational system. However, it is important to first understand the concept of change.

Researchers see change as a process that occurs gradually over a long period of time (Hord et al., 1987; Joyce et al., 1989; Fullan, 1993). It involves the active participation and cooperation of all the involved parties, school management, school teachers and administrative staff (Fullan, 1993). Part of the process of change is the integration of new perceptions, attitudes, and behaviours into one's sense of self. Teachers relate to change in terms of what it will do for them (Hord et al., 1987). The literature indicates that change requires the time and coordinated efforts of groups of individuals who are willing to work together and share common goals (Fullan, 1993). For an individual to consider change, the perception must be that change must be needed and appear reasonable, and time must be provided for implementation. Change must be compatible with organisational culture, resources must be available, and new changes must be prioritised with existing initiatives (Fullan 1991).

Attempts have been made to describe the change process. It is often seen in three broad stages. The first, variously labeled initiation, mobilisation or adoption, consists of all the decisions and activities which occur before the change is put into place in the classroom. Implementation or initial use, the second stage, involves putting the curriculum idea or change into actual use in the classroom. The third stage, which different writers call continuation, incorporation, routinisation, or institutionalisation, refers to those processes and decisions which lead to the change either being 'built in' as an ongoing part of the learning environment, or rejected (Fullan, 1991). Marsh (1992) contends that recognition should be given to a distinct preliminary stage, which he calls the orientation and needs phase, and Fullan (1991) stresses that change should include a later stage, which he calls:

"the outcomes stage, to cover a longer term extension or continuation, including improved student learning and attitudes, new skills, attitudes or satisfaction on the part of teachers: (p.48)."
The five stage model in Figure 2-1 attempts to express the process of change as seen by Fullan.

**Figure 2-1: Stages of curriculum change and the importance of dissemination**

*Fullan, 1991, p 43*

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>Initiation</td>
<td>Implementation</td>
<td>Continuation</td>
<td>Outcomes</td>
</tr>
<tr>
<td>Needs</td>
<td>Mobilisation</td>
<td>Initial use</td>
<td>Incorporation</td>
<td></td>
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<tr>
<td></td>
<td>Adoption</td>
<td></td>
<td>Routinisation</td>
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<td></td>
<td></td>
<td></td>
<td>Institulisation</td>
<td></td>
</tr>
</tbody>
</table>

Dissemination important

Dissemination essential

Dissemination as monitoring and collecting feedback

This model served as a basis to other theoreticians such as Rogers (1995) who created his model of the stages of innovation and decision making which is discussed below. The models stress the broadness and inter-connectivity of any nominated stages and emphasise that it is not a linear process but one where numerous factors operate at each phase, feeding back and altering decisions made at previous stages (Fullan, 1991; Rogers, 1995). Educational change is seen as a long term interactive process, in which any stage "may be in the works for years" (Fullan, 1991, p.48-49). Reasons for failure to introduce change are plentiful. The complexity of the process and the problems faced very often lead to settling for symbols over the substance of actual change (Fullan and Miles, 1992). The leaders of change often show impatience at the pace of change leading to superficial solutions (Fullan and Miles, 1992; Peled, 1986). Change may often arouse misunderstanding and resistance (Aviram, 2000; Fullan and Miles, 1992; Dwyer et al, 1990). Teachers should not be expected to implement an innovation that is unneeded, unclear or unrealistic in time, resource or support (Fullan, 1994). Successful introduction of change should take into account that change is learning, loaded with uncertainty; change is a journey, not a blueprint; change is resource-hungry; change requires the power to manage it; change is systemic; and, all large-scale is implemented locally (Fullan and Miles, 1992, p. 745-752). They write that:
"Failure to institutionalise an innovation underlies the disappearance of many reforms. Changes in structure must go hand in hand with changes in culture and in the individual and collective capacity to work through new structures" (p. 748).

One of the educational changes that many schools were required to implement during the last decade was the introduction of computer technology.

Change and Computer Technology

Creating an improved learning environment in the learning centred school can be approached by using powerful catalysts for change. One such catalyst is computer technology (Dimmock, 2000). Designers, developers, and advocates of technology (Peled, 1986; Harrari, 1993) wish to achieve one of two (sometimes both) goals: widespread adoption and considerable change in practice. These two goals can complement each other, but they can also conflict. Increased capacity to produce considerable change could lead to increased adoption. Increased capacity for change, however, can also hinder adoption because change can be disturbing and threatening (Dwyer et al, 1991; Fullan and Miles, 1994; Aviram, 2000). Fullan (1991) claimed that educational change involves “change in practice” (p.37) especially that of the teacher. The difficulty he found in defining the practice that would be altered was that:

“Educational change is not a single entity...Innovation is multidimensional. There are at least three components or dimensions at stake in implementing any new programme or policy: (1) the possible use of new or revised materials (direct instructional resources... or technologies, (2) the possible use of new teaching approaches (i.e. new teaching strategies or activities), (3) the possible alteration of beliefs (e.g. pedagogical assumptions and theories underlying particular new policies or programmes.” (p.37)

This multidimensional approach is emphasised by Peled, (1986) and Harrari (1993), the initiators of computer technology in the Israeli schools. They believed that widespread use of computers in education was important yet what was the ultimate goal was change in teaching approaches, practices and beliefs. A unique attribute of computers as an educational innovation is that their use demands many new skills and competencies and embraces changes in educational ideologies (Peled, 1986; Harrari, 1993). Blease and Cohen (1990) assert that the fundamental change required to use computers for teaching is to change teachers' existing
conception of the teaching-learning process and of their pedagogic role within it (p. 29). Prawat (1992) identifies in computer-assisted learning, a shift from conventional teacher-student dialogue to learning environments that are complex and interactive. Sheingold and Hadley (1993) and Becker (1993) also accept that the use of technology may be changing the way teaching is conducted. Some teachers can cope adequately with such large-scale changes, some even welcome it. Harrari (1993). Eraut (1991), in his investigation of reasons for differences in uptake of information technology in schools, found some teachers whom he describes as cosmopolitan teachers who seek out opportunities for change, enjoy risk-taking and are willing to work with new methods of learning. However, not all teachers are like this. Kulik (1994) carried out a meta-synthesis on computer assisted learning research studies about the educational adoption and implementation of computers and came to the same conclusion. Despite all this, however, change theorists argue that the teacher can, and should, adopt a positive attitude to change and learn to accept it as a valuable part of professional development:

"Success in school change efforts is much more likely when problems are treated as natural, expected phenomena, and are looked for.... The anxieties of uncertainty and the joys of mastery are central to the subjective meaning of educational change (Fullan, 1991, pp. 28 and 32).

Innovations in education are frequently avoided if current methodologies appear to be serving their own purposes and no real need for change is apparent. Change is more likely to occur when people can relate the change to need (Eckhardt, 1995). Eckhardt believes that the reluctance of some teachers to embrace the development of new and specific skills in computer technology is because the value of such change is not perceived by them in the same way as those requiring the changes to be made. Eckhardt (1995) cites Stenhouse’s view that “as a starting point, teachers should want to change, rather than others wanting to change them” (p.32). Schild (1997) concludes, in her study of the integration of computers in Israeli schools, that success depends on both school and teachers. However, since teachers have strong beliefs about the content of their subject as well as the pedagogy, these beliefs change slowly. Teachers adopt new media if they can use them in accordance with their existing beliefs and practices. Chen (1995) supports this argument and adds that successful teachers in particular will be unwilling to drop approaches that work for the sake of something new unless they see that it can work too. Sandholz et al (1997) suggests that change involves risk in moving from the familiar to the unfamiliar. A common sequence of feeling is expected. It begins with the feeling of loss of long-standing beliefs, ideas and behaviour patterns. Another
feeling of loss may be that of loss of confidence or self esteem. The second feeling is that of anxiety about new knowledge and skills, about the unknown future and ways of coping with it. This is followed by the urge to struggle to survive, to acquire new competencies and to gain respect and recognition (Sandholtz et al, 1997).

Introducing technology into the school organisation poses an enormous challenge not only to teachers but to the entire organisation and its success very often depends on the approach to its diffusion into the system and adoption by the system.

**Diffusion and Adoption of Innovation and Change**

Introducing computer technology in teaching is an innovation that is being diffused throughout the school culture with mixed results. Rogers (1995) depicts the beginnings of research on diffusion as describing the rate at which people adopted an innovation. He reinforces the idea that the decision to implement innovation or change behaviour is a personal decision. Goodlad (1991), Fullan (1991), Means (1994), and Rogers (1995) all conclude that the decision to change must take place at the individual level. Individual behavioural change is at the root of integrating computers into classroom instruction. In his Model of Stages in the Innovation-Decision Process, (figure 3-4), Rogers (1995) displays the process through which an individual passes from “first knowledge” to “confirmation” (p. 163).

**Figure 2-2: A model of stages in the innovation- decision process**
(Rogers, 1995, p. 163)

The first of these is knowledge. If individuals do not find the information relevant to their situations, or if enough knowledge is not obtained to persuade the individual to use the
innovation, the knowledge step is skipped (Rogers, 1995). This may be compared to Fullan’s (1991) model of the process of change (figure 2-3). The first stage to change is called “orientation” (p.43) during which the individual examines the idea of change and tries to attach it to his/her needs (Marsh, 1992; Fullan, 1991). Very similarly, Kershaw (1996), in his three-step transformation process, describes the first step as the one during which the individuals must understand that there is an urgent need to change. In Rogers’ model, the persuasion stage is when the individual actively seeks information about the new idea. The individual examines the advantages, disadvantages, and consequences of the innovation and opinions of peers are the most valued. This may be compared to Fullan’s (1991) initiation stage and to Kershaw’s second stage during which individuals come to understand that they themselves must change. The persuasion stage will result in either a favourable or an unfavourable attitude toward the innovation. The decision stage in Rogers’ model is where the individual chooses to adopt or reject the innovation. Individuals will adopt innovations more readily if the innovation can be used on a trial basis (Rogers, 1995). In the implementation stage, both in Fullan’s and Rogers’ models, the individual puts the innovation to use. Here the individual actively seeks information about the innovation. The implementation stage ends when the adopter institutionalises the innovation and makes it a regular part of the ongoing operations. This is Kershaw’s third stage during which the individuals change the way in which they perform their roles in the institution. At the confirmation stage the adopter seeks reinforcement for the innovation decision already made and may reverse this decision if exposed to conflicting messages about the innovation. This is equivalent to Fullan’s “outcomes” stage (Fullan, 1991, p.43). Negative messages at the confirmation stage may lead to discontinuance (Rogers, 1995, p. 162-163).

Kershaw uses four adopter categories: innovators, early majority, late majority, and laggards (Kershaw, 1996, p. 44-48). The first individuals to adopt a new idea, the innovators, do so not only because they become aware of the innovation sooner than their peers, but because they require less time to move from knowledge to decision (Rogers, 1995). Geoghegan (1995) refers to the innovators as “early adopters” (p.30) who experiment with every new technology that comes along and are the first to adopt and use any technology innovation. Kershaw’s early and late majorities need to be reassured that there is sufficient administrative and technical support available to them as they embark on the transformation process. They come successively later to the acceptance of change and later yet before change actually occurs. Geoghegan (1995) groups them as “the mainstream” (p.30). This group tends to be more conservative in its approach. Its members focus much more on the problems, processes, and tasks at hand than on the tools that might be used to address them and tend to
prefer incremental change. Kershaw's laggards will not change. They may progress to step two of the transformation process (Figure 2-4) and accept the need to change but, for some reason, choose not to do so (Kershaw, 1996). Geoghegan (1995) does not provide any equivalent group for the non-users.

Table 2-2 summarises some of the differences cited by Geoghegan as separating early adopters from the mainstream faculty.

**Table 2-2: Adoption categories for information technology.**

<table>
<thead>
<tr>
<th>Early Adopters</th>
<th>Mainstream</th>
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<tbody>
<tr>
<td>Favour revolutionary change</td>
<td>Favour evolutionary change</td>
</tr>
<tr>
<td>Visionary</td>
<td>Pragmatic or conservative</td>
</tr>
<tr>
<td>Strong technology focus</td>
<td>Strong problem and process focus</td>
</tr>
<tr>
<td>Risk-takers</td>
<td>Risk-averse</td>
</tr>
<tr>
<td>Experimenters</td>
<td>Want proven applications of compelling value</td>
</tr>
<tr>
<td>Largely self-sufficient</td>
<td>May need significant support</td>
</tr>
<tr>
<td>“Horizontally” networked</td>
<td>“Vertically” networked</td>
</tr>
</tbody>
</table>

Source: Geoghegan (1995, p. 30)

It is important to note that it has been Geoghegan's experience that early adopters often turn out to be poor role models and change agents. On the other hand, Smylie (1995) claims that the early adopters, who implement change in their educational settings, influence other teachers. In order for meaningful school reform to take hold, teacher leaders should be developed. These leaders, usually early adopters, exert influence over other teachers less eager or less willing to change and to learn new things. (Smylie, 1995) and become change agents.

There are a number of attempts to define the role of change agents. Rogers (1995) believes a change agent is one who influences clients' innovation decisions in a direction deemed desirable by a change agency. An effective change agent, according to Fullan (1991), is a member of the organisation who can take responsibility and action to exploit the many opportunities for bringing about improvements. Dalton claims that change agents advocate for, and empathise with, the adopters and their main role is to facilitate the flow of innovations from a change agency to an audience of clients. For this to be effective innovations must be selected to match the clients' needs and problems (Rogers, 1995). Attempts have been made to identify the skills and roles of change agents. Miles, Saxl and
Lieberman, in an article published in 1988, looked at the skills which a change agent needs. A synthesis of their findings resulted in a list of eighteen key skills for educational change agents, including general, personal, and socio-emotional, task and educational content skills.

Educators, principals and teachers, often learn from each other in their approach to change and therefore, may take the role of change agents by influencing others' behaviour in a desired direction (Hanson, 1998). While remembering that "there are no blueprints for change" and "change is a learning process loaded with uncertainty" (Fullan and Miles, 1992, p. 747), it is possible to receive guidance and direction from role models, principals and teachers, in their field of expertise (Sarros and Butchatsky, 1996, p.277). They are capable of empowering others "to achieve commonly-agreed goals through actively involving them in everyday decision making and policy implementation processes" (Sarros and Butchatsky, 1996, p.280) even in times of uncertainty. For teachers, this means bringing about improvements in their own teaching and, very often, effecting improvements within a wider school context if teachers are to obtain the necessary conditions to enable them to use and develop technology as a resource in their teaching. (Fullan, 1991).

The existence of informal teacher leaders in schools has long been recognised (Smylie, 1995). Glickman et al. (1998) observe that:

"empowered individuals and groups are more likely to develop beliefs, values, norms, and assumptions that are congruent with risk taking, experimentation and continuous improvement" (p. 443).

These teachers are implementing change in their educational settings and influencing other teachers without a formal leadership role (Murphy, 1999). These leaders, who may be defined as change agents, exert influence over other teachers less eager or less willing to change and to learn new things. Whether they are becoming involved in formal decision-making processes, curriculum innovations, or modified instructional delivery models, teacher contributions to the quality of instruction are significant. Principals alone are not, and cannot be, solely responsible for the quality of the instructional programme in their schools (Murphy, 1999).

Researchers have documented that school principals play a critical role in influencing reform initiatives and are recognised as instrumental in the complex process of effecting school improvement and organisational change (Hall and Hord, 1987; Fullan, 1995; Idan, 1998).
Their role is best defined as change agents who facilitate the process of reform. Consequently, the expectations of teachers and principals within this social system are different when confronted with change. Therefore, it is the development of this relationship and the degree of understanding between principals and teachers that is likely to ultimately determine the environment for change (Sergiovanni, 1996). Sheppard and Brown (1999) in their study of two Canadian high schools recognised for successful change discovered that:

"formal leaders, particularly the school principals, were key players throughout the change process" (p. 12).

The success of principals in introducing and implementing change is linked to their ability to effectively articulate and put into action their vision of excellence in teaching and learning. Sergiovanni (1996) defined this as:

"the process of emphasising, paying selective attention to, and modeling important goals and behaviours in such a manner that it signals others what is valued in the school." (p. 18)

School principals who are effective leaders within the organisation achieve their goals and promote that which they and their organisation find most important (Givon, 1997).

**Effective Leadership**

There are many theories about leadership, most developed from organisational theory, although educational administration has in the last 20 years begun to develop concepts and theories of its own. Senge (1990) describes leadership as "the capacity to hold the shared picture of the future we hope to create" (p. 9). Views of leadership in general and school leadership in particular are changing largely because of current restructuring initiatives and the demands of the last decades. Patching (1999) claims that leaders of the future will need skills to deal with facts, intentions, meanings and judgments. Day (1995) as cited in Busher and Saran, 1995, believes that leaders in the future will need to build into their roles "platforms for reflection on mission" to respond to the externally, imposed innovation (Busher and Saran, 1995, p. 118). However, there is a consensus as to the importance of the
role of the school leader in enhancing success and effectiveness as shown in recent findings in England, Canada and the United States. Day et al's (2000) study of school leaders in England in twelve schools shows that effective principals constantly work at helping individual teachers develop, continually work at enhancing relationships in the school and between the school and community, and maintain a focus on goal and programme coherence. Similarly, Leithwood et al (1999) claim that school leaders in Canada spend their time developing people, building commitment to change, creating the conditions for growth in teachers, and relating to outside forces while continually acquiring and targeting resources. Sebring and Bryk's research (2000) in Chicago reform shows that school leadership is a determining factor in school success. School principals lead the charge in focusing on instruction, school-wide mobilisation of resources and effort with respect to the long-term emphasis on instruction, and above all they attack incoherence.

School education is at present undergoing dramatic change. In order to implement change and to continue to offer quality education in substance and delivery, improved leadership is seen as central (Beare et al., 1989; Idan, 1998). This concern with what is called leadership has become prominent especially since James McGregor Burns' (1978) landmark study of political leaders in which he developed the notions of transactional and transformational leadership. The idea of transformational leadership was later extended by Bernard Bass (1990) and others. Burns (1978) introduced the concept of transformational leadership, describing it as not a set of specific behaviours but rather a process by which "leaders and followers raise one another to higher levels of morality and motivation" (p. 20). Working with Burns' (1978) definition of transformational leadership, Bass (1985) asserts that these leaders motivate followers by appealing to strong emotions regardless of the ultimate effects on the followers and do not necessary attend to positive moral values. Leithwood (1992) posits transformational leadership as moving beyond managerial and instructional leadership to providing schools with strategies necessary to cope with change. A significant body of literature documents the importance of transformational leadership in this climate of change (Fullan, 1991; Leithwood, 1992).

Characteristics of Transformational Leadership

Dubrin defines transformational leaders as those who bring "about positive, major changes in an organisation" (p. 433). Owens (1998) describes transformational leaders as those who
"work with followers in ways that change both leaders and followers so that over time they are performing at increasingly higher levels of functioning than they were initially" (p. 209).

Similarly, Leithwood, Janzi, and Steinbach (1999) state transformational leadership:

"assumes that the central focus of leadership ought to be the commitments and capacities of organizational members" (p. 9).

Burns (1978) distinguishes between transactional and transformational leadership. Transactional leadership involves a transaction, an exchange, and while this is a necessary component, it:

"may not ensure that the organisation achieves at a level of excellence or, if a change in direction or new levels of achievement are desired, that these will eventuate" (Caldwell and Spinks, 1992; p 49).

What Burns (1978, p. 4) called transforming leadership is:

"more potent (than transactional leadership). The transforming leader recognises and exploits an existing need or demand of a potential follower, looks for potential motives in followers, seeks to satisfy higher needs and engages the full person of the follower" (p. 4).

Perhaps the greatest contribution to the understanding of transformational leadership has been the identification of four characteristics, referred to as the four "Ts" (Bass and Avolio, 1993, p. 51) which transformational leaders use to stimulate and engage followers.

The four I's of transformational leadership are:

- "Individualised Consideration: Gives personal attention to others, making each individual feel uniquely valued."
• Intellectual Stimulation: Actively encourages a new look at old methods, stimulates creativity, encourages others to look at problems and issues in a new way.

• Inspirational Motivation: Increases optimism and enthusiasm, communicates high expectations, points out possibilities not previously considered.

• Idealised Influence: Provides vision and a sense of purpose. Elicits respect, trust, and confidence from followers”. (Bass and Avolio, 1993, p. 51)

Transformational leaders are thought to engage followers by employing one or more of the four "Ts" to stimulate voluntary and enthusiastic responses to their influence attempts. The optimal leader, Bass and Avolio (1993) argue on the basis of their research results, is someone who is at the active end of the leadership spectrum and combines positive transactional behaviours with the four Is of transformational leadership. Bass and Avolio (1993) claim that good managers achieve good results; transformational leaders, however, in addition to producing higher levels of effectiveness, achieve results beyond expectations. Transformational leaders do not necessarily react to environmental circumstances, they create them with their ability to concretise a vision, to excite others, to change the way problems are thought about.

Caldwell and Spinks (1992) identify important qualities of leadership in schools where excellence is valued. These include: emphasis on transforming rather than transacting; developing and communicating a vision that builds commitment; emphasising school-based management and collaborative decision-making; acknowledging many kinds of leadership in the school; keeping abreast of trends and issues, threats and opportunities in the school environment and in society at large; and recognising that both "masculine" and "feminine" stereotype qualities are important regardless of the gender of the leader. These qualities are reflected in the four facets of leadership identified by Caldwell and Spinks (1992) namely, cultural leadership, strategic leadership, educational leadership and responsive leadership. These facets highlight the importance of understanding the values that drive the day-by-day activities and determine excellent outcomes for the school.
Leithwood, is best known for his advocacy of transformational school leadership which he has tested in many empirical studies. Leithwood (1994, pp. 7-8) defines transformational leadership as follows:

"The term "transform" implies major changes in the form, nature, function and/or potential of some phenomenon; applied to leadership, it specifies general ends to be pursued although it is largely mute with respect to means. From this beginning, we consider the central purpose of transformational leadership to be the enhancement of the individual and collective problem-solving capacities of organisational members; such capacities are exercised in the identification of goals to be achieved and practices to be used in their achievement.” (Leithwood, 1994, p. 7-8)

Collaboration in Transformational Leadership

Central to transformational leadership is collaboration that involves teachers, parents and students (Salant and Kachensky, 1998). Leithwood (1992) identifies a wide range of specific transforming actions that build a collaborative school culture. These include: clarifying and prioritising goals, reducing staff isolation and stimulating teacher commitment; fostering staff development; developing a supportive collegial environment and staff commitment; engaging in frequent communication about cultural norms, values and beliefs; and celebrating, recognising and appreciating the work of staff and students. Fullan (2001) points out the need to develop:

"collaborative school cultures that value teachers working in teams and in which the principal and the teachers work together to focus on student performances and on what it takes to make continuous improvements” (p.80)

Consistent with the collaborative model, transformational leaders delineate a clearly defined process leading to the formulation of the community's plan. This process also assists with the clarification of short-term goals and the identification of the school's priorities. Collaboration also implies responsiveness and accountability. The responsive leader is:

"at ease with the notion that all those whose interests are served are entitled to have information to enable judgments to be made about the extent to which the school is
Responsive leadership is the way in which the transformational leader demonstrates a desire for improvement. Evidence of the effects of transformational leadership, according to Leithwood (1992), is positive. He found that transformational leadership practices have a sizable influence on teacher collaboration, and that significant relationships exist between aspects of transformational leadership and teachers' own reports of changes in both attitudes toward school improvement and altered instructional behaviour. Leithwood, Janzi, and Steinbach (1999) state transformational leadership:

"assumes that the central focus of leadership ought to be the commitments and capacities of organisational members" (p. 9).

They describe transformational leaders as those who work with followers in ways that change both leaders and followers so that over time they are performing at increasingly higher levels of functioning than they were initially. Sergiovanni (1996) concludes that student achievement is remarkably improved by such leadership and schools where teachers and students report a culture conducive to school success have a transformational leader as its principal.

Leadership plays an important role in determining the organisation's culture. Successful leaders have learned to view their organisation's environment in a holistic way. This wide angle view is what the concept of school culture offers principals and other leaders. It gives them a broader framework for understanding difficult problems and complex relationships within the school. By deepening their understanding of school culture, these leaders are better equipped to shape the values, beliefs and attitudes necessary to promote a stable and nurturing learning environment (Deal and Peterson, 1990). The following section deals with school cultures and the role they play in the implementation of computer technology in their organisation.
School Culture

In this section school culture is first defined then related to school improvement and finally a
linkage will be made between school culture, school improvement and collegial or
collaborative culture.

Definitions

The field of education lacks a clear and consistent definition of school culture. The term has
been used synonymously with a variety of concepts, including “climate”, and “ethos” (Deal,
1993). Deal and Kennedy (1982) define culture as an abstraction that relates to the
unconscious side of the organisation. It consists partially of recurrent and predictable
behaviour patterns known to members of a community (Firestone and Corbett, 1988). Culture
is a learned process of expectations and norms, and it is an important factor relative to
improving schools. Core values of school culture are beliefs, assumptions, and perceptions
that school community members hold about their work. These factors together comprise a
theory of organisational acceptability that guides how people behave and operate
(Sergiovanni, 1996). To perform change in school, the underpinning of the system, values,
beliefs, perceptions, and assumptions must be altered to permit the system to shift in
orientation and thinking, allowing it to develop new paradigms. Personalities, attitudes,
emotions, and relationships all play a critical part. Research supports the effects of school
culture on student learning, as well as on teacher productivity and well being (Joyce et al,
1990). In a study that profiled effective and ineffective organisational cultures, Yin Cheong
Cheng (1993) found that stronger school cultures had better motivated teachers. In an
environment with stronger organisational ideology, shared participation, charismatic
leadership and intimacy, teachers experienced higher job satisfaction and increased
productivity.

As Deal and Peterson (1990) point out, expectations and norms of an organisation comprise
the dynamic social system of complex interrelationships and symbolic webs. Dubrin (1998),
Leithwood et al. (1999), and Angus (1989) all point to an effective school culture being one
which embraces change through a common vision brought about by inclusive decision
making with leaders emanating from the entire staff. Within the larger school culture, smaller
unique cultures will exist that can influence, accommodate, or resist change (Purkey and
Smith, 1983). The culture of a school or department, which conveys a set of norms, beliefs
and taken-for-granted ways of behaving to teachers, is in need of careful analysis (Busher,
1999). Idan (1998) argues convincingly that:

"culture should not be taken to be unitary, fixed and monolithic and normative.
Rather, any culture is continually being recreated in an ongoing process of
production and reproduction that itself is historically located." (p.5)

Purkey and Smith, (1983) claim that principals shape, facilitate, and foster the development of
norms, values, and beliefs. These elements intimately shape the school's culture, ethos, and
climate. A leader's job is to make conscious decisions that have an impact on school culture in
a way that makes that culture more amenable to change and more functional in its delivery of
services to students (Idan, 1998). It is within such a culture that change may be enhanced
successfully and school improvement achieved.

School Culture and School Improvement

Leithwood et al. (1999) report that conditions for school improvement include:

"a widely shared vision; a professional culture that encourages considerable
collaboration; strong norms of continuous professional growth; structures that allow
for frequent interaction and authentic participation; and policies and resources that
support professional learning initiatives" (p. 215).

Individual behaviour is significantly influenced by the culture of the organisation (Deal and
Kennedy, 1982). Studies have shown that better schools have a culture where teachers enjoy
work and help establish a disciplined environment (Hargreaves and Fullan, 1998). Where
teachers are respected for their professionalism, supported in their work, and given
responsibility for school planning, their culture reflects a shared belief that they are important
to the school. They believe they can make a change in student achievement, and they have a
positive attitude about the mission of the school. Fullan (2001) insists that:

" a teacher cannot sustain change if he or she is working in a negative school
culture" (p. 80)
Many schools today have adopted an organisational approach that relies on a strong culture to influence employees' direction. This approach has reduced differences in the status of organisational membership and placed a strong emphasis on participative decision-making. Sarason (1990) defends greater teacher participation in decision-making and explains that:

"when a process makes people feel that they have a voice in matters that affect them, they will have greater commitment to the overall enterprise and will take greater responsibility for what happens to the enterprise" (p. 61).

Research indicates that many common themes emerge in schools that have been successful at promoting change. These elements are collegiality, personal and professional growth, high expectations for students, discipline, a high level of commitment, and availability of resources. Fullan (1993) suggests that principals should aim to build collaborative cultures rather than charging in forcefully with heavy agendas for change. To build collaborative work cultures, principals must concentrate on fostering: vision building; norms of collegiality that respect individuality; norms of continuous improvement; problem-solving and conflict resolution strategies; lifelong teacher development that involves inquiry, reflective practice, collaboration, and technical skills; and restructuring initiatives (Hargreaves and Fullan, 1998; Leithwood et al, 1998). Fullan (1993) asserts that good principals should create coherent vision which specifies the particular values and beliefs that will guide policy and practice within the school. Ideally, principals do not create a vision independently and impose it on people; they develop a collaborative culture in which participants build a vision together. Unless principals put forth an extra effort to make that innovation meaningful to teachers, by relating it to an overall vision for the school and by constantly reinforcing that vision through frequent interactions with teachers, then the motivation to implement innovations will not last. The creation of a vision is not a static event, because the vision must change as culture changes. The principal who is able to adapt a vision to new challenges will be more successful in building strong school cultures (Senge, 1990).

While much was made of the visionary leadership of the principal in the school change process, more lasting change comes from a collaborative culture when teachers are actively involved in setting the vision (Fullan, 1992). Teachers should take an active role in any discussion of change in schools because they are most frequently involved in the implementation of reforms (Fullan, 1993). Troen and Boles (1993) stated,
“What is needed is a school culture in which classroom teachers are fully empowered partners in shaping policy, creating curriculum and managing budgets” (p. 27).

Research has shown that when teachers and principals work together in planning and implementing change, the chance for success is enhanced (Purkey and Smith, 1983; Sarason, 1990).

In effective schools, teachers value norms of collegiality and continuous growth and improvement (Little, 1993). Growth opportunities through professional development is one method for altering the culture of schools (Hopkins, 1994; Joyce and Showers, 1995). The next section therefore, considers professional development and turning schools into learning organisations in order to successfully enhance computer technology in teaching.

Professional Development

Fullan (1999) declares that school improvement happens:

"when a school develops a professional learning community that focuses on student work and changes teaching... In order to do that, you need certain kinds of skills, capacities, and relationships. Those are what professional development can contribute to... Any school that is trying to improve has to think of professional development as a cornerstone strategy." (Fullan, 1999, p. 23)

For professional development programmes to be successful, Putnam and Borko (1996) argue they should embody several key features of teacher learning programmes. These include an explicit focus on teacher learning and knowledge expansion, opportunities for teachers to examine their beliefs about teaching and learning and opportunities for teachers to construct their own knowledge in an environment that supports and encourages risk taking and reflection. While individual teachers can expand their knowledge and learn about technology, they need opportunities to develop and grow professional relationships with their peers to effect changes in the larger school culture.. As Putnam and Borko suggest:
"Teachers need to construct their complex new roles and ways of thinking about teaching practice within the context of supportive learning communities." (p. 16)

Main (1985) defines staff development as:

"the means by which a person cultivates those skills whose application will improve the efficiency and effectiveness with which the anticipated results of a particular organisational segment are achieved" (p. 34)

The concept of increased effectiveness as an ultimate outcome is found in other works. A major change in staff development of teachers is embodied in the DfEE document (1997) on the reform of teacher training in Great Britain dealing with the growing recognition that to perform effectively requires a commitment to the development of skills throughout working life. The report adds that investing in staff development is a powerful force for improved standards. Bowles (1999) perceives staff development as being a complicated process that is primarily about learning which is on-going, cumulative, interactive, occurs in different contexts, for different purposes, with different people. He claims that since organisations are constantly changing and organisations find it hard to respond to change except through the development of their individuals, ways should be found that enable staff to recognise the necessity of learning and developing.

Professional development and computer technology

Introducing computer technology into the school systems requires that schools become learning enterprises for teachers and for students (Chen, 1995). Effective staff development is required to maximise benefits that computer technology can bring not only in improving the teachers' technological skills but changing their teaching and learning styles. (Harrari, 1993; Hargreaves, 1994).

A number of major reports on the use of ICT in British schools have all emphasised the importance of staff development for successful implementation of IT in schools. The "Impact Report" commissioned by the DES in 1993 on primary children achievements concluded that the use of ICT-based work is primarily dependent on the individual teacher's initiatives. The teachers, therefore, felt they needed an on-going programme of in-service training, not only
on knowledge of software but rather on class organisation and management, teaching styles, technical issues. The McKinsey Report (1997) identified the urgent need for “improved training and support for teachers” (p.25), among the five main issues to be resolved for IT’s full educational promise to be realised. The report claims that:

“All almost everyone we interviewed highlighted this lack of training, …and therefore proficiency in the use of IT as one of the most important issues.” (p.27)

The “Stevenson Report” (1996) commissioned by Tony Blair reached very similar conclusions. It announced that the main elements in any new strategy of diffusing issues of ICT in schools should:

- “Increase the time given to ICT in both initial and in-service training
- Make computers available to teachers
- Create external networks for teachers to use and learn from each other
- Give special training and support to advisors and inspectors so they can provide better support for ICT.” (p.7-8)

The EDSI (Educational Departments Superhighways Initiative) Report, published by Scrimshaw in 1997, detected that staff development was seen as a crucial and central to the success of the integration of ICT in British schools (Scrimshaw, 1997).

In Israel, the current school reform effort is seeking to develop and create not only new conceptions of teaching, learning, and schooling, but also a wide variety of practices that support teacher learning (Peled, 1986; Harrari, 1993). These practices cut into some deeply held notions about staff development and in-service education that have long influenced both educators’ and the public’s views of teachers.

Although there is growing sophistication about the process of restructuring schools and the problems of changing school cultures (Lieberman 1995; Fullan 1991,1994; Hargreaves 1994), there is still widespread acceptance that staff learning takes place primarily as a set of
workshops, a conference, or a project with a long-term consultant (Chen, 1996). The conventional view of staff development as a transferable package of knowledge to be distributed to teachers is being radically re-thought. It carries not only a limited conception of teacher learning, but one grounded in a set of assumptions about teachers, teaching, and the process of change that does not match current research or practice (Grimmett and Neufield 1994). The conflicting assumptions, that teachers learn mainly through direct teaching, rather than by being involved in helping to define and shape the problems of practice, carry with them deep-rooted philosophical notions about learning, competence, and trust that are at the heart of professional development in this era (Darling-Hammond 1993; Hargreaves 1994). In the case of the adoption of computer technology in teaching, staff development often aims more than just to improve the teachers' computer skills (Harrari, 1993). Staff development aims at having an impact on the teaching approach and alters teaching techniques both in the computer environment and in the regular classroom.

In a study performed in the USA on teachers who participated in the ACOT project, teachers who received continuous training and continued to use computers, changed their teaching style to a student-centred classroom (Dwyer et al, 1991). These teachers became more innovative in the implementation of computer-based technologies into the instructional process and more comfortable in using computer-based technology in the classroom. They began to expect more from their students and were able to engage students in higher order learning objectives (Dwyer, et al, 1991).

"Teachers who had regular training, professional support and access to computer technology in their classrooms over several years time experienced significant changes in their instruction, but not until they had confronted deeply held beliefs about schooling" (Dwyer et al, 1991, p. 45).

Some of the positive reactions of teachers who integrated computer technology in their teaching have resulted from exploiting the potential of interactive technology, from changing teaching style, and from having greater feelings of self-worth (Chen, 1996). For more teachers to experience these positive reactions, schools must reinvent themselves as "learning organisations" (Senge, 1990).
Learning Organisations

Transforming schools into learning organisations, where people work together to solve problems collectively, is more than a question of inserting a new curriculum or a new programme; it involves thinking through how the content and processes of learning can be redefined in ways that engage students and teachers in the active pursuit of learning goals—a joining of experiential learning and content knowledge (Pedler et al, 1988).

Dubrin (1998) states that a learning organisation is:

"one that is skilled at creating, acquiring and transferring knowledge and at modifying behaviour to reflect new knowledge and insight" (p. 408).

Senge (1990) defines "learning organisations" as:

Organisations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free; and where people are continually learning how to learn together. (p. 3)

Leithwood et al. (1999) state that the main challenge for those developing a learning organisation:

"is to determine the organisational conditions that foster individual and collective learning and to build those conditions into the school" (p. 215).

The process of restructuring schools places demands on the whole organisation that makes it imperative that individuals redefine their work in relation to how the whole school works (Little, 1993). Teaching as telling, which has dominated pedagogy and the consequent organisation of schooling and the way teachers see their work, is being called into question as professional learning for teachers increasingly connects to this reconsidered view of schools.

According to Pedler et al (1988) a learning organisation is an organisation which both facilitates the learning of all its members and continuously transforms itself. Pedler et al (1988) took a great deal of effort to make the point that a learning organisation is more than
just one that engages in a great deal of training. The development of individual skill relates to, and indeed is a key part of the concept of the need for organisational learning. They actually state that a learning company is one in which learning and working is synonymous. They claim that in addition to having a climate in which individual members are encouraged to learn and to develop their full potential, it is in a continuous process of organisational transformation and it is this, which is the key component.

Lumby (1997) has difficulty in defining the term ‘learning organisation’ since:

"it has collected a multiplicity of definitions and there is no common understanding to what the term means." (Lumby, 1997, p.33)

Southworth (1994) is more specific about the school context and puts the emphasis on all staff learning with the principal as the “leading learner” (p. 53) who creates the right school culture. Not only does the learning organisation promote learning, but it creates a general involvement which provides a model of lifelong learning. To achieve it Lumby (1997) suggests that:

"establishing the capacity to learn is a central strategic task of those with the responsibility of managing people and involves looking at the whole range of circumstances which will support or impede this effectiveness.” (p. 37).

In spite of the unquestionable importance of the role played by the leading figure, the principal, there seems to be an agreement among researchers (Sammons et al., 1995) that there is a need for a participative approach rather than a hierarchical decision making structure, although it may be argued that:

"more autonomy increases motivation and the capacity to respond, but may lessen the incentives to communicate widely.” (Lumby, 1997, p. 38).

Establishing learning organisations is a complex task which requires careful planning and effective management (Goldberg and Richards, 1995). Fullan (1999) observes that:

"schools as learning communities in their inside and outside relations will not happen by chance. They require assertive planning, the depth and the likes of which we have rarely seen" (p. 80).
The issues to be considered are first how to place learning in the centre of all activities, second how to banish fear of learning by communicating trust, using upward appraisal and third to see strategic performance as an ongoing learning for the whole staff. (Sammons et al, 1994). To achieve these goals the appropriate leadership is necessary.

Fullan (1995) contends that it is more likely to bring about meaningful change if models of leadership are consistent with those inherent in the theory of schools as learning organisations. What often goes unrecognised is that among the biggest obstacles to the adoption of new pedagogy are the current beliefs about how people learn. One way to think about these "beliefs" has been described by Peter Senge. In The Fifth Discipline (1990) Senge describes these beliefs as mental models, invisible assumptions that determine how the world is viewed and how decisions are made. In education such "theories-in-use" not only govern how the students' ability to learn is viewed; they also impact the decisions that made about the most effective way to instruct them. The idea of a learning organisation:

"where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together" (p. 3)

inspires educators who struggle to plan and implement reform in their schools.

Leadership is the driving force in a learning organisation according Peter Senge (1990).

"In a learning organisation, leaders are designers, stewards, and teachers. They are responsible for building organisation where people continually expand their capabilities to understand complexity, clarify vision, and improve shared mental models, that is, they are responsible for learning." (p. 352)

Sergiovanni explains that "the sources of authority for leadership are embedded in shared ideas" (1996, p. 214), not in the power of position. Senge (quoted by O'Neil, 1995) adds that the principal's job is to create an environment in which the staff can learn continuously. Fullan (1994) states that having a vision is vital to becoming a learning organisation. It helps create the conditions in which some or all of the features of a learning company can be brought
about. Learning strategy, participative policy making, learning climate, self-development are only a few of the conditions which have to be in place and to be a part of the everyday operation and culture in the organisation. Learning and organisational theorists claim that people learn best through active involvement and by thinking about and articulating what they have learned (Goldberg and Richards, 1995; Sammons et al, 1995).

Processes, practices, and policies that are built on this view of learning are at the heart of a more expanded view of teacher development that encourages teachers to involve themselves as learners in much the same way as they propose their students do. The extent of the pedagogical practice of schools and some connections between teacher development and school development will be discussed in the next section.

**Learning styles and teaching methods**

As mentioned in an earlier section, teachers who wish to adopt computer technology in their teaching should get professional training which exposes them to learning situations similar to those their students function in. This expanded view of professional learning, of necessity, is both personal and professional, individual and collective, inquiry based and technical (Lieberman and Rosenholtz, 1997). While there are no definitive road maps that lead directly to how these dualities are negotiated, there is a growing body of evidence from some schools that have discovered the power and critical importance of professional development when viewed as an integral part of the life of the school (Lawson and Comber, 1999; Darling-Hammond, 1997). By studying such schools, a deeper understanding is achieved of how teachers acquire the experience that encourages them to grow and change in the context of school reform (Comber et al, 1998; Darling-Hammond, 1997; Lieberman 1995).

Kolb is one of the most influential researchers in the field of experiential learning. Kolb (1985) declares that:

"Learning is the process whereby knowledge is created through the transformation of experience" (p38).

His theory presents a way of structuring and sequencing the curriculum and indicates, in particular how a session, or a whole course, may be taught to improve student learning. It suggests that learning is cyclical, involving four stages, sometimes referred to as
sensing/feeling, watching/reflecting, thinking, and doing. Kolb refers to these four stages as: concrete experience (CE), reflective observation (RO), abstract conceptualisation (AC) and active experimentation (AE). They follow each other in a cycle. (See figure 2-3). The learning cycle thus provides feedback, which is the basis for new action and evaluation of the consequences of that action.

**Figure 2-3: Kolb’s Learning Cycle**
*In Jenkins, 1998, p.43*

- **Concrete Experience (CE):** Where the learner is actively experiencing an activity (e.g. a laboratory session, field class).
- **Reflective Observation (RO):** Where the learner is consciously reflecting back on that experience.
- **Abstract Conceptualisation (AC):** Where the learner is being presented with or trying to conceptualise a theory or model of what is (to be) observed.
- **Active Experimentation (AE):** Where the learner is trying to plan, how to test a model or theory, or plan for a forthcoming experience.

Another important feature of the theory is that the different stages are associated with distinct learning styles. Individuals differ in their preferred learning styles and recognising this is the first stage in raising students' awareness of the alternative approaches possible and helping them to become more flexible in meeting the varied demands of learning situations (Kolb, 1991). Teachers also need to recognise their own learning styles as a basis for the development of effective teaching and learning strategies. Learning may suffer where there is marked mismatch between the style of the learner and the approach of the teacher. Kolb (1984, p.63) identifies four learning styles each of which is associated with a different way of solving problems: divergers who view situations from many perspectives and rely heavily upon brainstorming and generation of ideas; assimilators who use inductive reasoning and have the ability to create theoretical models; convergers who rely heavily on hypothetical-deductive reasoning; and accommodators who carry out plans and experiments and adapt to immediate circumstances. Gardner’s (1993) theory of ‘multiple intelligences’, which may have evolved from Kolb’s theory, believes, like Kolb, that students learn best when they learn in the way best suited to them. He feels that by acknowledging that each learner has components of at least seven different intelligences, different pathways to learning, teachers can activate more of those pathways. He claims that by creating rich learning environments where
multiple intelligences are addressed simultaneously, learning is more effective. The introduction of IT into the classrooms is one of the ways that create such learning environments. The world around the school is becoming an integral part of the classroom (Gardner, 1993; Idan, 1998). Local issues, problems and resources are being integrated. Information from around the world, available to teachers and students via technology, serves as the framework within which local issues can be understood and examined, creating curriculum that allows students to understand global events in relation to the world in which they live (Gardner, 1999). Many curricular, pedagogical, and assessment approaches to student learning provide powerful professional learning for teachers, involving them in rethinking their role with students while expanding the way students interact with content and the problems of learning. Many instances of professional learning come about as a result of starting with meetings about subject matter content, pedagogical approaches, new means of assessment, or simply learning (Lieberman 1995). What makes the difference for teachers is that the content of the curriculum, the context of each classroom within the school, and the context of the school itself are all considered, with teacher participation central to any changes to be made in the functioning of the school (Fullan, 1994).

As learning theory and pedagogical models have changed, so have various approaches to professional development. The main reason that teachers participate in professional growth experiences is to benefit their students (Means 1994, p. 4). However, for the experience to be meaningful to the teacher, the content must not only be something he or she can take to his or her classroom, but it must also offer "intellectual stimulus ... from sources both in and outside of teaching" (NFIE, 1996, p. 57). The second vital point cited in the National Foundation for Improvement in Education study is that professional development must be "tailored to the context of the workplace and teachers' experience levels" (NFIE 1996, p. 57). The person teaching must be very familiar with school culture and the challenges of classroom management. Harris (1998) cites the work of Rogers which has shown that:

"each person's decision about whether to use a new tool regularly (in other words, to adopt it) is more dependent upon who shares the news of the tool than upon how well the tool might actually assist them" (Harris 1998, p. 12).

This relates not only to the experience of the facilitator, but also to the level of respect he or she has earned among colleagues.

In terms of format, short, one-time training is generally not effective if the goals involve
complexity or change. Longer term opportunities for growth and development spread over
time with ongoing support are most effective (Lieberman, 1995, Dede, 1998). There are a
number of models that can work well for longer-term engagement including mentorship,
action research, observation and feedback, involvement in an improvement process and small
group and individual inquiry (Dede, 1998).

Teacher involvement, inquiry and reflection are critical components of redesigning schools
and classrooms. Darling-Hammond and McLaughlin (1995) talk about professional
development as:

"a means of providing occasions for teachers to reflect critically in their practice and
to fashion new knowledge and beliefs about content, pedagogy, and learners" (1995,
p. 597).

Lieberman (1995) indicates the role of reflection as crucial especially as the nature of
professional development changes from direct teaching to more constructivist models which
ask teachers to examine their teaching and consider change (Lieberman, 1995, p. 593). The
NFIE Executive summary (1996) indicates that the most effective schools are those in which
teachers make the important decisions about their teaching and the life of the school as a
whole (Fullan, 1994; Lieberman, 1995).

As opportunities increase for professional learning that move away from the traditional in-
service mode toward long-term, continuous learning in the context of school and classroom
with the support of colleagues, the idea of professional development is taking on new
importance (Chen, 1996; Mor, 2001). For if teacher learning takes place within the context of
a professional community that is nurtured and developed from both inside and outside of
school, the effects may be not only an expanded conception of teacher development, but the
accomplishment of significant and lasting school change (Fullan, 1994).

Summary of Part 2

The second part of the Literature Review considered the school leadership and school culture
as influencing forces of change and its diffusion in the educational system. Successful
implementation of computer technology by teachers is mainly achieved in supportive and
collegial cultures created by transformational leadership (Fullan, 1991, 1993, 1994, 1999;
Hargreaves, 1994; Leithwood, 1994; Leithwood et al, 1999) It was indicated that education is in a constant state of change. In this context, research in this area supports the idea of change as a means for professional growth and revitalisation. Change is a multi-faceted and complex process. There are many different pieces to the puzzle that comprises the change process. The relationship between each of the different pieces plays an integral part in making up the whole and the direction of change. The importance of the role of school culture in the process of change is imperative as is the contribution of the school principal, change agents and opinion leaders.

However, once computer technology is first implemented the leaders of the process should ensure that practice is continually improved, knowledge is regularly developed and innovations incessantly brought into the system if change is to be materialised. Lifelong learning is the aim of many successful organisations and an effective staff development plan enabling it. However, traditional staff development is unlikely to suffice. Transforming the school into a learning organisation (Pedler et al, 1988; Leithwood, 1999; Lumby, 1997) may underpin the introduction of computer instruction in the institution.
Summary of Literature Review

The literature reviewed for this study opened with a general overview of the impact of the training for the integration of computers on the teachers' computer use in schools. It examined both contributions of the use of computer-based technology to the teaching and learning process and barriers to its effective use. It provided a wider view of educational technology in the school system thus enabling a better understanding of the research question:

Has the training teachers received influenced their use of computers in their instruction?

In terms of:
- teacher training and implementation;
- purposes of usage;
- teaching strategies.

Teacher training was discussed in the attempt to understanding its impact on the teachers in their use of technology education. The literature examined learning and teaching theories. Constructivist teaching and learning strategies were discussed as being suitable for a computer based learning environment (Von Glaserfed, 1996; Bruner, 1995; Fosnot, 1996; Murphy, 1997; Inge, 1997) and therefore should be adopted for teacher training purposes and computer class strategies. Designers, developers, and advocates of technology (Harrari, 1993; Peled, 1986) wished to achieve both widespread adoption and considerable change in practice, they believed that widespread use of computers in education was important yet what was the ultimate goal was change in teaching approaches, practices and beliefs (Fullan, 1994; Gooden 1996; Hargreaves, 1994; Marcinkiewicz. and Regstad, 1996).

To implement computer technology in schools there are major obstacles and barriers to overcome. This addressed the research question:
What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?

The section that addressed that topic provided an account of these obstacles and barriers. Becker (1994), Chen (1995) described obstacles common to teachers involved in the process such as fear of technology, lack of enthusiasm, lack of support, technical or administrative, lack of access and lack of time. Other barriers were often encountered as innovations were considered for adoption. Some of these included cost, scarcity of the equipment, inflexibility of the equipment, and lack of adequate understanding of the advantages of the innovation (Cuban, 1986; Lieberman and Rosenholtz, 1997; Loveless, 1996).

Determining the factors that may predict successful implementation of ICT in teaching was the next issue reviewed. It addressed the following research question:

Which of the following factors predict computer use in classroom instruction?
- attitudes of teachers toward computers in the classroom;
- continuous training of teachers in computer use – life long learning;
- teacher’s acceptance of change;
- age of teacher;
- grade level in which the teacher teaches

The literature on the attitudes and perceptions of teachers towards change in general and technology in particular was examined. Teachers’ beliefs played an important role in the performance (Borko and Putman, 1996; Fullan, 1994; Rosso et al, 1998) when adopting computer technology in their teaching. Acceptance of change and flexibility were very important issues required to enhance IT (Means et al, 1994; Dwyer et al, 1994; Chen, 1995). In addition to that, teachers should be willing to become life long learners (Schild, 1997; Fullan and Hargreaves, 1998; Rhodes and Cox, 1990).

The second section of the literature review addressed the following research question:
To what extent do school leadership and school culture influence the teachers’ incorporation of computers in their teaching?

In terms of:

- the principal as the leader of infusion of change;
- school as a learning organisation;
- support – leadership, professional, technical, environmental.

This part demonstrated how school leadership and school culture were an influencing element on the teacher’s incorporation of technology in their teaching. In order for change to occur leadership and school culture should create the appropriate environment and provide the suitable conditions (Fullan, 1993; Hord et al., 1987; Joyce et al., 1989; Leithwood, 1994) Achieving this goal involved the active participation and cooperation of all the involved parties, school management, school teachers and administrative staff and change had to be compatible with organisational culture, resources had to be available, and new changes had to be prioritised with existing initiatives (Peled, 1986; Harrari, 1993; Fullan 1991). Literature reviewed details how change and innovation were introduced to the organisation (Rogers, 1995). Staff development in educational organisations was another issue reviewed in this chapter. Teachers were expected to introduce innovations into their classroom and to do that successfully continuous training and support was necessary (Little, 1993, Darling-Hammond, 1993, 1997). To achieve this schools had to become efficient learning organisations (Lumby, 1997; Fullan, 1994; Leithwood, 1994) that had a clear vision (Pedler et al, 1988; Fullan and Hargreaves, 1998; Idan, 1997).

The issues discussed in the chapter and the interplay between the four factors, teachers, school leaders, school culture and training and staff development were illustrated in the following diagram (figure 2-4).
Figure 2-4: Integrating computers in teaching

- **TEACHERS**
  - Training
  - Flexibility
  - Attitude
  - Beliefs
  - Change agents

- **LEADERSHIP**
  - Transformational
  - Visionary
  - Collegial
  - Modeling

- **CULTURE**
  - Collegial
  - Supportive
  - Collaborative

- **INTEGRATING COMPUTER TECHNOLOGY IN TEACHING**

- **STAFF DEVELOPMENT**
  - Relevant
  - Constructivist
  - On-going
  - Collaborative
The main elements that determine a successful integration of computer technology in schools are the school leadership, the school culture, staff development and the teachers. These factors interact with and influence the others. When these interactions and impacts are harmonious, a successful integration of computer technology occurs.

The teachers, one of the four factors, had an essential impact on the process. Their acceptance of change, flexibility and beliefs played a central role in the performance (Borko and Putman, 1996; Lawson and Comber, 1999; Dwyer et al, 1994; Fullan, 1994; Rosso et al, 1998) when adopting computer technology in their teaching. The second factor, school leadership, was as important. The literature showed that, at the level of the institution, integration of computer technology was best accomplished where the school principals were committed to the idea of ICT (Lawson and Comber, 1999; Pedler et al, 1988; Fullan and Hargreaves, 1998; Idan, 1997) and their leadership was transformational. Such leadership enabled the creation of an appropriate school culture, the third factor, within which the teachers were encouraged to use computers and supported both technically and professionally to ease the process (Fullan, 1993; Hord et al., 1987; Joyce et al., 1989; Leithwood, 1994). Turning schools into learning organisations was one of the main goals of such collegial school cultures in which effective staff development, the fourth factor, played an important role in encouraging lifelong learning among the teaching staff (Lumby, 1997; Fullan, 1994; Leithwood, 1994).
CHAPTER 3: METHODOLOGY

Introduction

Having presented the main issues relating to the computer implementation, change management and staff development from the literature, it is now necessary to consider the research methods used to collect the empirical data. After providing a general framework of the research design, an overview of the main research methods used in this study will be discussed and justified. In the next section the specific issues raised in the design of the research instruments are identified in the context of the research questions which are restated below.

Research Questions:

1. Has the training teachers received influenced their use of computers in their instruction?
   In terms of:
   • teacher training and implementation;
   • purposes of usage;
   • teaching strategies.

2. To what extent do school leadership and school culture influence the teachers’ incorporation of computers in their teaching?
   In terms of:
   • the principal as the leader of infusion of change;
   • school as a learning organisation;
   • support – leadership, professional, technical, environmental

3. What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?

4. Which of the following factors predict computer use in classroom instruction?
   • attitudes of teachers toward computers in the classroom;
The primary purpose of this study is to investigate the use of computer-based technology by the ESL teachers that participated in one of the courses "Integrating Computers in the English Class" provided by the Ministry of Education in the Tel-Aviv District as part of the "Tomorrow 98" Reform. The study seeks to understand when, why and how teachers use computer-based technology. Understanding when, why and how computers are best used and the support needed to incorporate them into the curriculum could aid teachers in using them more effectively. The study investigates the extent of the influence of the training the teacher received on the actual implementation of technology and on the teaching methods used in a technological environment. An awareness of the limitations and constraints teachers face and the support they need in order to use computer-based technology might allow steps to be taken to overcome these difficulties and more useful training programmes to be developed. Educational management, school culture, the attitude and behaviour of school leadership, the spirit of the school culture, the approach of colleagues, all play some role in determining the success or failure of the individual teacher's use of technology in school. A better understanding of these influences on the teachers' use of computer-based technology in the classroom may lead to the development of a more constructive environment and may encourage the use of computers where they are found to be most effective. Other factors such as teachers' attitudes towards computers, the teachers' age, the grade level taught, readiness to undertake continuous training and life-long learning and the need for constant moral and professional support are also examined in this study.

The aim of the research investigation was to use a balance of methods to achieve a broad coverage of the research question areas. The development of the research instruments, therefore, attempted to cover the issue from the point of view of both breadth and in depth. In an effort to achieve this goal, a two-stage study was performed:
A. A questionnaire administered to all the teachers (167) who participated in the course “Integrating Computers in the ESL Classroom” organised by the Israeli Ministry of Education, Tel-Aviv District.

B. Five in-depth case studies of five teachers chosen from stage one – three teachers who integrate computers in their teaching and two teachers who do not.

The researcher has adopted a flexible approach to the gathering of the data, complementing a questionnaire with a more in-depth qualitative research approach. The combination of a postal questionnaire with case studies incorporating a set of qualitative tools – e-mail diaries, observations, interviews - provide the researcher with the opportunity of obtaining a large amount of quantitative data, as well as rich qualitative data.

The following sections provide an examination of this choice by providing an overview of the paradigms, approaches and tools used.

**Research Paradigms**

When designing research, a major consideration is whether it reflects the quantitative (positivist or normative) or qualitative (relativist or interpretive) paradigm, each of which can be subdivided into a wide range of variations. There are several ways in which research methods can be classified. A common method is to make the distinction between quantitative and qualitative research methods (Myers, 1997). In simplified terms, quantitative researchers assimilate facts and study the association between one set of gathered facts with another, while qualitative researchers are more interested in understanding individuals’ (or groups’) perceptions of their environment (Bell, 1993). Qualitative research methods are designed to aid researchers in understanding the social and cultural contexts within which subjects operate (Myers, 1997).

Cohen and Manion (1994) identify two major features of the normative paradigm. The first is that human behaviour is seen as essentially rule-governed, and the second is that the methods of natural science are adopted. The interpretive paradigm, on the other hand, seeks more of an understanding of the world of human experience and efforts are made to understand from within by resisting the form and structure of quantitative approaches.
Glaser and Strauss (1967) suggest that:

"there is a fundamental clash between the purposes and capacities of qualitative and quantitative methods or data. What clash there is concerns the primacy of emphasis on verification or generation of theory." (p. 17)

Cohen and Manion (1994) summarise these two approaches as two opposing conceptions of social reality, normative and interpretive. Table 3-1 lists some of these aspects.

<table>
<thead>
<tr>
<th><strong>Table 3-1: Research paradigms</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normative</strong></td>
</tr>
<tr>
<td>Society and social system</td>
</tr>
<tr>
<td>Medium or large scale research</td>
</tr>
<tr>
<td>Objective - statistical</td>
</tr>
<tr>
<td>Researcher is an ‘outsider’</td>
</tr>
<tr>
<td>Generalisations from the specific</td>
</tr>
<tr>
<td>Explaining behaviour and looking for causes</td>
</tr>
</tbody>
</table>

Based on Cohen and Manion, 1994, p. 39

The research of this paper tends to adopt elements from both columns in the table above since the mixed approach is used. This approach is discussed in further detail later on in this chapter. The normative, objectivist approach is largely linked to the positivist thinking, that a social reality exists and that it is possible, through empirical research, to establish sets of social facts. The interpretive, subjectivist approach may be exemplified by phenomenologists who believe that it is the subjective experience of the individual that is important and it is individual perception that gives meaning rather than there being an external objective meaning. In this approach:

"The principal concern is with an understanding of the way in which the individual creates, modifies and interprets the world in which he or she finds himself or herself." (Cohen and Manion, 1994, p. 8)
The assumptions and characteristics of qualitative research define the nature of the research process. A qualitative research design assumes a worldview in which "there are multiple realities - that the world is not an objective thing out there but a function of personal interaction and perception" (Merriam, 1988, p.17). These realities are dynamic and change over time. This view is important to research that is attempting to bring understanding to a process or event as perceived by the participants in that event.

The choice of research approach, emphasis and degree of compromise between the two paradigms reflects not only this philosophical starting point, but also the interests and skills of the researcher and the nature of the research questions explored.

The Mixed Approach

The researcher of this paper has adopted a mixed approach with a tendency towards relativism although a survey, a positivist tool, was used as part of the research. The study attempts to find answers to questions without setting a hypothesis as would be expected from a positivist approach. Possible answers to the research questions are investigated through a survey questionnaire sent to an entire population of ESL teachers who participated in the course "Integrating computers in the English Class". Statistics were used to analyse the data provided by the filled out questionnaires. No hypothesis has been defined in this study and these findings were a source through which the researcher was able to better understand the nature of behaviour and perceptions of the case study participants. The data collected from the case study research, which included interviews, observations and e-mail diaries, provided an additional illuminative perspective to the study.

Barbour, (1996) indicates that the two approaches are not compatible and that they should not be combined due to the fundamental conflict between the two paradigms in regard to the nature of knowledge, the relationship between inquirer and the object of inquiry, and the appropriate means of generating knowledge. In contrast, Yin, (1994) postulates that it is possible to integrate both approaches. These researchers present valid points on the following issues: many of the supposed incompatibilities are illusory (e.g., nature of reality); many specific assumptions can be widened and become common to both approaches (i.e., world is complex and stratified); the complexity of the many different factors influencing behaviour require such a multi-paradigm approach; both approaches emphasise scientific rigour and
critical analysis; both approaches have been used for years and both have contributed to the understanding of human behaviour; and most current researchers consider themselves equally balanced between the approaches. Finally, supporters of each paradigm agree that good studies include testing all evidence and achieving results that have significant implications.

Morgan's (1998) approach acknowledges the importance of the two different paradigms and recognises the importance of exploring differences in the pursuit of philosophical understanding. Morgan (1998) also acknowledges combining qualitative and quantitative methods without a clear understanding of these differences would indeed be a futile and risky business. However, Morgan (1998) contends that once a researcher had developed a clear framework for a research project, then the selection of methods (even mixed methods) is largely a technical task.

**Justification of the Mixed Approach**

The use of both survey and case study methods in this research tend to complement each other and provide the researcher with insights not achieved otherwise. The two approaches contribute to the research, and despite their advantages and disadvantages, the major disadvantages of each approach seem to be the strengths or the advantages of the other. Usually research using both approaches proceeds simultaneously and iteratively, as each method confronts new research tasks at which the other method is superior. The study of this paper is iterative in nature as illustrated by the sampling of the case study from the survey and the reference to the questionnaire during the interviews. The strengths of one method are used to enhance the performance of another method (Greene et al, 1989). For example, while qualitative research may have good validity, it has been critically questioned by quantitative researchers for problems of reliability and generalisability. In contrast, quantitative research has always been perceived as able to demonstrate reliability and generalisability of findings, but has been criticised by qualitative researchers on the validity (or interpretation) of outcomes. Carefully combining both qualitative and quantitative approaches, a mixed method research paradigm can theoretically achieve the strengths of both paradigms (that is, the whole is more than the two parts combined). The ultimate aim of this is to develop a valid (qualitative) study with demonstrated reliability and generalisability of (quantitative) findings. The issues of reliability, validity and generalisability will be discussed in more detail later in this chapter.
Research methods

The mixed approach, as described above, adopted for this study, required the use both survey and case study methods.

The survey

Surveys are very popular within educational research. According to Johnson (1994) surveys elicit “equivalent information from an identified population” (p.13). In this study, the information elicited was equivalent since a standard questionnaire was used. The identified population was all the in-service ESL teachers who participated in the course “Integrating Computers in the English Class”. Hoinville and Jowell(1978) argue that surveys should be regarded as:

“essentially a means by which we can document, analyse and interpret past and present attitudes and behaviour patterns. By exposing trends, they will certainly provide clues about the future, but they are only clues.” (p. 184)

Cohen and Manion (1994) highlight the nature of the survey approach when they state:

“Typically, surveys gather data at a particular point in time with the intention of describing the nature of the existing conditions, or identifying standards against which existing conditions can be compared, or determining the relationships that exist between existing events”. (p. 83)

Bryman (1989) is more focused and claims that:

“…survey research entails the collection of data on a number of units and usually at a single juncture of time, with a view to collecting systematically a body of
quantifiable data in respect of a number of variables which are then examined to
discern patterns of association.” (p. 104)

The survey approach in the case of this study collects data from the entire population of
teachers who had participated in the course “Integrating Computers in the English Class” in
the attempt to find out the extent and form of use of computers in their teaching. This may
suggest an evaluative study although the researcher had no such intention.

**Justification of choice**

The exhaustive scale survey of all the in-service ESL teachers in the Tel-Aviv district who
participated in one or more of the courses provided since the year 1994 till today represents a
significant addition to the very limited existing research in Israel on the integration of
computers in the educational system. The presentation of the findings may add a new
dimension to the research data available so far. Another issue to be considered is that of
generalisability. Quantitative research in general and the survey method in particular is
perceived as being able to demonstrate reliability and generalisability of findings (Greene et
al, 1989). This will be discussed in more detail on page 118.

The tool used for the survey was a posted questionnaire sent to the entire population of ESL
teachers who participated in the course “Integrating Computers in the English Class”. The aim
was to find answers to the research questions concerning their use of computers in their
teaching in terms of extent and form.

**The Questionnaire**

Questionnaires may be used within an institution where access to the researcher is possible,
or, in the case of the research instrument in this study, sent as a postal questionnaire created
by the researcher of this study in the aim to elicit information which may provide answers to
the research questions. Lavan (1985) points out that it is cheaper to conduct a postal
questionnaire than hiring interviewers to carry out the work. Johnson (1994) considers that
postal questionnaires are suitable for surveying “scattered specialist populations” (p.42),
which can be much more cost-effective than interviews.
Construction of Questionnaire for this study

The questionnaire prepared for this study was sent to the entire population of participants – all the ESL teachers who participated in the course "Integrating Computers in the English Class". This seemed to be the only way to getting to them since the course was held every year since 1994 and no follow-up sessions were organised for the graduates. The only way of contact was through mail. The list of participants with the addresses was provided by the secretary of the Computer Centre in the Tel-Aviv District where the course was held. Thirty nine of the addresses were inaccurate since the enveloped questionnaires were returned to the researcher unopened. No further attempt was made to locate the correct addresses since the return was very high (108) out of a potential of 128 and the process of locating was complicated.

Mailing

The mailing took place on the first week of March 2000. The mailed envelopes included the covering letter, the questionnaire and a stamped and addressed return envelope to simplify the mailing process. The covering letter introduced the purpose of the questionnaire, conveyed the importance of the study, reassured the respondents about confidentiality and encouraged their replies by explaining the reason for the choice of the participants. Since all the participants are familiar with the name of the researcher, no further introduction was required. The letter gave a specific date for return of the questionnaire and offered a digest of the findings on request. Summaries of the data analysis have already been sent to eighty-seven respondents who have requested it.

Length and design

There is a controversy concerning the appropriate length of the questionnaire. Johnson (1994) argues that it is unlikely to be effective as a research tool if a great deal of information is required from each respondent, and therefore postal enquiries need to be short as response falls off with lengthy questionnaires. Hoinville and Jowell (1977) believe that a specialist population may not react favourably to a short questionnaire which appears to trivialise the subject.

The questionnaire used for this study was eight pages (thirty questions) long. Seymour and Bradburn (1982), Bell (1993) and Lavan (1985) provide important advice for preparing the
questionnaire: ambiguity, imprecision and assumption should be avoided; simple language should be used; double, hypothetical, sensitive and leading questions should be avoided; bias in the design should be avoided; there should be a good layout with adequate spacing; analysis should be considered; there should be clear instructions for distribution and return. Seymour and Bradburn (1982) show how to determine information needed, phrase questions to minimize bias and distortion, obtain and use successful questions from existing questionnaires, control level of threat in questions, order questions to encourage response, select the best method of administration, adapt questions and format to method of administration, test and validate the completed questionnaire, and evaluate and review the questionnaire for improved results.

Efforts were made to ensure that the questionnaire was clear and attractive following the advice of Cohen and Manion (1994):

"The appearance of the questionnaire is vitally important. It must look easy and attractive." (P. 96)

An extensive use was made of boxes where tick responses could be placed (See Appendix B).

Following Robson's (1993) advice to cut down on the number of open-ended questions, one question, out of the thirty, was left open-ended while the others required mostly ticking boxes. The inclusion of the open-ended question was mainly for the purpose of acquiring some qualitative data from the entire population in the hope of it adding to the understanding of the process. According to Youngman's classification (1986, in Bell, 1993 p.77), the majority of the questions were of the list type. Respondents throughout the survey were given opportunities to provide their own categories, and this provided a richer variety of answers (See Appendix B). However, in all the 108 filled out questionnaires not once was this option exploited. This may be due to the relatively wide variety of categories and statements provided by the researcher.

Overall, the questionnaire was constructed in a way that was intended to be as clear as possible and to eliminate questions of ambiguity and obscure terminology. To this end the questionnaire was finally piloted with a small group of ESL teachers.
The Pilot

Since the population is a census – all the ESL teachers who participated in at least one course of “Integrating Computers in the English Classroom” – it was preferable not to reduce the population. Therefore the questionnaire was piloted on ten ESL in-service teachers who have participated in a similar course during their university studies (taught by the researcher) and who integrate computers in their teaching and therefore have not taken part in the study itself. A supplementary sheet on the questionnaire design was included, and this produced some valuable suggestions for the refining of the research instrument. Some minor changes in wording were made as a result of the pilot. The changes mainly involved the clarifying some of the terms used in the questionnaire.

Response rate

Non-response may be a problem, particularly with a postal questionnaire. Bell (1993) points out that:

“non-response is a problem because of the likelihood – repeatedly confirmed in practice – that the people who do not return questionnaires differ from those who do.” (p. 86)

However, in this case the response was high enough (108 responses from 167 posted questionnaires) to enable the researcher to disregard non-response.

The questionnaire was sent to 167 ESL teachers who participated in the course “Integrating Computers in the English Classroom”. One hundred and eight returned completed, and a further of 39 were returned without being completed due to faulty addresses. It must be pointed out that some of the addresses available to the researcher were six years old and it is possible that teachers have moved to new locations. The researcher’s attempt to study the returned envelopes in terms of year the participants attended the course failed due to administrative limitations. The list provided by the office was an alphabetic list of names of participants and their addresses with no indication of the year of participation in the course. Therefore it was not possible to say that the thirty nine were members of the “older” courses (the ones held in 1994 and 1995).
The number of responses, and the details in which many had completed their answers, indicated that they were really interested in the topic of the questionnaire and some returned questionnaires with additional information, notes of encouragement and requests for further information (mostly about the international PhD programme of University of Leicester).

In view of the high response rate on the one hand and the costly and time-consuming process of re-locating the non-respondents, it was decided not to undertake a follow-up exercise.

The choice of tools for collecting qualitative data for the case studies included semi-structured interviews, e-mail correspondence diaries and classroom observations. The survey research is one of the two approaches used in this study. The case study approach is the second.

**Case Study**

The case study is the second approach chosen for this study which, as Greene et al (1989) point out, is a good complementary combination. The case study is an examination of a specific phenomenon, in this case a specific process that teachers are experiencing when integrating computers into their teaching. The case study seeks holistic description and explanation (Merriam, 1988). The case study design is particularly well suited to situations where it is impossible to separate the phenomenon's variables from their context (Yin, 1994). It is the goal of the case study design to accurately describe and give voice to the informants being studied. The emphasis is on filtering meaning from a variety of data collection methods. A case study can be defined as:

"an enquiry which uses multiple sources of evidence. It investigates a contemporary phenomenon within its real life context, when the boundaries between phenomenon and context are not clearly evident." (Yin, 1994, p. 20)

The case study has even been presented as the prime strategy for developing educational theory which illuminates educational policy and enhances educational practice' (Bassey, 1999,
Case studies are the preferred research strategy when 'how', 'what' and 'why' questions are being asked, when the researcher has little control over the event or when the research is being carried out in a real life context (Yin, 1994).

"Case studies also allow a researcher to reveal the multiplicity of factors [which] have interacted to produce the unique character of the entity that is the subject of study." (p.82)

Case study research has many aspects. The purpose for the study, the size of the unit under study, the range of data gathering approaches used and the overarching methodological paradigm for the study all contribute differences. Case studies may involve description, explanation, evaluation and prediction (Thomas, 1998). Bassey (1999) defines a range of purposes for educational case studies that include theory-seeking and theory-testing case study, story-telling and picture drawing case study and evaluative case study. The study reported in this paper could be seen as a story telling and a picture drawing case study. The researcher attempts to draw the picture of the performance of the teachers who participated in one of the courses “Integrating Computers in the English Class” in their use of computer technology in their teaching. It tells the story of five teachers, their experiences, their difficulties, their achievements and perceptions of the use of computers in their instruction.

Just as in any approach, a number of advantages and disadvantages of the case study method may be detected. Bell (1993) sees its strengths and points out:

"The great strength of the case-study method is that it allows the researcher to concentrate on a specific instance or situation and to identify, or attempt to identify, the various interactive processes at work. These processes may remain hidden in a large-scale survey but may be crucial to the success or failure of systems or organisations.” (p. 8)

This advantage has served the researcher of this study since it allowed her to concentrate separately on each of the five case studies in the attempt to discover different perceptions and understandings to the variety of issues concerning the integration of computers into their teaching process.
A frequent criticism of case study methodology is that its dependence on a single case renders it incapable of providing a generalising conclusion. Yin (1993) presented Giddens' view that considered case methodology "microscopic" because it "lacked a sufficient number" of cases. Hamel (Hamel et al., 1993) and Yin (1994) forcefully argued that the relative size of the sample whether 2, 10, or 100 cases are used, does not transform a multiple case into a macroscopic study. The goal of the study should establish the parameters, and then should be applied to all research. In this way, even a single case could be considered acceptable, provided it met the established objective. Yin (1994) stated that general applicability results from the set of methodological qualities of the case, and the rigour with which the case is constructed. He detailed the procedures that would satisfy the required methodological rigour. Case study can be seen to satisfy the three tenets of the qualitative method: describing, understanding, and explaining (Yin, 1994). This seems to agree with the study performed for this paper. The researcher, by using a variety of research methods, aimed at understanding the process the ESL teachers had to undergo, explain it and describe it so that the insights would be then better understood by both policy makers, principals and teachers in the enhancement of computer technology in teaching.

Yin (1994) recommended the use of case-study protocol as part of a carefully designed research project that would include the following sections:

"Overview of the project (project objectives and case study issues); Field procedures (credentials and access to sites); Questions (specific questions that the investigator must keep in mind during data collection); Guide for the report" (Yin, 1994, p. 64)

The researcher, throughout the entire research, prepared detailed documentation in a diary format with plans, ideas, questions, guidelines, dates and random thoughts. This note taking enabled the writer to organise both her thoughts and activities.

Yin (1994) also refers to the study questions which are most likely to be "how" and "why" questions and their definition is the first task of the researcher. The study's propositions sometimes derive from the "how" and "why" questions, and are helpful in focusing the study's goals. Not all studies need to have propositions. An exploratory study, rather than having propositions, would have a stated purpose or criteria on which the success will be judged. The
unit of analysis defines what the case is. Linking the data to propositions and the criteria for interpreting the findings are the least developed aspects in case studies (Yin, 1994).

Yin notes that evidence for case studies may come from six sources: documents, archival records, interviews, direct observation, participant observation, and physical artifacts. It is important to keep in mind that not all sources are relevant for all case studies (Yin, 1994). The investigator should be capable of dealing with all of them, should it be necessary, but each case will present different opportunities for data collection. The data collected for the five case studies came mainly from semi-structured interviews, e-mail diaries and classroom observations.

**Justification of Choice**

Following the surveys of the ESL teachers, the results provided a starting point for the case studies. It was considered that the case study approach was effective because it enabled the researcher to tackle specific issues arising from the questionnaire to ask questions which covered a broader range of issues. The researcher was able to triangulate the results from the data in the survey with those from the case studies. Another aim was to find more specific responses to the main research questions which formed the basis for the case study process. It was hoped that the data would reflect points raised in the literature review and provide evidence for analysis. The purpose of the five case studies was to go into greater depth to examine the nature of and the opportunities for integration of computers in the teaching of English in the Israeli schools. The case studies aimed at revealing a variety of perceptions, attitudes and 'internal' factors which effect the integrating of computer technology in the teaching process.

Collecting the qualitative data for the case studies required the use of tools such as semi-structured interviews, e-mail correspondence diaries and classroom observations.

**Interviews**

The use of interviews as a data collection method within the case study approach is widely documented. Both Yin (1984) and Johnson (1994) recognise the use of interviews as valid data collection techniques.
"There would seem to be few aspects of social research where interviews are an entirely unsuitable research tool." (Johnson, 1994, p. 50)

She identifies three main types of interviews: structured, semi-structured and specialised (see Table 3-2). In the structured interviews social interaction is kept to a minimum and they are generally used in large-scale surveys with closed questions. The semi-structured interviews, adopted for this study, are more flexible and adapted to the interviewee. Their aim is to encourage the respondents without leading them. The specialised interviews are individually tailored for a particular role-holders or individuals and aim to acquire complementary information.

### Table 3-2: Interview types

<table>
<thead>
<tr>
<th>Structured</th>
<th>Semi-structured</th>
<th>Specialised</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Social interaction is kept to a minimum</td>
<td>• More flexible</td>
<td>• Individually tailored for particular role-holders or individuals</td>
</tr>
<tr>
<td>• Used in large-scale surveys with closed questions</td>
<td>• Adapted to the interviewee.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Aim is to encourage the respondents without leading them</td>
<td>• Aim to acquire complementary information</td>
</tr>
</tbody>
</table>

Based on Johnson, 1994, pp. 44-47

Structured interviews have been very successful for gathering quantities of information; semi-structured interviews are likely to be used in small-scale research, as is the case in this study, and specialised interviews are of greatest value in exploratory work or to obtain the views of a single 'expert'.

Despite the benefits of using interview techniques there are possible limitations caused by interviewer bias. Misdirected prompting, problems with question wording and assumptions that reciprocal understanding is in place can influence and possibly distort the data collected. In some case, the sources of bias are the characteristics of the researcher, the characteristics of the respondent, and the substantive content of the questions (Cohen and Manion, 1994). The
researcher of this study has tried to minimise the possible sources of bias, although she is acquainted with the teacher participants (they participated in at least one of her courses). On the side of the teacher participants, their inclination was to assist the researcher as best as they could which may have had some influence on their answers. In addition, both the questionnaires and the interview schedules were prepared with the intention of being free from bias. It is generally recognised that there are a number of sources of bias: those arising from the subject being researched; and those arising from the subject-researcher interaction (Cohen and Manion, 1994). This disadvantage of case study research being prone to subjectivity and bias may be found in this study although the researcher, being aware of this possibility, took extra measures to avoid bias (recording interviews, asking peers to reread notes and protocols in search for subjectivity). It should be pointed out that the researcher has topic bias. She has a bias for the integration of IT in education since she has been involved in the enhancement of the process into the Israeli school system for the last ten years. However, her research purpose aims to contribute to the advancement of her knowledge and that of her peers and superiors for the future educational development of her country in enhancing IT in schools. For that reason she has been careful to avoid subjective assessment.

Interviews for this study

Ten interviews were held altogether, five one hour interviews with the teacher participants, three twenty minute interviews with the school coordinators of Alef, Bet and Gimel High Schools (referred to as Leader 1, 2 and 3 respectively), two twenty minute interviews with the school principals of Sin and Taf High Schools (referred to as Principal 1 and 2 respectively). Permission to tape-record the interviews was requested and granted in all cases. All the interviews began with a discussion on the issue of ethics and confidentiality and a promise to present the interviewee with a full transcript of the interview before any further analysis to enable any alterations and deletions required. The transcripts were indeed sent to the ten interviewees. Very few and minor alterations were made to two of the transcripts.

All the interviews were held in the schools' staff rooms in a relatively quiet corner and since they were held either before or after school hours or during lessons (not during breaks) the atmosphere was always peaceful and pleasant. The two interviews with the principals were held in their offices. All ten interviews were efficient and courteous. The interviews were semi-structured in nature and although an interview schedule was used (see Appendix C) the interviews sometimes tended to lose their structure when the respondent gave detailed answers which very often referred to issues either previously discussed or not mentioned.
before and yet relevant for the research. The questions were mostly direct and the answers were mostly factual. The semi-structured interviews enabled probing where information was sparse and attentiveness to minor nuances such as changes of tone when enthusiasm was being expressed. The interviewer's difficulty was to remain remote and investigative during the interview and still reveal trust and empathy to the interviewees most of whom are well acquainted with the researcher.

Observations

Observation is an everyday activity but needs a form of structure to be effective as a research method for consistency and comparability. Anderson and Burns (1984) differentiate between structured and unstructured observation. Structured observation involves systematic recording of observations, although there are limitations identified by Anderson and Burns (1984) such as lack of confidence on the part of the observer, wrong perceptions of observers and inadequate definitions. Unstructured observation, the one selected for this study, may still be systematic, and has the advantages of recording behaviour as it occurs when it may not be easily verbalised, although it may not be economical in time.

Observations can be either participant or non-participant (Cohen and Manion, 19944). In a participant observation the researcher becomes immersed in a community for a long period of time and the relationships are more intimate and informal. The observations are usually written after the event and often depend on interpretation. Participant observations tend to be subjective, biased, impressionistic and lacking in quantifiable measurements. Non-participant observations, selected for the performance of this study, are external and covert. The researcher sits unobtrusively and records the observations without voicing an opinion or interfering in the event.

Observations for this study

The researcher of this study observed one lesson prepared by each of the user participants (a total of three observations). The teachers who agreed to participate in the case study research also agreed to the observation session. The observations were unstructured in nature with the researcher sitting in a corner following the events as they occurred and noting them in five-minute intervals. The researcher, as part of her job as a Computer Assisted Language Learning (CALL) Counselor, has participated actively in similar situations, helping and
advising the teachers in the computer rooms. This passive behaviour, required for the study, is very irregular and unnatural and therefore was very difficult to perform. Every once in a while the teachers turned to her for assistance and she had to refuse it. A detailed account is provided in Chapter 5 - The Case Studies.

The main reason for the observations was to examine the teaching strategies used in a computer environment lesson. Since one of the aims of the "Tomorrow 98" project and the course "Integrating Computers in the English Class" was to try to change the teaching techniques and adapting them to the new environment, the researcher wanted to witness whether such a change really occurred. Since the questionnaire also dealt with the issue of teaching techniques used both in the computer environment and the regular classroom, comparing the observation notes with the responses of the participant to those questions provided triangulation.

Diaries

The emergence of diary keeping as a distinctive research genre in the social sciences is a recent development in spite of a tendency to dismiss diaries as impressionistic or their survey use as 'crude' empiricism (Galloway and Morison, 2000).

"'Diary' is a generic term covering all forms of self-report or memoir, but distinctions have been drawn between logs, diaries and journals." (Galloway and Morison, 2000, p.1 referring to Holly, 1984)

Johnson (1994) defines commissioned diaries as:

"records which an investigator asks an informant to compile and produce to assist in the research enquiry." (p.64)

Hodder, (1994) sees diaries as:
"a form of mute evidence... which unlike the spoken word, endures physically and thus can be separated across space and time from its author, producer or user." (p. 393)

Diary keepers may be researchers or research participants, as is the case in this study. The participants are often requested to record their activities and attitudes. These accounts provide data about phenomena not otherwise accessible to the researcher. The context and design of the diaries are important so that they suit the context and the ways in which diary data are expected to articulate with data from other sources. In case-study research, these documents can stand alongside first-hand collection of data through observation and interviews (Galloway and Morison, 2000).

E-mail diaries for this study

In the case of this study the participants' diaries were a collection of e-mail messages, almost a cross between diary and interview, which was a means of communication between the researcher and the participants. These "e-mail diaries" documented the process of the lesson planning which the user teachers went through. The diaries were kept for the period of two weeks required to plan the lesson in the computer room which was then observed by the researcher.

The researcher failed to detect the terminology 'e-mail diaries' in the literature, however, since the participants all use e-mail it was a convenient means of both communication and documentation. After the purpose of the process was verbally explained by phone, the researcher sent the first message providing the participants with a guided outline of the requested assignment (See Appendix D). It was a three-stage correspondence. In the first stage the teacher was requested to decide on the topic, teaching goals, activities. They had to discuss the process of their decision-making and whether it was reached alone or with the collaboration of others. The second stage involved the preparation of the lesson itself. The third stage was preparing the lesson plan. The participants were provided with a short form (See Appendix D) which they had to fill out with the information about the lesson.

Although the format of the messages to the participants was identical, the correspondence was loose in style and format. The three participants were involved in an active
correspondence with the researcher in addition to the three stage messages. These additional messages asked for additional information, advice and ideas. The researcher tried not to become involved in the actual lesson building. The process will be further described in Chapter 5 – The Case Studies. By the end of two weeks of almost daily correspondence, the three lessons and their plans were ready.

The Process and Purpose of the Case Study

The data collection period was from September 3rd to October 20th 2000 and consisted of e-mail correspondence and visits to the participants' schools both for classroom observations and audio-taped interviews. Additional contact with staff, mainly computer coordinators, was arranged by mutual agreement to enable the completion of the interviews in the projected time-scale. The collection of documentation and general enquiries involved further contact by telephone and e-mail.

School principals were contacted to gain permission to observe teachers teaching in a technology environment. Field notes were taken focusing on the teachers' instructional methods and activities during the class period. Observations of the participants teaching a technology lesson were valuable for several reasons. The data illustrated the teaching strategies and methods used to incorporate the technology into the lesson. They also describe the settings in which the teachers were working. Information about the teacher's access to technology and support is also an important factor in their perception of using technology in the classroom. The researcher observed each teacher's setting to determine the accuracy of the self-reporting about the environment the teacher was working in.

The teachers were encouraged to keep an e-mail diary as part of the dialogue with the researcher throughout the period of the research. This correspondence served as a journal of the teachers' questions, feelings, processes and perceptions as they worked on planning their computer-based lessons. Telephone calls were made occasionally to follow up on e-mail that wasn't answered, to schedule observations and interviews, and to keep in contact with the teachers. Finally, collecting the lesson plans that the participating user teachers developed was helpful in seeing how they envisioned classroom lessons working out. These lessons provided clues on the design and how the teacher planned to use the technology. The lesson plans
identified the teaching strategies and instructional methods the teacher intended to use when teaching a lesson with computers.

The main aim was to find more specific responses to the main research questions which formed the basis for the case study process. It was hoped that the results would reflect or explain points, raised in the literature review and provide evidence for analysis and triangulation. The purpose of the five case studies was to go into greater depth to examine the nature of and the opportunities for integration of computers in the teaching of English in Israeli schools.

Stages of the Case Study Investigations

User Teachers 1, 2 and 3

- Letter of permission from the school principal to perform the research in the school
- An explanation phone conversation with the teachers concerning the process of the case study - setting email date limits, classroom observation dates and interview dates
- First e-mail contact followed by a correspondence which serves as a diary of the planning process of the computer-based lesson.
- Observation of the lessons held in the computer rooms
- Interviews with the teachers
- Interviews with the computer coordinators

Non-User Teachers 4 and 5

- Letter of permission from the school principal to perform the research in the school
- An explanation phone conversation with the teachers concerning the process of the case study – setting interview dates
- Interviews with the teachers
- Interviews with the school principals
User teachers 1, 2 and 3

Once the population was sampled and the different dates were set, the e-mail correspondence with User 1, 2 and 3 began.

Schedule for the Case Study Meetings

The following is the schedule for the case study meetings arranged with the five teachers.

Table 3-3: Meeting Schedule with Teachers

<table>
<thead>
<tr>
<th>Research Tool</th>
<th>User 1</th>
<th>User 2</th>
<th>User 3</th>
<th>Non-User 1</th>
<th>Non-User 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mail diaries</td>
<td>From August 20th – September 10th</td>
<td>Not relevant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom observations</td>
<td>September 12th 8.00-9.30</td>
<td>September 14th 12.00-13.30</td>
<td>September 17th 10.00-11.30</td>
<td>Not relevant</td>
<td></td>
</tr>
</tbody>
</table>

For further in-depth investigation and triangulation of the questionnaire findings, the researcher made appointments with leading figures within the schools. This was more complicated since the researcher was not personally acquainted with the people involved. In the user schools (Alef, Bet and Gimel High Schools) appointments for interviews were made with the computer coordinators. In the case of the non-user schools (Shin and Taf High Schools) no coordinators were detected. The researcher, therefore, insisted on interviewing the principal to try and find out the attitudes to computers in the lessons. This was eventually achieved after a number of phone calls. The limitation of 20 minutes was agreed upon. The schedule for the leading figures is as follow:
Table 3-4: Meeting Schedule with Leading Figures

<table>
<thead>
<tr>
<th></th>
<th>Alef High School</th>
<th>Bet High School</th>
<th>Gimel High School</th>
<th>Shin High School</th>
<th>Taf High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview with computer</td>
<td>September 27th</td>
<td>September 24th</td>
<td>October 3rd</td>
<td>October 3rd</td>
<td>October 4th</td>
</tr>
<tr>
<td>coordinator</td>
<td>14.00-14.20</td>
<td>15.00-15.20</td>
<td>7.30-7.50</td>
<td>10.00-10.20</td>
<td>7.00-7.20</td>
</tr>
<tr>
<td>Interview with school</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>principal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sampling

Decision on the sample is an important stage and the method varies according to what assumptions are made about the situation being analysed. In this study, the whole population of ESL teachers (167) who participated in the course “Integrating Computers in the ESL Class” was sent the questionnaire. The participants for the five case studies were then sampled from this group.

Survey

Anderson (1990) suggests that the questionnaire is a method for obtaining information which is not available from any other source. He differentiates between the survey and census which attempts to collect data from all members of the group, as is the case of this study. The idea of sample is a feature of the survey method which:

"...is intended to study a population by selecting and studying a sample of people who belong to it." (p.195)

Case Studies

In sampling the population for case study research Cohen and Manion (1994) point out that:
Researchers endeavour therefore to collect information from a smaller group or subset of the population in such a way that the knowledge gained is representative of the total population under study." (p. 87)

It is normal to start with a view of the total population and work down to the sample. In the case of this study, the total population was 108 teachers who participated in the survey. There are two broad methods of sampling: probability and non-probability. The probability samples are such that the probability of selection of each respondent is known and therefore the data collected from each respondent is more generalisable and is considered more reliable. The non-probability sample is selected at random from the large population in a variety of methods. Convenience sampling is an example in which the subjects are chosen for the convenience of the researcher which is clearly open to bias, since the researcher can sample to satisfy his/her hypothesis. In quota sampling the subjects are chosen for convenience within a quota for that group. The homogeneous groups are chosen to represent groups within the large population and the quota is supposed to preserve the proportions within the wide population. Purposive sampling is an example where the subjects are handpicked to suit the researcher's idea of their typicality within the population (Cohen and Manion, 1994).

The researcher used purposive and convenience sampling for this study. The five teachers were chosen from among the teachers who participated in the survey and agreed to take part in the case study. Since the main issue in the questionnaire was whether the teachers integrated computers in their teaching, Question 7 (See Appendix B) deals with computer usage in the classroom. In this question teachers were asked to state whether they use computers in their instruction. Frequencies statistics show that 71 per cent (N=76) of the teachers who answered this survey use computers in their instruction, and 29 per cent (N=32) of the teachers do not use computers for instruction purposes (total number of teachers is 108). This finding determined the grouping of the case studies in a similar proportion – three teachers who use computers in their teaching and two teachers who do not. All the participants belong to the group of teachers who participated in a course "Integrating Computers in the English Classroom". Another important point to emphasise is that as part of the questionnaire, the participants were requested to tick their willingness to participate in the case studies. The relatively high percentage of willing teachers (45 teachers) enabled the writer of this paper to further characterise the case study population. The researcher was interested in a relatively homogeneous age group (30-50), teachers with more than eight years of teaching experience and more than ten years to retirement and who taught in Junior High schools.
The main objective for this sampling procedure was the wish to keep a balanced representation of the total participant audience (108 teachers) rather than choosing randomly. The following table (Table 3-5) summarises the participants' characteristics as mentioned above.

Table 3-5: Case Studies Participants' Characteristics

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Years of experience</th>
<th>Name of school</th>
</tr>
</thead>
<tbody>
<tr>
<td>User 1</td>
<td>31-40</td>
<td>12</td>
<td>Alef High School</td>
</tr>
<tr>
<td>User 2</td>
<td>31-40</td>
<td>14</td>
<td>Bet High School</td>
</tr>
<tr>
<td>User 3</td>
<td>41-50</td>
<td>19</td>
<td>Gimel High School</td>
</tr>
<tr>
<td>Non-user 1</td>
<td>31-40</td>
<td>9</td>
<td>Shin High School</td>
</tr>
<tr>
<td>Non-user 2</td>
<td>31-40</td>
<td>13</td>
<td>Taf High School</td>
</tr>
</tbody>
</table>

Access and Ethical Considerations

The researcher secured all necessary approval for the research study from the Ministry of Education, Tel-Aviv District. Participants volunteered to participate and had the right to withdraw from the study at any time. The identity of all participants is protected and pseudonyms are used in this report to protect confidentiality. Teachers signed an appropriate informed consent form to participate in the study (see Appendix A).

The five teachers who agreed to participate in the case study research were approached by telephone, explaining the nature of the research, the tools used by the researcher for the case studies, the requirements and extent of involvement on their part. It was made clear that their participation is strictly confidential and no names would be mentioned in the paper. User teachers 1, 2 and 3 were informed about the need to participate in an e-mail correspondence with the researcher dealing with the process of planning and preparing a computer-based lesson. Appointments were also made for the classroom observations of the planned lessons. Dates for the interviews were postponed till after the observed lessons. Dealing with Teachers 4 and 5 was much simpler since only interview dates were set. Since all five teachers volunteered to participate in the questionnaires, and since they are all familiar with the
researcher (they participated in her course “Integrating Computers in the English Classroom”), there were no problems in arranging the meetings.

Once the teachers were selected, permission to access the schools was requested from the Ministry of Education, Tel-Aviv District. A permission form was filled out and a description of the research, the research questions and the questionnaire and interview schedules were attached. A written permission to perform research in the Tel-Aviv district schools was granted. The principals of the five schools involved were then approached and once the written permission, giving the researcher access to observations in the school settings, was presented to them they added their signature thus completing this phase. At the conclusion of the study, each participant received a copy of the final summary of the research project.

Data Analysis and Presentation

The process of data analysis in the qualitative design involves taking the data apart and then reconstructing it to identify what is to be learned and the patterns that might reside within the data. In case study research, Yin (1994) discusses searching the data for "patterns" in the case which may explain or identify causal links in the data base. The analysis of the data is a partially concurrent process with the collection (Tesch, 1990). Data collection and analysis inform or drive each other. The result of the analysis is some type of higher-level synthesis of the information (Tesch, 1990). Beginning codes were generated from the research questions, and evaluated for fit as the data were analysed.

In the study described in this paper two types of data analysis were performed, the largely quantitative analysis based on the returned questionnaires and the five case studies which provided qualitative data.

The Survey Questionnaire Analysis

All the data was coded and analysed using SPSS software obtaining frequencies and counts where appropriate. Due to the format of the questionnaire, the number of responses varied depending on the question. The participants were asked to answer all the questions up to number seven which asked whether they used computers in their instruction. The participants who replied ‘no’ were requested to disregard parts two, three, four and five and move directly
to parts six, seven and eight. The number of participants who filled in the questionnaire \((N)\) varies and is therefore pointed out in each occasion. The \(N\) is 108 in parts one, six, seven and eight. The \(N\) is 76 in parts two, three, four and five (See Chapter 4 for further detail).

Further analysis of the frequencies was undertaken under the basis of one factor – users versus non-users of computers in their teaching. This interrogation of the data allowed comparisons and relationships to be established. In the one open-ended question all the teachers (users and non-users) were asked to write in 20 to 30 words, what they think and feel about teaching with computers. The responses were grouped according to themes (see Chapter 4 for further details).

**The Case Study Analysis**

In developing an approach to analysing the qualitative data, Robson's (1993) advice was followed by looking at analysis:

"as mainly concerned with data reduction...and focuses on ways of displaying data to assist in drawing conclusions." (p. 370)

Miles and Huberman (1994) consider three stages in qualitative analysis: data reduction, data display, and conclusion drawing and verification (p.11). They suggest that data reduction is a form of analysis that “sharpens, sorts, focuses, discards, and organises data in such a way that ‘final’ conclusions can be drawn and verified” (p.11). The data is most commonly displayed in the form of extended text but can be in the form of “matrices, graphs, charts and networks” (p.11) The process of conclusion drawing and verification may begin lightly, with vague conclusions being drawn, but as the processes of qualitative analysis continue, the conclusions will be tested for “their plausibility, their sturdiness, their ‘confirmability’ – that is their validity” (p.11)

To reduce the data collected and display it in a way to assist in drawing conclusions, content analysis of the transcripts and manuscripts was carried out. Initially it was necessary to design suitable coding categories as defined by Robson (1993):
“A code is a symbol applied to a group of words to classify or categorise them. They are typically related to the research questions, concepts and themes.” (p. 385)

The data coding was organised to define patterns or themes in the transcriptions of the interviews, observations, and e-mail responses following the guidelines provided by Strauss (1987).

“Try to discover genuine categories and give them a name. Relate those categories as specifically and variably as possible to the context in which they occur. Relate categories to each other; construct sub-categories where appropriate. Always do it on the basis of specific data, underlying or highlighting each occurrence.” (p. 81)

This process involved reading transcriptions to get a sense of the whole, identifying descriptors or codes, clustering or grouping categories of data together according to the codes, and recoding data if necessary. According to Miles and Huberman (1994) codes should relate to one another in coherent, study-important ways and provide a governing structure for the analysis.

Coding categories on acquiring skills training, its impact on implementation, teaching strategies, planning, lesson design, access to computers were used to analyse the first research question which dealt with the influence of IT teacher training on the classroom performance. For the second research question which concentrated on the role leadership and school culture plays in successful implementation of IT in schools, the coding categories included school principal, support issues, leadership, change, management, culture. Coding categories on time issues, anxieties, technical problems, obstacles, troubleshooting and support issues referred to the third research question which investigated the limitations and obstacles teachers encountered in their attempts to incorporate computers in their teaching. The fourth question which tried to detect factors that predict computer use in instruction made use of coding categories such as lifelong learning, age and retirement issues, flexibility to change, grade level. Twenty-two coding sub categories were identified and were grouped into four major categories based on the four research questions of the study: training and implementation; leadership and school culture; barriers and obstacles; predictive factors.

The data was read and re-read in a search for patterns in the statements. Miles and Huberman (1994) assume that:
"through continuous reading of the source material and through vigilance over one’s presuppositions, one can reach the ‘Lebenswelt’ of the informant, capturing the ‘essence’ of an account...This approach does not lead to covering laws, but rather to a ‘practical understanding’ of meanings and actions." (p. 8)

Where the same statement was made by a number of interviewees, this was noted and then the process of further filtering the responses consisted of matching similar themes and linking them together in a continuous prose. This process allowed for a synthesis of the evidence which formed the basis of the continuous prose which was organised under each question heading. Although the number of interviews was relatively small, the quantity of data accumulated was large and provided some initial difficulties in the handling of material since the general approach was to look for themes and similarities in the data. Although the process in itself was time consuming, it made the comparison and grouping of responses easier to accomplish.

In this study the data analysis included the consideration of data collected from different sources and research tools. Three cases studies involved diaries, observations and interviews with the teacher participants and the computer coordinators in their schools. The other two case studies involved interviews with the participating teachers and the principals of their schools. The data was subdivided and basically followed the process suggested by Miles and Huberman (1994). An emphasis was placed in the detection of similarities. The data was displayed in the form of extended text which was organised to form patterns and themes established through data reduction. Conclusion forming and verification surfaced from this process.

Validity, Reliability, Generalisability and Triangulation

Validity and reliability

As in all research, consideration must be given to construct validity, internal validity, external validity, and reliability (Yin, 1994). He suggested using multiple sources of evidence as the way to ensure construct validity. The current study used multiple sources of evidence; survey instruments, interviews, observations and e-mail correspondence. Yin (1994) provided the assertion that external validity could be achieved from theoretical relationships, and from
these generalisations could be made. It is the development of a formal case study protocol that provides the reliability that is required of all research.

The issue of reliability relates to the suitability of the research instrument. If a research tool is consistent and stable it is said to be reliable (Moser and Kalton, 1989). Thus:

"a scale or test is reliable to the extent that repeated measurements made by it under constant conditions will give the same result." (p.353).

The concept of validity refers to the data and accounts for the ability of the instrument to measure what it is meant to measure. Robson (1993) claims that:

"validity is concerned with whether the findings are 'really' about what they appear to be about. Are any relationships established in the findings 'true', or due to the effect of something else?" (p. 66).

The analysis of the findings indicates that the questionnaire was consistent and stable in terms of response. The findings measure the main issues concerned and enable the construction of appropriate answers to the research questions (See Chapter 4 for further details). Bush, (1999) points out that:

"Large-scale surveys also encourage researchers to believe that findings will be both reliable and valid." (p. 4)

Transcribing interviews from audiotape, as was the case in this study, reduced the threat to valid description. Researcher bias is the main threat to valid interpretation. Such bias is defined by Cohen and Manion (1994) as:

"...a systematic or persistent tendency to make errors in the same direction, that is, to overstate or understate the 'true value' of an attribute." (p. 281).

They propose that a practical way of achieving greater validity is to minimise the amount of bias by paying attention to the attitudes and opinions of the interviewed participants, by reducing the tendency to seek answers that support the researcher's preconceived notions, and
by limiting the misunderstanding of what is being said. Careful formulation of the questions is yet another means of reducing bias (Cohen and Manion 1994). Respondent checks (Stake, 1995) provide verification for the accuracy of the information transcribed and interpreted in the research study attempting to control for researcher bias. Informants were given the opportunity to review and edit the information representing their perspectives to verify its accuracy.

**Generalisability**

The issue of generalisation has appeared in the literature with regularity. It is a frequent criticism of case study research that the results are not widely applicable in real life. Yin (1994) in particular refuted that criticism by presenting a well constructed explanation of the difference between analytic generalisation and statistical generalisation. He stated that in analytic generalisation, previously developed theory was used as a template against which to compare the empirical results of the case study.

The inappropriate manner of generalising assumes that some sample of cases has been drawn from a larger universe of cases. Thus the incorrect terminology such as "small sample" arises, as though a single-case study were a single respondent. Stake (1995) argued for another approach centred on a more intuitive, empirically grounded generalisation. He termed it "naturalistic" generalisation. His argument was based on the harmonious relationship between the reader's experiences and the case study itself. He expected that the data generated by case studies would often resonate experientially with a broad cross section of readers, thereby facilitating a greater understanding of the phenomenon.

It is the wish of the researcher that generalisability will be possible to some extent. The fact that the questionnaire was sent to the whole population of ESL teachers who participated in the course “Integrating Computers in the English Class” and that there was a high response rate, strengthens the case for generalisability from the findings. Robson (1993) states that generalisability may be shown either by carrying out further study, or by:

“...persuading that it is reasonable for the results to generalise, with arguments that the group studied... is representative.” (p.72)
Findings that relate in this study to ESL teachers in the Tel-Aviv District may be generalised to relate to other disciplinary teachers in other districts who have participated in a similar training course. Schools have been computerised in many parts of Israel and the problems, obstacles, needs and experiences of the teachers in the Tel-Aviv District may apply to a much wider population.

Several different techniques were employed as verification strategies for this qualitative case study. Internal validity and reliability issues were addressed in the research study design and process. External validity or the ability to generalise is more problematic in qualitative research; the conclusions are based on the analysis of the case studied and not on a population. Maxwell (1996) identifies threats to the validity of three types of understanding - description, interpretation, and theory - in a qualitative research study.

**Triangulation**

Case study is known as a triangulated research strategy. Stake (1995) stated that the protocols that are used to ensure accuracy and alternative explanations are called triangulation. The need for triangulation arises from the ethical need to confirm the validity of the processes. In case studies, this could be done by using multiple sources of data (Yin, 1994). The problem in case studies is to establish meaning rather than location. Denzin (1984) identified four types of triangulation: Data source triangulation, when the researcher looks for the data to remain the same in different contexts; Investigator triangulation, when several investigators examine the same phenomenon; Theory triangulation, when investigators with different viewpoints interpret the same results; and Methodological triangulation, when one approach is followed by another, to increase confidence in the interpretation. The Data source triangulation is the one sought for in this study. The variety of sources for data collection provides triangulation in the data (Merriam, 1988; Miles and Huberman, 1994). The data for this study were obtained through a variety of methods that each offered a different avenue for the teachers to express their perceptions of integrating technology into their instruction. E-mail correspondence with the informants was collected and coded. The teachers' thoughts were gathered through an interview process, classroom instruction was observed, and the teacher's home computer work environment was also checked. Reactivity to the researcher is a threat to the validity. Semi-structured, open-ended interview questions would help reduce the amount of reactivity in an interview setting where what the informant says is always a function of the interviewer and the interview situation (Maxwell, 1996). Follow-up questions or probes were
occasionally e-mailed to the informants following an interview to clarify meaning or explore a new question as a result of the transcription process.

It is not the goal of a qualitative case study to be able to make generalisations from the case, but rather to offer understanding or insights about the case. A rich description of the case allows readers to make decisions regarding transferability of the research (Merriam, 1988). This places the decision of transferability on the reader and not the researcher.

Issues of reliability are addressed through using five subjects or cases in this study and looking for replication in the descriptions of the informants. The use of the interview and observation protocols provides consistency in the same procedures being used for each case (Yin, 1993). Comparisons with the survey and existing literature will also provide a check for consistency or replication of the findings.

Conclusion

A wealth of data for this study was collected through the combination of a large scale survey (109 participants) and in-depth investigation of five case studies which involved interviews, observations and e-mail correspondence. The good response rate of the questionnaires provides a contextual framework to which to set qualitative data. In addition to that the interview and observation data provides detail to supplement and triangulate the quantitative elements of the survey and this is further strengthened by the qualitative data produced by the open-ended question (question 21) of the questionnaire.

The next chapter provides an account and analysis of the findings of the survey questionnaire followed by the case studies.
CHAPTER 4: FINDINGS OF THE SURVEY

The following chapter is the analysis of the findings of the survey questionnaire sent to one hundred and sixty-seven ESL teachers who participated in at least one 112-hour course provided by the Ministry of Education, “Integrating Computers in the English Lesson”. Thirty-nine unopened envelopes were returned due to a wrong address. The reason for this is likely to be that some of the addresses available to the researcher are up to six years old. One hundred and eight completed questionnaires were returned. This is a high response (63 per cent) as in real terms it is 108 out of 167 questionnaires. This impressive response rate may be the result of the researcher’s personal acquaintance with most of the participants (she was the teacher in most of the courses), and in many of the questionnaires personal remarks, congratulations and encouraging notes were added. The results were coded and analysed using SPSS software. It should be noted that the writer of this thesis used the services of another person with knowledge of statistical analysis to run the analyses and advise her on appropriate statistical procedures.

The questionnaire has eight parts and asks thirty questions.

Part I: Training and Professional Development (questions 1-6)
Part II: Computer-Based Instruction (questions 7-12)
Part III: Support (question 13)
Part IV: Possible Barriers (question 14)
Part V: Access to Computers (question 15)
Part VI: Using Computers in Your School (question 15i)
Part VII: Attitude Towards Teaching with Computers (questions 16-21)
Part VIII: Demographics (questions 22-30)

The Questionnaire can be found in Appendix B.

The participants were asked to answer all the questions up to number seven which asked whether they used computers in their instruction. The participants who replied ‘no’ to the question were requested to disregard parts two, three, four and five and move directly to parts six, seven and eight. The number of participants who filled in the questionnaire (N) varies and is therefore indicated in each occasion. The N is 108 in parts one, six, seven and eight. The N is 76 in parts two, three, four and five.
The findings of the survey will be presented as responses to the main research questions:

**Research Questions:**

1. **Has the training teachers received influenced their use of computers in their instruction?**
   
   In terms of:
   
   • teacher training and implementation;
   • purposes of usage;
   • teaching strategies.

2. **To what extent do school leadership and school culture influence the teachers’ incorporation of computers in their teaching?**
   
   In terms of:
   
   • the principal as the leader of infusion of change;
   • school as a learning organisation;
   • support – leadership, professional, technical, environmental

3. **What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?**

4. **Which of the following factors predict computer use in classroom instruction?**
   
   • attitudes of teachers toward computers in the classroom;
   • continuous training of teachers in computer use – life long learning;
   • teacher’s acceptance of change;
   • age of teacher;
   • grade level in which the teacher teaches.
Has the training teachers received influenced their use of computers in their instruction?

Since all the participants attended at least one of the courses “Integrating Computers in the English Class”, one of the factors the researcher wished to study was its influence on the teachers’ implementation of IT in the classroom. Question 7 deals with computer usage in the classroom. In this question teachers were asked to state whether they use computers in their instruction. Frequency statistics show that 71 per cent (N=76) of the teachers who answered this survey use computers in their instruction, and 29 per cent (N= 32) of the teachers do not use computers for instruction purposes (total number of teachers is 108). This division of the teachers’ population into users versus non-users of computers for instruction will guide most of the statistical analysis when dealing with the stated research question. For example, it is most important to separate responses about limitations, support, and school culture effects on using computers with reference to these two groups, they are likely to differ in their attitudes towards computers, support needs, obstacles. However, it should be pointed out that some non-users use computers for their personal needs, for preparing class material (e.g. worksheets), for class management.

Teachers’ training and implementation

Question 6 deals with teachers’ impressions concerning their training experience in the course “Integrating Computers in the English Class” and its influence on their instruction. Table 4-1 shows the percentage of teachers who marked each statement as being true for them.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Per cent</th>
<th>N (108)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taught me how to implement computers into my curriculum</td>
<td>93</td>
<td>99</td>
</tr>
<tr>
<td>Taught me to competently operate computers</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>Been based on hands-on experience</td>
<td>83</td>
<td>88</td>
</tr>
<tr>
<td>Been for self-improvement</td>
<td>76</td>
<td>81</td>
</tr>
<tr>
<td>Improved my teaching capabilities</td>
<td>74</td>
<td>78</td>
</tr>
<tr>
<td>Taught me how to evaluate software/hardware for instruction</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td>Promoted my career</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>Changed my teaching style</td>
<td>30</td>
<td>32</td>
</tr>
<tr>
<td>Changed my understanding of being a teacher</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>Been a waste of time</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
As shown in table 4-1 most teachers feel that training taught them how to implement computers into their curriculum (93 per cent) and taught them to competently operate computers (87 per cent). Seventy-four per cent of the participants claim that the course has improved their teaching capabilities. Only two per cent felt training was a waste of time. This proves a positive attitude towards the course and an overall satisfaction both of content and form. The DFEE document (1997) on the reform of teacher training in Great Britain deals with the growing recognition that to perform effectively requires a commitment to the development of skills throughout working life. Peled (1986) and Harrari (1993) both emphasised the importance of relevant training as a dominant condition for successful integration of technology in teaching.

Question 3 deals with the implementation of teacher’s training material in instruction. Table 4-2 shows the percentage of teachers who marked ‘yes’ for each statement.

Table 4-2: Teachers who marked ‘yes’ for implementation statements

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Per cent</th>
<th>N (108)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have implemented what I have learned in the course</td>
<td>80</td>
<td>86</td>
</tr>
<tr>
<td>I prepare my own material for computer use</td>
<td>80</td>
<td>86</td>
</tr>
<tr>
<td>I use materials prepared in the course</td>
<td>63</td>
<td>68</td>
</tr>
<tr>
<td>I have adopted teaching techniques used in the course</td>
<td>59</td>
<td>64</td>
</tr>
<tr>
<td>I team with my colleagues to prepare materials</td>
<td>45</td>
<td>48</td>
</tr>
<tr>
<td>I have altered my teaching methods as a result of using computers</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>The course has changed my perception of my profession</td>
<td>32</td>
<td>35</td>
</tr>
<tr>
<td>I have never used anything from the course</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>No one in my school uses computers</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>I will never make any use of contents provided in the course</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

As shown in table 4-2 most teachers (80 per cent) claim that they have implemented what they have learned in the course, and they prepare their own material for computer use as well. It is important to point out that sixty four teachers (59 per cent) have adopted teaching techniques used in the course, forty two teachers (39 per cent) admit to have altered their teaching methods as a result of using computers and thirty five teachers (32 per cent) claim that the course has changed their perception of their profession. Katz and Ophir (1996) stress the need for changes “in thinking, knowing, ...and ways of doing and being a teacher.”(p.219). This, however, still leaves a majority who has not yet changed their teaching methods. This is similar to the conclusion reached by some researchers that the teachers who use computers in their teaching very often refuse to transform instruction methods to suit the new environment (Eisenberg, 1996; Levin and Riffel, 1997; Fullan, 1992). These findings are particularly
relevant due to the fact that one of the main aims of introducing ICT into the Israeli educational system is to change teaching methods and strategies (Peled, 1986; Harrari, 1993; Chen, 1996) and one of the aims of the course was to achieve this change. Very few teachers (12 per cent) never make any use of the contents provided in the course. Kershaw (1996) names them “laggards” who will probably never attempt using computers in their teaching.

It may be noticed that in Table 4-1, 30 per cent of the participants admit to have changed their teaching styles whereas in Table 4-2 39 per cent claim that they have altered their teaching methods. This difference may arise from the terminology of “teaching style” and “teaching methods”. Teachers may find it easier to admit to changing methods rather than style.

Table 4-3 compares the users versus the non-users with regards to their implementation of the course material. It is noteworthy that fourteen teachers, who do not use computers in their classes, use materials prepared in the course. Only three teachers have never used anything from the course and one teacher never will. They are “laggards” according to Kershaw (1996). It is also interesting to note that 39 per cent of the non-users implement what they have learnt in the course without integrating computers in their classrooms. This helps to explain the claim mentioned above that the non-users make use of computers although they do not physically teach with them.

Table 4-3: Implementation divided by group

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Users who said yes % (n)</th>
<th>Non-users who said yes % (n)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have implemented what I have learned in the course</td>
<td>97 (74)</td>
<td>39 (12)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>I have adopted teaching techniques used in the course</td>
<td>76 (58)</td>
<td>19 (6)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>I use materials prepared in the course</td>
<td>71 (54)</td>
<td>45 (14)</td>
<td>P&lt;.05</td>
</tr>
<tr>
<td>I prepare my own material for computer use</td>
<td>96 (73)</td>
<td>42 (13)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>I team with my colleagues to prepare materials</td>
<td>57 (43)</td>
<td>16 (5)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>I have never used anything from the course</td>
<td>4 (3)</td>
<td>32 (10)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>I have altered my teaching methods as a result of using computers</td>
<td>46 (35)</td>
<td>23 (7)</td>
<td>P&lt;.05</td>
</tr>
<tr>
<td>I will never make any use of contents provided in the course</td>
<td>1 (1)</td>
<td>7 (2)</td>
<td>N.S</td>
</tr>
<tr>
<td>The course has changed my perception of my profession</td>
<td>38 (29)</td>
<td>19 (6)</td>
<td>P&lt;.05</td>
</tr>
<tr>
<td>No one in my school uses computers</td>
<td>3 (2)</td>
<td>16 (5)</td>
<td>P&lt;.05</td>
</tr>
</tbody>
</table>
Another issue to consider is that of statistical significance. Then chi-square scores were calculated in order to see if users have different attitudes than non-users. Chi-square is a test used with frequency data and requires that the data be classified according to categories. The chi-square test shows a significant difference between users and non-users in all the items except "I will never make any use of contents provided in the course".

Two more questions (question 2 and 8) in the survey deal with usage of technology and training. Question 2 asks the teachers to mark the topics that they have learned in the course. Table 4-4 shows percentages of teachers who marked ‘yes’ to the following topics.

Table 4-4: Percentage of teachers who marked yes for areas of training

<table>
<thead>
<tr>
<th>Areas of training</th>
<th>Percent</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer operation basics (Windows, Windows 95)</td>
<td>94</td>
<td>101</td>
</tr>
<tr>
<td>Word processing</td>
<td>92</td>
<td>99</td>
</tr>
<tr>
<td>Lesson planning</td>
<td>83</td>
<td>90</td>
</tr>
<tr>
<td>Presentation software (Power point)</td>
<td>80</td>
<td>86</td>
</tr>
<tr>
<td>Internet</td>
<td>78</td>
<td>84</td>
</tr>
<tr>
<td>Preparation of worksheets</td>
<td>78</td>
<td>84</td>
</tr>
<tr>
<td>Curriculum integration</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>Teaching techniques</td>
<td>60</td>
<td>64</td>
</tr>
<tr>
<td>Data base management (Access, Dbase, etc.)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Spreadsheets (Excel Lotus, etc.)</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Most teachers received training in computer operation basics (94 per cent) and word processing (92 per cent). Fewer teachers (78 per cent) say that they have received Internet training. That could be the result of year the course was given. The Internet was only integrated into the course after 1996. It is important to note that teachers mention other topics such as lesson planning (83 per cent), curriculum integration (60 per cent) and teaching techniques (60 per cent). Learning to prepare worksheets (78 per cent) may explain the fact that although 71 per cent of the teachers use computers in their instruction (question 7) there are seven teachers (6 per cent) who are non-users and yet prepare their worksheets using the computer applications.

Question 8 asked the teachers to mark how often they use different kinds of applications in their instruction. It is important to compare question 2 and question 8, in order to see how training may influence usage in instruction. In question 8 the teachers received a list of seven applications. In each application teachers were asked to mark how often they use it in their instruction. Teachers had six options for answer: never, once or twice a year, monthly,
weekly, daily, application is not available. For data analysis purposes, daily and weekly were regarded as frequently, monthly and once or twice a year were viewed as rarely, never and not available were analysed separately. Table 4-5 shows data analysis results. The N is 76 for this question.

Table 4-5: Percentage of teachers who frequently, rarely or never use the following applications.

<table>
<thead>
<tr>
<th>Application</th>
<th>% use frequently (N)</th>
<th>% use rarely (N)</th>
<th>Never use (N)</th>
<th>Not available (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSWord</td>
<td>90 (67)</td>
<td>7 (5)</td>
<td>3 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Internet</td>
<td>82 (61)</td>
<td>8 (6)</td>
<td>1 (1)</td>
<td>9 (7)</td>
</tr>
<tr>
<td>E-mail</td>
<td>73 (53)</td>
<td>10 (7)</td>
<td>4 (3)</td>
<td>13 (10)</td>
</tr>
<tr>
<td>MSExcel</td>
<td>7 (5)</td>
<td>30 (21)</td>
<td>49 (34)</td>
<td>14 (9)</td>
</tr>
<tr>
<td>Drill/practice programmes, tutorials</td>
<td>21 (14)</td>
<td>32 (21)</td>
<td>24 (16)</td>
<td>22 (15)</td>
</tr>
<tr>
<td>MSPowerPoint</td>
<td>19 (14)</td>
<td>71 (52)</td>
<td>7 (5)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Graphical applications</td>
<td>12 (9)</td>
<td>44 (31)</td>
<td>34 (24)</td>
<td>10 (7)</td>
</tr>
</tbody>
</table>

As shown in table above, the most frequently used computer applications are MSWord. 97 per cent of teachers use it and it is available in all schools, and the Internet 90 per cent of teachers use it, and it is available in 91 per cent of schools. These are probably the most practical teaching tools ESL teachers need to enhance foreign language learning (Kiato, 1995). It is interesting to note that 90 per cent of the teachers use the Internet although only 78 per cent of teachers marked earlier that they have not received any kind of training in the Internet usage. It may be concluded that general computer training was sufficient for self-learning. Another interesting finding concerns Excel usage. Only three per cent of the teachers marked that they received training in Excel but 30 per cent use it (rarely, but use), and 49 per cent never use it. It is important to say the Excel is available in most schools (86 per cent), but still is not used. It may be true for ESL teachers in particular (unlike mathematics and science teachers) since it is not an essential application for language teaching. Another interesting issue is that most schools have all regular MS applications but only 78 per cent of schools have relevant drill or practice programmes. And even if they do have them 56 per cent rarely or never use them. This may be due to the fact that the participants of the survey are all ESL teachers and using the open tools (word processors, Internet) is convenient and available. Another reason may be the fact that the writer of this research who has been in charge of the course since 1992 has encouraged the usage of open tools rather than drill and practice programmes.
Purposes of usage

Question 9 deals with the purposes for which students use computers in the class. Table 4-6 shows the percentage of teachers who marked ‘yes’ to the following purposes. The (N) for this analysis is 76 since only teachers who use computers in their teaching were required to answer it.

Table 4-6: Purpose of using computers in classes

<table>
<thead>
<tr>
<th>Purposes</th>
<th>Per cent</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>To create visual presentations</td>
<td>83</td>
<td>63</td>
</tr>
<tr>
<td>To collect data</td>
<td>78</td>
<td>59</td>
</tr>
<tr>
<td>To organise and store information</td>
<td>76</td>
<td>58</td>
</tr>
<tr>
<td>To plan, draft, proofread, revise and publish written text</td>
<td>74</td>
<td>56</td>
</tr>
<tr>
<td>To support individualised learning</td>
<td>66</td>
<td>50</td>
</tr>
<tr>
<td>To communicate information as the result of investigations</td>
<td>54</td>
<td>41</td>
</tr>
<tr>
<td>To manipulate/analyse/interpret data</td>
<td>34</td>
<td>26</td>
</tr>
<tr>
<td>To create visual displays of data/information</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>To create graphics or visuals of non-data products</td>
<td>25</td>
<td>19</td>
</tr>
</tbody>
</table>

As shown in table 4-6 computers are mostly used to create visual presentations (83 per cent), collect data (78 per cent), organise and store information (76 per cent), and plan, draft, proofread, revise and publish written text (74 per cent). The most rarely used aspects of computer usage are to create graphics or visuals of non-data products (30 per cent), and create visual displays of data/information (25 per cent). This may be the consequence of the subject matter taught, such as ESL. Creating visual presentations is very often used in the English lesson as a means to encourage oral practice. For example, learners are asked to prepare a speech on a certain topic using a slide show as reinforcement. Preparing the slide show helps them organise the form and pattern of their speech (Kitao, 1995). The extensive usage of reading and writing skills in the computer rooms may also be due to the fact that language learning is more often concerned with written texts rather than graphics and visual data.

Teaching strategies

Question 10 deals with teaching strategies that are used in the computer room. For each strategy teachers were asked to mark how often they use it: 1=hardly ever, 2=sometimes, 3=very often. Table 4-7 shows percentage of teachers who marked ‘sometimes’ or ‘very often’ to the following teaching strategies. The (N) for this analysis is 76 since only teachers who use computers in their teaching were required to answer it.
Table 4-7: Use of strategies in the computerised classroom.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>% Marked sometimes (N)</th>
<th>% Marked very often (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>My choice of teaching topics is relevant to my students’ interests.</td>
<td>28 (21)</td>
<td>72 (54)</td>
</tr>
<tr>
<td>My lessons provide the learner with choice</td>
<td>30 (22)</td>
<td>70 (52)</td>
</tr>
<tr>
<td>My students work in teams</td>
<td>34 (26)</td>
<td>66 (50)</td>
</tr>
<tr>
<td>I engage my students in projects</td>
<td>52 (39)</td>
<td>47 (35)</td>
</tr>
<tr>
<td>I demonstrate the task before asking the students to perform it.</td>
<td>56 (42)</td>
<td>40 (30)</td>
</tr>
<tr>
<td>My students do research work</td>
<td>68 (51)</td>
<td>25 (19)</td>
</tr>
<tr>
<td>I adopt computer room teaching strategies in my regular classroom teaching.</td>
<td>74 (55)</td>
<td>16 (12)</td>
</tr>
<tr>
<td>I have teaching strategies that I use only in the computer room.</td>
<td>79 (60)</td>
<td>7 (5)</td>
</tr>
<tr>
<td>I use textbooks in my computer lessons.</td>
<td>51 (39)</td>
<td>3 (2)</td>
</tr>
</tbody>
</table>

As shown in table 4-7, the most frequently used learning strategies are teaching topics relevant to the students' interests, provide the learner with choice, work in teams. The least frequently used methods are textbook usage and teaching strategies that are used only in the computer room. In addition, the teachers were asked to mark three strategies they prefer to use in the computer room and three strategies they prefer to use in their regular classes. Findings were analysed in several ways. First a list was computed of the preferred strategies (first, second and third place) for each environment (computer and regular) separately. Results are shown in table 4-8.

Table 4-8: Strategies used in computer versus regular environments:

<table>
<thead>
<tr>
<th>First</th>
<th>Computer room</th>
<th>Regular classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work in teams</td>
<td>59 (42)</td>
<td>63 (47)</td>
</tr>
<tr>
<td>Second</td>
<td>Student choice</td>
<td>Students choice</td>
</tr>
<tr>
<td>Engage in projects</td>
<td>29 (20)</td>
<td>26 (16)</td>
</tr>
</tbody>
</table>

As shown in table 4-8 the strategy used in computer classes has a very clear hierarchy. In the first place stands teamwork with a clear advantage (59 per cent) over other options. For example, only 15 per cent of the teachers chose projects, which was the next most popular first place. The second place in computer classes has less definite results. Although choice is the most frequent in the second place with 26 per cent and the second most popular second choice is teamwork again with 22 per cent. The third place is given to project work - 29 per cent of the teachers marked it in the third place and the next most popular third place is student choice with 27 per cent. As for regular classes, the hierarchy is less clear. Although
first place is very clear (63 per cent for teamwork and next is projects with only 8 per cent, the most common answer for the second place is students choice (27 per cent) followed by teamwork (22 per cent) and textbook usage (20 per cent). The most common answer for the third place is again student choice (26 per cent) following by textbook usage (19 per cent) and projects (17 per cent). The results concerning strategies most often used in the regular classes are not as clear as the hierarchy of strategy usage in the computerised classes. Hence a second analysis was performed, in which frequencies of all three places were summed in order to find one scale which presents the strategies used most often in the computer rooms compared to regular classrooms. Results are shown in table 4-9.

Table 4-9: Scale of the strategies used most often in the computer rooms compared to regular classrooms.

<table>
<thead>
<tr>
<th></th>
<th>Computer rooms</th>
<th>% of teachers (N)</th>
<th>Regular classrooms</th>
<th>% of teachers (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Team work</td>
<td>32 (67)</td>
<td>Team work</td>
<td>32 (67)</td>
</tr>
<tr>
<td>Second</td>
<td>Projects</td>
<td>21 (44)</td>
<td>Student choice</td>
<td>20 (41)</td>
</tr>
<tr>
<td>Third</td>
<td>Student choice</td>
<td>20 (43)</td>
<td>Textbook</td>
<td>16 (33)</td>
</tr>
<tr>
<td>Fourth</td>
<td>Relevant topics</td>
<td>10 (21)</td>
<td>Projects</td>
<td>13 (28)</td>
</tr>
<tr>
<td>Fifth</td>
<td>Demonstrations</td>
<td>9 (19)</td>
<td>Relevant topics</td>
<td>11 (22)</td>
</tr>
<tr>
<td>Sixth</td>
<td>Research work</td>
<td>8 (18)</td>
<td>Demonstration</td>
<td>4 (10)</td>
</tr>
<tr>
<td>Seventh</td>
<td>Textbook</td>
<td>0 (0)</td>
<td>Research work</td>
<td>4 (8)</td>
</tr>
<tr>
<td>Sum</td>
<td></td>
<td>100 (212)</td>
<td></td>
<td>100 (209)</td>
</tr>
</tbody>
</table>

Table 4-9 shows clearly the difference in strategy use between the computerised and the regular classes. Although teamwork is first in both environments, other strategy usages are different. A very dominant difference is the usage of textbooks. Textbooks are not used at all in computer classes but are quite high in the strategy hierarchy in regular classes. Other differences are noted in projects, which is second in computer classes but fourth in regular classes. There is less difference in the lower strategies in the hierarchy. Both computer and regular classes use demonstrations and research work infrequently. This differentiation between computer rooms and regular classrooms is supported by Means et al (1993) who sees computers as part of a macro type process aimed at improving educational outcomes by transforming teaching methods. According to Inge (1996), Phillips (1997), Bruner (1995) and Crawford (1999) the constructivist approach (discussed in Chapter 2) is suitable for a computer technology environment and teachers find it easier to adopt constructive teaching techniques in such an environment. These techniques are later adapted, in some cases, to regular classroom environment.
In their answers to the open-ended question (Question 21) some of the user teachers referred to the effect computer integration had on their teaching methods.

"Computers have changed the way I teach."

"I believe that I am a better teacher since I started teaching in the computer room."

The extra time and effort involved in the planning, preparation and implementation of computer based lessons are mostly compensated for by self satisfaction (Shahar and Sharan, 1998; Hargreaves, 1994; Hargreaves and Fullan, 1998). Fullan (1991) stresses that change often causes "improved ...satisfaction on the part of teachers": (p.48). The ImpaCT2 research (Becta, 2001) conducted in 60 UK schools reports that many teachers, particularly in secondary schools, commented on how ICT changes the teaching process and particularly the role of the teacher, who can take on a more "facilitatory role" (p.13).

To what extent do school leadership and school culture influence the teachers' incorporation of computers in their teaching?

The second research question concentrates on the environment within which the teachers operate and its influence on the successful integration of computer technology in their instruction.

The principal - the leader of infusion of change

Several statements in different questions (question 15i, statements d+f, question 13 statement b+f) that deal with principal's behaviour and influence were checked for frequencies. (Table 4-10, Table 4-11, Table 4-12, Table 4-13)

Table 4-10: Our principal uses a computer in his/her office (N=108).

<table>
<thead>
<tr>
<th></th>
<th>Frequency (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>15 (14%)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>66 (62%)</td>
</tr>
<tr>
<td>Always</td>
<td>25 (24%)</td>
</tr>
</tbody>
</table>
Table 4-11: Our principal encourages computer use among teachers (N=108)

<table>
<thead>
<tr>
<th>Frequency (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
</tr>
<tr>
<td>11 (10%)</td>
</tr>
<tr>
<td>Sometimes</td>
</tr>
<tr>
<td>27 (26%)</td>
</tr>
<tr>
<td>Always</td>
</tr>
<tr>
<td>67 (64%)</td>
</tr>
</tbody>
</table>

Table 4-12: Our school principal shows his appreciation of my computer instruction (N=73)

<table>
<thead>
<tr>
<th>Frequency (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
</tr>
<tr>
<td>2 (3%)</td>
</tr>
<tr>
<td>Sometimes</td>
</tr>
<tr>
<td>11 (15%)</td>
</tr>
<tr>
<td>Always</td>
</tr>
<tr>
<td>59 (82%)</td>
</tr>
</tbody>
</table>

Table 4-13: Our principal is supportive of computer instruction (N=73).

<table>
<thead>
<tr>
<th>Frequency (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
</tr>
<tr>
<td>3 (4%)</td>
</tr>
<tr>
<td>Sometimes</td>
</tr>
<tr>
<td>19 (26%)</td>
</tr>
<tr>
<td>Always</td>
</tr>
<tr>
<td>50 (70%)</td>
</tr>
</tbody>
</table>

It is evident that the majority of the teachers are aware of the positive attitude of their principal towards their use of computers and his/her influence on their work. According to Table 4-11, 64 per cent of the teachers admitted that their principal encouraged them in their computer usage. Table 4-13 shows that 70 per cent of the user participants felt that their principal was supportive. Principals showed their appreciation of the teachers’ computer instruction in 82 per cent of the cases. Table 4-10 indicates that the majority of the principals (62 per cent) sometimes use computers in their office which does not seem to influence teachers’ computer use to a great extent.

These numbers were then computed into one variable which represents an average of the four statements. Reliability analysis was performed in order to check internal consistency of the component items. Reliability analysis (Cronbach Alpha) shows a reliability score of 0.64. This is a good reliability score for only four item scale. Then a T-test was performed in order to see whether there is a difference between those teachers who use computers to those who do not in terms of principal’s influence. The results are clear. Principals who themselves use computers, principals who openly encourage teachers who integrate them in their teaching, principals who show their appreciation and support, often determine the use of computers (T(103)=-6.69, P<.01). Results are in the table 4-14 below. The findings from the ImpaCT2 research (Becta, 2001) conducted in UK schools, report that:
"a positive effect occurs where headteachers are enthusiastic and visionary about ICT, and can be creative with funds, resources and expertise. Teachers report a positive impact when senior managers in school, not just ICT coordinators, lead by example." (p.13)

Table 4-14: School principal influence mean difference between teacher users and non-users of computers in their instruction.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use computers in instruction</td>
<td>2.60</td>
<td>0.41</td>
<td>76</td>
</tr>
<tr>
<td>Do not use computers in instruction</td>
<td>1.91</td>
<td>0.59</td>
<td>29</td>
</tr>
</tbody>
</table>

As seen in table 4-14 in schools where teachers use computers in instruction the principal is more supportive (M=2.60) than in schools where teachers do not use computers in instruction (M=1.91). Here again it is important to remember that the scale on which the t-test is performed is 1 to 3. Therefore the mean difference could not be very big. A difference of 0.69 on a 1 to 3 scale is a 35 per cent difference between the two groups.

The findings mentioned above are all based on data collected from the teachers when asked about their principals and what impact their principals' behaviour had on their performance. The findings indicate that teachers are motivated to try innovations when they are encouraged and supported by their leaders and they find it easier to adopt change when their leaders set an example. The literature review describes transformational and instructional leadership as types of leaderships that enable a successful implementation of change (Burns, 1978; Fullan, 1991; Leithwood, 1992, 1999) since they involve processes by which "leaders and followers raise one another to higher levels of morality and motivation" (Burns, 1978, p. 20). Transformational leaders motivate followers by trying to implement the change first, by giving personal attention to others, making each individual feel uniquely valued. (Bass and Avolio, 1993; Leithwood, 1992).

School culture - a supportive environment
Question 15i deals with school culture reality. In this question teachers were asked to mark several statements dealing with routine and habits practiced in their school environment as part of its culture on an *always, sometimes* and *never* scale.

**Table 4-15: Computers and school culture. (N=108)**

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Sometimes</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. The documentation (grades, report cards, etc), in our school is computerised</td>
<td>9%</td>
<td>9%</td>
<td>90%</td>
</tr>
<tr>
<td>b. Our principal encourages computer use among teachers</td>
<td>10%</td>
<td>26%</td>
<td>64%</td>
</tr>
<tr>
<td>c. School material is word processed</td>
<td>3%</td>
<td>36%</td>
<td>51%</td>
</tr>
<tr>
<td>d. Our computer room is occupied</td>
<td>2%</td>
<td>50%</td>
<td>48%</td>
</tr>
<tr>
<td>e. Teachers get support from the technician or teacher in charge of the computer room</td>
<td>10%</td>
<td>52%</td>
<td>38%</td>
</tr>
<tr>
<td>f. Most of the teachers in my school use computers</td>
<td>11%</td>
<td>60%</td>
<td>29%</td>
</tr>
<tr>
<td>g. Using computers is a major issue in our school.</td>
<td>8%</td>
<td>66%</td>
<td>26%</td>
</tr>
<tr>
<td>h. Our principal uses a computer in his/her office.</td>
<td>14%</td>
<td>62%</td>
<td>24%</td>
</tr>
<tr>
<td>i. Staff meetings are held in the computer room</td>
<td>83%</td>
<td>15%</td>
<td>2%</td>
</tr>
<tr>
<td>j. PowerPoint presentations are used in staff meetings</td>
<td>55%</td>
<td>44%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Table 4-15 clearly indicates that in most schools (90 per cent) the documentation was computerised and 51 per cent of the materials distributed in school were word processed. The literature points out that school cultures that model recommended behaviours usually succeed in convincing the teachers and staff members to act accordingly (Salant and Kachenski, 1998). In 64 per cent of the cases the teachers felt that their principals encouraged their use of computer technology and the use of computers was a major issue sometimes (66%) and always (26%).

The mean of the answers to this question was computed into one variable that presents school culture regarding computer implementation. Reliability analysis was performed in order to check internal consistency of the component items. Reliability analysis (Cronbach Alpha) shows a reliability score of 0.79. This is a good reliability score. Then a t-test was performed in order to see whether there is a difference between those teachers who use computers to those who do not in terms of school culture. The results are shown in table 4-16. School culture appears to determine the use of computers (T(104)=−6.14, P<.01). The mean of school culture support for those who do not use computers is lower (m=1.89) than the school culture support for teachers who use computers (m=2.28) Results are in the table below.
Table 4-16: School culture mean difference among teachers who use vs. teachers who don't use computers in their instruction.

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use computers in instruction</td>
<td>2.28</td>
<td>0.27</td>
<td>76</td>
</tr>
<tr>
<td>Do not use computers in instruction</td>
<td>1.89</td>
<td>0.34</td>
<td>30</td>
</tr>
</tbody>
</table>

It is important to remember that the scale on which the t-test is performed is 1 to 3. Therefore the mean difference could not be very considerable. A difference of 0.39 on a 1 to 3 scale is a 20 per cent difference between the two groups. Another factor to consider is the reason for using t-test for an ordinal 1 to 3 scale. Since 10 ordinal statements were grouped into one variable (that represents an average of all 10 statements), the 1 to 3 ordinal scales had turned into 1 to 3 interval scale.

The literature provided a variety of definitions of school culture (Deal, 1993; Firestone and Corbett, 1988; Sergiovanni, 1996). The basic assumptions were that culture involved norms, habits, values and behaviours. The main findings mentioned above indicate the importance of such practices when attempting to introduce computer technology in schools. Everyday practice that involves technology soon makes it part of the school routine and thus part of the teachers' practice (Sergiovanni, 1996).

A supportive school culture may contribute to a successful integration of computer technology in teaching. Question 13 deals with forms of support provided by the school to teachers who use computers in their instruction. Question 13 lists ten forms of support. For each, teachers marked the frequency they get it, on a never, sometimes or always scale. Reliability analysis was performed in order to check internal consistency of the 13 support items. Reliability analysis (Cronbach Alpha) shows a reliability score of 0.70.

The ten forms of support were then divided into groups: environmental support (statements: a+d+g, Reliability analysis (Cronbach Alpha) shows a reliability score of 0.67), technical support (statements: c+e+j Reliability analysis (Cronbach Alpha) shows a reliability score of 0.70), leadership support (statements: b+f, Reliability analysis (Cronbach Alpha) shows a reliability score of 0.76) and professional support (statement h). New variables were created using the “compute -means” option in the SPSS application. Each new variable is an average of the statements that structure it. Then descriptive statistics were computed in order to see which group has the highest score: which is most dominant for teachers who use computers. A t-test between teachers who use computers in their instruction and teachers who do not use
it could not be computed since teachers who do not use computers in their classes were not required to answer question 13. Table 4-17 shows the mean for each kind of support.

Table 4-17: Forms of support teachers get.

<table>
<thead>
<tr>
<th>Forms of support</th>
<th>mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental support</td>
<td>2.606</td>
<td>0.44</td>
<td>75</td>
</tr>
<tr>
<td>Technical support</td>
<td>2.10</td>
<td>0.39</td>
<td>75</td>
</tr>
<tr>
<td>Leadership support</td>
<td>2.77</td>
<td>0.57</td>
<td>74</td>
</tr>
<tr>
<td>Professional support</td>
<td>2.36</td>
<td>0.56</td>
<td>72</td>
</tr>
</tbody>
</table>

As seen in table 4-17, teachers who use computers in their instruction get support from the leadership and their working environment and less technical support. It is interesting to see that “moral” support (environmental) is widely provided while technical support is perceived as less available. This may be due to the fact that technical support (lab technicians) is still very rare in schools. Only the Tel-Aviv municipality (there are thirteen municipalities in the Tel-Aviv district) has agreed to budget for technicians in schools. Principals in other municipalities are required to find their own financial solutions for technical support. Another interesting issue is that teacher who use computers in their instruction perceive leadership as being most supportive of their work. (See findings for research question 2a). However, Rhodes (1986), Fullan (1991), Cuban (1986), Schild (1997) have all pointed out the importance of support to the teachers’ successful integration of computer technology in their teaching.

Staff development - the school as a learning organisation

Question 4 asked the participants to list all professional development courses related to computer use (in addition to “Integrating Computers in the English Class”) they participated in over the past five years and indicate by whom they were organised. Table 4-18 shows the types of courses and workshops taken by the participants in addition to the course “Integrating Computers in the English Class”.

Table 4-18: Description of courses taken during the last five years

<table>
<thead>
<tr>
<th>Course name</th>
<th>Percentages</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>42%</td>
<td>27</td>
</tr>
<tr>
<td>Windows and Office tools</td>
<td>20%</td>
<td>13</td>
</tr>
<tr>
<td>Curriculum</td>
<td>8%</td>
<td>5</td>
</tr>
<tr>
<td>Alternative assessment</td>
<td>8%</td>
<td>5</td>
</tr>
<tr>
<td>Building internet based units</td>
<td>6%</td>
<td>4</td>
</tr>
<tr>
<td>Distance learning</td>
<td>5%</td>
<td>3</td>
</tr>
</tbody>
</table>
Integrating computers in English learning | 3% | 2
---|---|---
Collaborative learning | 3% | 2
Reading and comprehension | 3% | 2
English on-line | 1% | 1
Drama | 1% | 1
Total | 100% | 65

The most popular course is the Internet workshop (42 per cent). This may be due to the fact that many computer rooms are connected to the Internet at present and teachers are eager to know how to use the Internet both for personal and professional matters. Windows and Office Tools is a compulsory basic course intended for all those teaching in schools that received their computers as part of the "Tomorrow 98" project. It is therefore surprising that the percentage is low (20 per cent). The reason may be that most teachers either forgot they took it since it was so basic or were exempt from participating due to previous knowledge of the material.

The following table points to the organising bodies of the various courses and workshops.

Table 4-19: The organisers of the course

<table>
<thead>
<tr>
<th></th>
<th>Percentages</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>71%</td>
<td>45</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>23%</td>
<td>15</td>
</tr>
<tr>
<td>Ben Gurion University</td>
<td>3%</td>
<td>2</td>
</tr>
<tr>
<td>Teachers Union</td>
<td>3%</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>64</td>
</tr>
</tbody>
</table>

Schools are by far (71 percent) the leading body that organises courses and workshops for its teachers. This indicates that schools are indeed aspiring to be learning organisations in charge of the professional development of their employees. It should be pointed out that in the last five years school principals have been instructed by the Ministry of Education to organise 56-hour courses on a variety of topics for the entire staff as part of the professional development plan. Teachers are required to participate in at least one course throughout the school year.

The Ministry of Education initiated a large number of courses and workshops and 23 percent of those taken by the participants of this research. Since the courses organised by the Ministry are mostly held outside schools, in special centres (such as the Computer Centres), the participation is voluntary and teachers often have to travel far to take part. This explains the low percentage in the table above. Research has shown that transforming the school to a learning organisation is essential to enhance integration of computers in teaching (Pedler et al, 1988; Little, 1993; Lumby, 1997; Southworth, 1994). The process is a complex task which
requires careful planning and effective management (Goldberg and Richards, 1995). The issues to be considered are first how to place learning in the centre of all activities, second how to banish fear of learning by communicating trust, using upward appraisal and third to see strategic performance as an ongoing learning for the whole staff. (Sammons et al, 1994).

Question 21, the open-ended question (see also page 185), asked the teachers to describe what they feel about teaching with computers. The teachers related to many areas, including training issues. Both users and non-users referred to the need for relevant and satisfactory training within their schools.

“I think I should get more training, more often. Things change so fast.”

“I would love to use the computer room. I need more training not in computer use but in how to integrate it in the classroom.”

“I would like to teach in the computer room but the training I’ve had isn’t sufficient.”

Three teachers who integrate ICT in their teaching complained that the training was insufficient and too general.

“I feel I need more training. I lack the confidence. I might join another course.”

“I use computers and like it but I fear I lack the extra time required to improve my knowledge.”

Two other participants, a user and a non-user, claimed that the training did not prepare them for dealing with technical problems.

“Unfortunately my training has not prepared me well enough for technical difficulties.”

Two non-users believe that the training should be more software oriented and specific to their teaching subject.
"I think it is very good but only if you have proper and suitable programmes. I think teachers should be trained to use specific programmes."

This need to provide continuous and adequate training so that ICT may be effectively used as a tool for teaching and learning is reflected in research carried out by Green (1998) in "The Campus Computing Project" where the most important technology issue was the need for adequate training. Faba-Sack (1998) in research performed in one Israeli school discovered that 65 per cent of the participants claimed that in-service training was of short duration and inadequate. Those who integrate computers in their teaching claimed that their progress was a function of their prior knowledge rather than the outcome of the training provided by their school. However, in spite of this dissatisfaction 73 per cent of the participants in the survey are in favour of including computers in their curriculum. This shows that the lack of training does not necessarily create a negative attitude towards computers and should encourage management to invest in efficient staff development.

Access to computers and software

Question 15 deals with the access to computers available to teachers both at home and in school. The results may be seen in table 4-20

Table 4-20: Access to computers

<table>
<thead>
<tr>
<th></th>
<th>Per cent</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a computer at home</td>
<td>94%</td>
<td>106</td>
</tr>
<tr>
<td>I use a computer to prepare my class activities and work sheets.</td>
<td>91%</td>
<td>105</td>
</tr>
<tr>
<td>I teach in the computer room at least once a month.</td>
<td>66%</td>
<td>105</td>
</tr>
<tr>
<td>I have both the necessary equipment and software available in the computer room for my instruction.</td>
<td>59%</td>
<td>106</td>
</tr>
<tr>
<td>I have access to a computer room for use with my classes whenever I wish to teach there.</td>
<td>52%</td>
<td>106</td>
</tr>
<tr>
<td>I teach in the computer room whenever it is available.</td>
<td>16%</td>
<td>106</td>
</tr>
<tr>
<td>There are no computers in the school I work in.</td>
<td>4%</td>
<td>105</td>
</tr>
<tr>
<td>I have at least one computer in every classroom I teach.</td>
<td>3%</td>
<td>106</td>
</tr>
</tbody>
</table>

It is interesting to note the high percentage of teachers who have computers at home (94 per cent). The ImpaCT2 study (2001) conducted in 60 UK schools point out that:
"having a computer at home has a significant impact on teachers’ ICT capability. Teachers who have access to a relatively new computer at home (one that can handle multimedia and web graphics) report growing confidence and competence. (p.13)

This may explain the high percent of teachers who use computers for teaching among the participants (71 per cent). This may also explain the high number of teachers who use computers to prepare their teaching materials (91 per cent). Bearing in mind a previously mentioned finding that 71 per cent of the participants use computers in their instruction (question 7), it may be concluded that teachers (29 per cent) who do not use computers in their instruction still use the computer to prepare their material.

It is important to point out that four per cent of the teachers claim that they do not have computers in their school. This is hard to explain since officially all the participants in this research teach in schools that have been computerised as part of the “Tomorrow 98” project and therefore zero per cent would have been expected. This finding may have been a result of misunderstanding “we do not have computers in school” with “we do not have available computers in school”. In some schools computer rooms are occupied solely by computer-skills teachers thus preventing other teachers from using them.

The very low percentage of teachers who have at least one computer in their classroom is due to a change in policy which moved all computers from regular classrooms into special computer rooms electronically secured against burglary. This occurred after repeated instances of burglaries which resulted in hundreds of computers and other expensive equipment being stolen.

**What limitations and obstacles do teachers have in their attempts to incorporate computers into classroom lessons?**

The third research question deals with the barriers to computer use in classroom according to the teachers’ beliefs. Question 14 deals with possible barriers. In this question teachers were given a list of sixteen possible barriers to computer use and an option to add more. They were asked to select the items that they consider as barriers to computer use and then order them when “1” means *most difficult to overcome*. Hence each item is considered as a variable with a 1 to 16 ordinal scale, when a lower mark on that scale means the barrier is most difficult to
overcome. Table 4-21 shows the barriers’ means order and table 4-22 shows barriers means divided into two groups of teachers (users versus non-users of computers in instruction).

Table 4-21: Barriers (order based on the number)

<table>
<thead>
<tr>
<th>Barriers</th>
<th>mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of time</td>
<td>2.30</td>
<td>1.58</td>
<td>91</td>
</tr>
<tr>
<td>Lack of training</td>
<td>2.63</td>
<td>1.13</td>
<td>95</td>
</tr>
<tr>
<td>Fear of computers</td>
<td>3.34</td>
<td>2.24</td>
<td>66</td>
</tr>
<tr>
<td>Psychological resistance</td>
<td>3.42</td>
<td>1.92</td>
<td>26</td>
</tr>
<tr>
<td>Lack of technical support</td>
<td>3.45</td>
<td>2.48</td>
<td>73</td>
</tr>
<tr>
<td>Lack of access</td>
<td>4.11</td>
<td>2.62</td>
<td>44</td>
</tr>
<tr>
<td>Lack of appropriate software</td>
<td>4.40</td>
<td>4.45</td>
<td>15</td>
</tr>
<tr>
<td>Reluctance to change teaching techniques</td>
<td>4.45</td>
<td>2.25</td>
<td>20</td>
</tr>
<tr>
<td>Fear of ridicule from colleagues</td>
<td>4.50</td>
<td>3.10</td>
<td>4</td>
</tr>
<tr>
<td>Lack of appropriate equipment</td>
<td>4.51</td>
<td>3.31</td>
<td>29</td>
</tr>
<tr>
<td>Lack of professional support</td>
<td>4.62</td>
<td>2.23</td>
<td>48</td>
</tr>
<tr>
<td>Objection to computers</td>
<td>4.62</td>
<td>3.26</td>
<td>16</td>
</tr>
<tr>
<td>Resistance to change</td>
<td>4.87</td>
<td>2.64</td>
<td>41</td>
</tr>
<tr>
<td>Lack of administrative support</td>
<td>5.02</td>
<td>2.16</td>
<td>35</td>
</tr>
<tr>
<td>Lack of enthusiasm</td>
<td>5.23</td>
<td>2.58</td>
<td>13</td>
</tr>
<tr>
<td>Past disappointments with computers</td>
<td>5.94</td>
<td>2.63</td>
<td>19</td>
</tr>
</tbody>
</table>

As seen in the table above the major barriers to computer use are in order: lack of training (88 per cent), lack of time (84 per cent), followed by lack of technical support (68 per cent), fear of computers (61 per cent), and psychological resistance (24 per cent). The least difficult barriers to computer use are: past disappointment with computers (18 per cent), and lack of professional support (32 per cent).

Table 4-22: Barriers - means by groups of users versus non-users

<table>
<thead>
<tr>
<th></th>
<th>Users mean</th>
<th>SD</th>
<th>Non-users mean</th>
<th>SD</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of time</td>
<td>2.20</td>
<td>1.66</td>
<td>2.55</td>
<td>1.39</td>
<td>N.S</td>
</tr>
<tr>
<td>Lack of training</td>
<td>2.56</td>
<td>1.20</td>
<td>2.74</td>
<td>0.90</td>
<td>N.S</td>
</tr>
<tr>
<td>Lack of access</td>
<td>4.64</td>
<td>2.79</td>
<td>2.66</td>
<td>1.55</td>
<td>P&lt;.05</td>
</tr>
<tr>
<td>Fear of computers</td>
<td>3.42</td>
<td>2.42</td>
<td>2.88</td>
<td>1.40</td>
<td>N.S</td>
</tr>
<tr>
<td>Reluctance to change teaching techniques</td>
<td>4.41</td>
<td>2.45</td>
<td>4.66</td>
<td>0.57</td>
<td>N.S</td>
</tr>
<tr>
<td>Psychological resistance</td>
<td>3.78</td>
<td>2.01</td>
<td>2.42</td>
<td>1.27</td>
<td>N.S</td>
</tr>
<tr>
<td>Lack of administrative support</td>
<td>5.21</td>
<td>2.05</td>
<td>3.00</td>
<td>2.64</td>
<td>N.S</td>
</tr>
<tr>
<td>Past disappointments with computers</td>
<td>6.57</td>
<td>2.24</td>
<td>3.00</td>
<td>1.82</td>
<td>P&lt;.05</td>
</tr>
<tr>
<td>Lack of enthusiasm</td>
<td>5.00</td>
<td>2.78</td>
<td>4.66</td>
<td>1.15</td>
<td>N.S</td>
</tr>
<tr>
<td>Lack of professional support</td>
<td>4.90</td>
<td>2.04</td>
<td>2.42</td>
<td>1.61</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>Lack of appropriate equipment</td>
<td>5.08</td>
<td>3.31</td>
<td>2.33</td>
<td>2.42</td>
<td>N.S</td>
</tr>
<tr>
<td>Lack of appropriate software</td>
<td>5.09</td>
<td>4.90</td>
<td>2.50</td>
<td>2.38</td>
<td>N.S</td>
</tr>
<tr>
<td>Resistance to change</td>
<td>5.34</td>
<td>2.57</td>
<td>3.37</td>
<td>2.44</td>
<td>N.S</td>
</tr>
<tr>
<td>Objection to computers</td>
<td>5.41</td>
<td>3.36</td>
<td>2.33</td>
<td>1.52</td>
<td>N.S</td>
</tr>
</tbody>
</table>
In contrast to the general ordering of barriers, table 4-22 shows that users and non-users order barriers differently. The major barrier for users is *lack of time* (90 per cent of 71 users of computer in instruction) while the major barrier for non-users is *lack of technical support* (48 per cent of 29 non-users). While *lack of technical support* is also a problem for users (82 per cent of 71 users), it is only fifth in the barriers ordering. The second barrier for users is *lack of training* (94 per cent of 71 users), while for non-users the next most important barriers are *objection to computers* together with *lack of appropriate equipment*. It is interesting to see that attitude barriers, such as *objection to computers*, *psychological resistance*, *fear of computers*, are higher in place for non-users than for users.

Another issue to consider is the statistical significance. Mann-Whitney test for the two independent samples shows a significant difference between users and non-users in four items: *lack of access* ($U=98.5$, $P<.05$), *past disappointments with computers* ($U=5.00$, $P<.05$), *lack of professional support* ($U=45.5$, $P<.01$) and *lack of technical support* ($U=233.5$, $P<.05$). As for *lack of access*, non-users report this barrier as being more significant ($M=2.66$) than users ($M=4.64$). In addition, non-users report of *past disappointment with computers* as being a more significant barrier to computer use ($M=3.00$) than users ($M=6.57$). Other significant differences show a similar trend. Non-users report of *lack of professional support* as being more significant ($M=2.42$) than users ($M=4.90$), and report of *lack of technical support* as being a more significant barrier ($M=2.14$) than users ($M=3.79$).

The findings are backed by some studies mentioned in the literature (Plomp et al, 1990; Rhodes and Cox, 1990; Schild, 1997; Dimmock, 2000; Somekh, 1998; Rosso et al, 1998; Veen, 1995) although the order of the graveness of the barriers often varies. Sheingold and Hadley reported the highest rated barrier to using computers in the classroom was the teacher’s lack of “time to develop lessons that use computers” (1990, p. 21) whereas Schild’s study emphasises the lack of training and skills (Schild, 1997).

Question 21, the open-ended question (see also page 185), asked the teachers to describe what they feel about teaching with computers. The teachers related to many areas, including computer usage obstacles. Therefore these comments are presented in this context. Table 4-23 shows obstacles mentioned by the participants in the open-ended question.
Table 4-23: Teachers’ reports of obstacles for computer usage

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Users N</th>
<th>Non users N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must have suitable software</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Teachers should be trained to use specific programmes</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>No access, not enough computers, school organisational problems.</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Time consuming, not enough time to improve knowledge</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Need technical support, a guide in school</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Old hardware</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Twenty-three teachers out of hundred and two who answered this question talked about obstacles to computer usage in their answer to the open-ended question (Question 21). Teachers who use computers complain mainly about lack of time and of organisational problems:

“*I rarely use computers because I don’t have the time – it is very time consuming!*”

“*I need more training and continuous support in school.*”

“*I feel frustrated that we have no internet in my school. Our computers are very slow The software is very old-fashioned and my pupils don’t enjoy using it. So I use mainly word processing.*”

Non-users complain mainly about organisational problems and other technical issues in line with the responses given to question 16.

“*My school is not ready for regular teaching with computers. It’s usually occupied by the computer teachers. There is also an urgent need to bring more software. We have only nine computers connected to the Internet which isn’t enough even for half a class.*”

“*Our computers are outdated and cannot be used for many things.*”

“*I have no access to the computer room.*”
"I realise the importance of the use of computers in the language classroom. However, technical problems such as scheduling, support, etc., make it impossible to implement."

Which of the following factors are associated with computer use in classroom instruction?

The fourth research question deals with factors that are associated with computer use in classroom instruction. The first factor is the attitude of teachers towards computers in the classroom. Questions 16, 17, 18 and 19 deal with teachers’ attitudes towards teaching with computers. The total number (N) is 108.

Attitudes of teachers toward computers in the classroom

Question 16 asks the teachers to express their attitude by checking whether they agree or disagree with statements given in the question. Percentages of teachers who use computers versus teachers who do not use computers were cross-tabulated with the teachers’ answers. Then chi-square scores were calculated in order to see if users have different attitudes than non-users. Chi-square is a test used with frequency data and requires that the data be classified according to categories. Table 4-24 shows percentages by group cross-tabulation.

<table>
<thead>
<tr>
<th>Table 4-24: Teachers' attitudes towards computer usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>% of agreements (N)</td>
</tr>
<tr>
<td>I enjoy using computers</td>
</tr>
<tr>
<td>The computer has more advantages than disadvantages</td>
</tr>
<tr>
<td>Computers make people feel worthless and inferior</td>
</tr>
<tr>
<td>When I see a computer I keep away</td>
</tr>
<tr>
<td>I am afraid that one-day computers will rule the universe</td>
</tr>
</tbody>
</table>

Users N=76
Non-users N=30

It is interesting to see that positive attitudes have higher agreement percentage then negative attitudes even among non-users. Another interesting factor is that non-users do not have negative attitudes at all. The difference between users and non-users is significant only in the
positive attitudes, for which more users than non-users agree. The ImpaCT2 survey, conducted in UK (2001) notes that:

"Teachers do not appear to be negative towards ICT, but many do not yet use ICT confidently in their lessons." (p.13)

This is also noted in question 21, the open-ended question (see also page 185), which asked the teachers to describe what they feel about teaching with computers are very noteworthy. Twenty-nine teachers who integrate ICT in their teaching admitted that they enjoy teaching in a technological environment.

"It's fun and I enjoy teaching more. Teaching with computers has improved my professional abilities and my pupils appreciate it and they tell me so."

"Integrating computers in my teaching has been a refreshing breeze in my career."

"Ever since I started teaching with computers I work harder but enjoy my work better."

Teachers also referred to the quality of their teaching and the satisfaction of their pupils.

"It turns learning into an exciting experience."

"Computers are tools which contribute to the quality of teaching."

"I think that computers are an invaluable resource and can definitely improve education if used properly."

Questions 17 and 18 deal with feelings when teaching in a technological environment versus feelings when teachers teach in a regular classroom. Teachers were given a list of five feelings for each they marked whether they feel it very often, sometimes or hardly ever.

Tables 4-25 and 4-26 show how users and non-users feel when they teach.
Table 4-25: The way teachers feel about teaching in a technological environment.

<table>
<thead>
<tr>
<th></th>
<th>Users</th>
<th>Non-users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hardly ever (N)</td>
<td>Sometimes (N)</td>
</tr>
<tr>
<td>Calm</td>
<td>7% (6)</td>
<td>51% (43)</td>
</tr>
<tr>
<td>Angry</td>
<td>53% (37)</td>
<td>46% (32)</td>
</tr>
<tr>
<td>Confused</td>
<td>26% (19)</td>
<td>74% (53)</td>
</tr>
<tr>
<td>Nervous</td>
<td>11% (8)</td>
<td>57% (41)</td>
</tr>
<tr>
<td>Secure</td>
<td>25% (18)</td>
<td>71% (51)</td>
</tr>
</tbody>
</table>

Table 4-26: The way teachers feel about teaching in a regular class

<table>
<thead>
<tr>
<th></th>
<th>Users</th>
<th>Non-users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hardly ever (N)</td>
<td>Sometimes (N)</td>
</tr>
<tr>
<td>Calm</td>
<td>6 (4)</td>
<td>51 (37)</td>
</tr>
<tr>
<td>Angry</td>
<td>49 (35)</td>
<td>50 (36)</td>
</tr>
<tr>
<td>Confused</td>
<td>29 (20)</td>
<td>71 (50)</td>
</tr>
<tr>
<td>Nervous</td>
<td>29 (21)</td>
<td>71 (51)</td>
</tr>
<tr>
<td>Secure</td>
<td>5 (3)</td>
<td>57 (43)</td>
</tr>
</tbody>
</table>

As seen in the tables above, most teachers (users and non-users) experience positive feelings when they teach. They are calm and secure and rarely angry confused or nervous. These feelings are true for either teaching environment. This may be due to the fact that it is only in the first few lessons conducted in a technological environment that the anxiety, discomfort and confusion are dominant. Once a teacher uses the computer room on a regular basis the environment becomes familiar and friendly. However, it should be pointed out that 71 percent of the teachers who integrate computers into their lessons report that they are sometimes nervous in their regular classroom compared to only fifty seven percent in the computer room. This may be explained by the fact that teachers who are used to teaching in a technological environment find it more comfortable and less strenuous.

Question 19 deals with beliefs about teaching with computers. The teachers were given a list of nine beliefs. For each belief they marked whether they think it is right for them, wrong for them or they don’t know. Table 4-27 shows teachers’ responses by group (users versus non-users) and the chi-square results for significant differences between the groups.
Table 4-27: Teachers’ beliefs

<table>
<thead>
<tr>
<th>I believe that</th>
<th>Users who said right % (n)</th>
<th>Non-users who said right % (n)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful implementation of computers use depends on good training</td>
<td>100 (76)</td>
<td>90 (26)</td>
<td>P&lt;.05</td>
</tr>
<tr>
<td>Students will enjoy school more if computers are integrated into their regular studies</td>
<td>97 (74)</td>
<td>69 (20)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>Students in my class like to use computers</td>
<td>97 (74)</td>
<td>60 (18)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>Computers improve learning</td>
<td>95 (71)</td>
<td>41 (12)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>All teachers will teach in a technological environment by 2010</td>
<td>59 (45)</td>
<td>41 (12)</td>
<td>N.S</td>
</tr>
<tr>
<td>Computers help teachers to improve their teaching techniques</td>
<td>45 (34)</td>
<td>28 (8)</td>
<td>N.S</td>
</tr>
<tr>
<td>My principal thinks teachers who use computers in classroom instruction are better teachers</td>
<td>43 (33)</td>
<td>7 (2)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>Teachers who use computers in classroom instruction are better teachers</td>
<td>20 (15)</td>
<td>3 (1)</td>
<td>P&lt;.01</td>
</tr>
<tr>
<td>My principal is going to promote me if I use computers in my instruction</td>
<td>5 (4)</td>
<td>0 (0)</td>
<td>N.S</td>
</tr>
</tbody>
</table>

One hundred per cent of the users believe that successful implementation depends on good training. This reinforces the findings discussed above dealing with the importance of staff development for successful implementation of ICT. Most users (97 per cent) believe that students like to use computers and computers improve learning. Users believe it more than non-users for which 60 per cent believe students like to use computers and 41 per cent believes computers improve learning. This is reinforced by the fact that nineteen users state that they believe that their students enjoy learning in the computer rooms as part of their answer to the open-ended question 21.

“"My lessons are very successful. I know it because my pupils don’t want to leave when the bell rings.”

“Teaching with computers opens new possibilities. Most pupils are motivated and they become more creative.”

“It improves teaching, teaching techniques, relations between teachers and students, enables individual progress and teamwork.”

In addition, more users (20 per cent) than non-users (3 per cent) believe that teachers who use computers in instruction are better teachers. The difference is also seen in teachers’ beliefs about the principal’s attitude toward teaching with computers. Forty three per cent of the
users believe that *the principal thinks teachers who use computers in classroom instruction are better* versus seven per cent of non-users.

Research indicates that teachers who adopt computer technology realise that computer-based technology enhances teacher/student productivity (OTA, 1995; Sheingold et al, 1990; Givon, 1997), and prepares students for the world of work (Hargreaves and Fullan, 1998). Teachers who hold these perceptions tend to be successful in adopting and using computer-based technology (Chen, 1995; Dwyer, et al, 1997).

**Continuous training of teachers in computer use – lifelong learning**

The second factor deals with continuous training as being associated with computer use in classroom instruction. The first question in the survey asks the teachers to write the years in which they have participated in the course “Integrating Computers in English Class”. The second question asks the teachers to state other courses that they have taken in computer usage. For statistical analysis purposes, the number of computer courses each teacher took was summed into one variable, which represents the number of courses. As for the “Integrating Computers in English Class” courses, a different analysis was used. Teachers who took one course in years 1994 or 1995 and did not take any later courses received the score “1”, all other teachers (those who took more than one course, or those who took one course but in recent years) received the score “2”. Table 4-28 shows teachers percentages plus Chi-Square scores for the course group interaction.

<table>
<thead>
<tr>
<th>Users % (N)</th>
<th>Non-users % (N)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>One course in 1994 or 1995</td>
<td>28 (21)</td>
<td>29 (9)</td>
</tr>
<tr>
<td>More than one or later one</td>
<td>72 (55)</td>
<td>71 (22)</td>
</tr>
</tbody>
</table>

As seen in this table there is no interaction between group and number of courses taken. The number of “Integrating Computers in English Class” courses participated in does not appear to predict computer usage in classrooms. The percentages of users versus non-users in the different categories are practically the same. The possible explanation may be that teachers who participated more than once, users and non-users, did so to develop their own computer skills and not only to learn how to integrate computers in their teaching.
Question 4 asked the participants to list all professional development courses related to computer use (in addition to "Integrating Computers in the English Class") they participated in over the past five years and indicate by whom they were organised.

Table 4-29 shows no clear indication of a relationship between the number of courses taken by a teacher and the implementation of its contents. This may be a result of the regulation from the Ministry of Education that all teachers should participate in a minimum amount of training hours (56) each year organised within the school (Bulletin Report, 1995).

### Table 4-29: Other computer courses as predictor to computer usage

<table>
<thead>
<tr>
<th>Number of courses</th>
<th>Users % (N)</th>
<th>Non-users % (N)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 courses</td>
<td>55 (42)</td>
<td>77 (24)</td>
<td></td>
</tr>
<tr>
<td>1 course</td>
<td>24 (18)</td>
<td>16 (5)</td>
<td></td>
</tr>
<tr>
<td>2 courses</td>
<td>15 (11)</td>
<td>7 (2)</td>
<td></td>
</tr>
<tr>
<td>3 courses</td>
<td>7 (5)</td>
<td>0 (0)</td>
<td>N.S</td>
</tr>
</tbody>
</table>

The importance of continuous learning has been pointed out in research mentioned in Chapter 2. Ellis (1986) who worked with teachers in an elementary school in Sheffield concluded that teachers should be kept continuously informed of technological innovations and available resources. Schild (1997) in her survey on Israeli schools emphasises the importance of continuous training when technology is concerned because of the fast and constant changes in the field. Teachers who integrate computers into their teaching are aware of the need to keep their knowledge updated (Dwyer, 1994; Fullan, 1990; Hargreaves, 1994; Katz and Ophir, 1996).

### Age of the teacher

To check the factor of the age of teachers, a chi-square test was performed. It shows a significant correlation between age and computer usage. Table 4-30 shows percentages of teachers by age levels.

### Table 4-30: Age and computer usage interaction

<table>
<thead>
<tr>
<th>Age</th>
<th>Users % (N)</th>
<th>Non-users % (N)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30</td>
<td>7 (5)</td>
<td>13 (4)</td>
<td></td>
</tr>
<tr>
<td>31-40</td>
<td>37 (28)</td>
<td>10 (3)</td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td>40 (30)</td>
<td>52 (16)</td>
<td></td>
</tr>
<tr>
<td>51-60</td>
<td>16 (12)</td>
<td>26 (8)</td>
<td></td>
</tr>
<tr>
<td>older</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>P&lt;.05</td>
</tr>
</tbody>
</table>
The difference between users and non-users is seen for teachers between the ages of 51 and 60. At that age 26 per cent are non-users (but it should be mentioned that they have taken the computer course) while only 16 per cent use computers in their instruction. At the ages 31 to 40, there are many more users (37 per cent) than non-users (10 per cent) and at the ages 41 to 50, users and non-users have similar percentages. This coincides with the findings of the survey conducted by Russell and Drew (2001) for the British Department of Education to discover the uptake of, attitudes towards and barriers to use of ICT, found that use of the ICT is greater among younger age groups, 70 per cent of 16-34, compared to 14 per cent of those aged 55 and older (p.4).

Grade level in which the teacher teaches

Another factor that may predict computer use deals with the grade level in which the teacher teaches. Chi-square test did not show a significant correlation between group and grade level. Thus the grade level in which the teacher teaches does not predict computer usage. However, the fact that fifty nine per cent of the teachers in Junior High school use computers in their teaching may be due to the fact that the first phase of the "Tomorrow 98" project computerised the junior high schools. The very low percentage usage in elementary schools is due to the fact that in Israel pupils start their English lessons in the fourth grade (this is gradually changing in autonomous schools and the grade for introducing English is either first or second). A possible explanation for the low percentage of users in the senior high classes (33 per cent) may be the reluctance of the teachers to 'waste time' when teaching for the Bagrut Exams (the Israel matriculation exams)

Table 4-31: Grade level and group interaction

<table>
<thead>
<tr>
<th>Grade level</th>
<th>Users % (N)</th>
<th>Non-users % (N)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>8 (6)</td>
<td>3 (1)</td>
<td></td>
</tr>
<tr>
<td>Jr. high</td>
<td>59 (44)</td>
<td>45 (14)</td>
<td></td>
</tr>
<tr>
<td>Sr. high</td>
<td>33 (25)</td>
<td>52 (16)</td>
<td></td>
</tr>
</tbody>
</table>

Teacher's acceptance of change

The fifth factor deals with acceptance of change. Only two items in the survey deal with this factor. The two items are both in question 14 that deals with barriers to computer use in
education. For data analysis purposes the two items were computed into one variable which represents an average of: reluctance to change teaching techniques and resistance to change. Then a t-test was computed to see whether users and non-users have different opinions towards change. The t-test scores did not show a significant difference between users and non-users as for their acceptance of change (T(44)=-1.46, N.S). Therefore acceptance or reluctance to change does not appear to be a predictor of computer usage with this group. Table 4-32 shows group statistics.

**Table 4-32: Teacher's reluctance to change**

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>4.94</td>
<td>2.47</td>
<td>38</td>
</tr>
<tr>
<td>Non-users</td>
<td>3.56</td>
<td>2.19</td>
<td>8</td>
</tr>
</tbody>
</table>

Although it seems that the literature (Cuban, 1986; Fullan, 1994: Loveless, 1996) attempts to emphasise the reluctance of teachers to adopt new teaching approaches such as computers and technology, the findings of this survey show no significant difference between users and non-users.

The open-ended question 21 provides no back up to this concept since the participants did not refer to the topic of change in their answers. One participant, a non-user, admits that she had not found “the courage to use computers in her teaching”, but this may be a result of technophobia rather than reluctance to change.

**Open ended question findings (survey question 21)**

As mentioned in several occasions throughout the chapter, all the teachers (users and non-users) were asked to write in 20 to 30 words, what they think and feel about teaching with computers. The teachers gave 22 major answers some of which have already been referred to. Table 4-33 shows the results by group of uses and non-users.

**Table 4-33: open ended question results**

<table>
<thead>
<tr>
<th></th>
<th>Users % (N)</th>
<th>Non-users % (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoy (personally)</td>
<td>28 (29)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Fun, interesting, students enjoy</td>
<td>19 (20)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Motivation to learn/ learn more and better/ more effective</td>
<td>13 (13)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Better teacher/improves teaching</td>
<td>13 (13)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Time consuming/ not enough time to improve knowledge</td>
<td>4 (4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>No access, not enough computers, school organisational problems</td>
<td>3 (3)</td>
<td>39 (7)</td>
</tr>
<tr>
<td>Essential/ the way people will learn in the future</td>
<td>3 (3)</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Could assist with learning disabilities/weak students</td>
<td>3 (3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>I feel satisfaction and content (professionally)</td>
<td>3 (3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Training was very poor / need more training</td>
<td>3 (3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Has potential</td>
<td>3 (3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Old hardware</td>
<td>2 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Need technical support/ guide in school</td>
<td>1 (1)</td>
<td>11 (2)</td>
</tr>
<tr>
<td>Not enough preparation for technical difficulties</td>
<td>1 (1)</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Students don’t appreciate because of the bagrut</td>
<td>1 (1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Instant feedback</td>
<td>1 (1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Improves relation between teachers and students</td>
<td>1 (1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Must have suitable software</td>
<td>0 (0)</td>
<td>11 (2)</td>
</tr>
<tr>
<td>Should train teachers specifically to use software</td>
<td>0 (0)</td>
<td>11 (2)</td>
</tr>
<tr>
<td>Advanced format of textbook</td>
<td>0 (0)</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Haven’t had the courage</td>
<td>0 (0)</td>
<td>6 (1)</td>
</tr>
</tbody>
</table>

The following table groups the statements according to their general correspondence to the research questions.

**Table 4-34: open ended question results grouped according to research questions**

<table>
<thead>
<tr>
<th>Question 1</th>
<th>Question 2</th>
<th>Question 3</th>
<th>Question 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation to learn/ learn more and better/ more effective</td>
<td>Essential/ the way people will learn in the future</td>
<td>Must have suitable software</td>
<td>I enjoy (personally)</td>
</tr>
<tr>
<td>Not enough preparation for technical difficulties</td>
<td>Need technical support/ guide in school</td>
<td>Must have suitable software</td>
<td>Fun, interesting, students enjoy</td>
</tr>
<tr>
<td>Training was very poor / need more training</td>
<td>Improves relation between teachers and students</td>
<td>Old hardware</td>
<td>Better teacher/improves teaching</td>
</tr>
<tr>
<td>Should train teachers specifically to use software</td>
<td>I feel satisfaction and content professionally</td>
<td>No access, not enough computers, school organisational problems</td>
<td>Has potential</td>
</tr>
<tr>
<td>Could assist with learning disabilities/weak students</td>
<td>Instant feedback</td>
<td>Time consuming/ not enough time to improve knowledge</td>
<td>Haven’t had the courage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-33 and 4-34 show that users generally have very positive attitudes towards computer usage. Statements from the answers to the open-ended question have been quoted throughout.
this chapter at the end of each section dealing with one research question. These are some more quotations taken from the teachers’ answers to the open-ended question. Some teachers expressed their personal joy and pleasure.

"I enjoy every minute I spend in the computer room. I never thought teaching can be so much fun!!"

"It’s so much fun! Teaching in the computer room is always exciting and often unpredictable."

Others expressed their professional satisfaction and belief that teaching in a technological environment makes them better teachers

"My teaching is more interesting, more efficient and more enjoyable."

"Both my pupils and I enjoy each and every lesson in the computer lab. We work hard but have a lot of fun."

They believe that their students enjoy learning there and that it increases their motivation to learn.

"My students love being in the computer room. They try harder to succeed in English learning because the material and the teaching methods."

"Using computers motivates students, activates even the passive ones and encourages everyone to do something during the lessons – which they may not do during a regular lesson."

"Computers are great for my weaker learners."

"My pupils love working in the computer room and are willing to work twice as hard without complaining."

As for non-users, only one participant thinks that computers perform like a textbook.
"If provided with technical support I might attempt to use computers although I think that they are no more than an advanced format of a notebook. They may also serve as a source of information but so can a good encyclopedia."

Non-users blame factors such as lack of access, and school organisational problems for their not integrating computers in their instruction.

"The school does not provide me with any technical support so I refuse to take it on myself."

"I believe that if teachers are provided with ready material for use in a computer room they’ll use them. As long as I have to invent such materials I won’t do it."

"I wish I could teach in the computer room!! It is never available!! Maybe next year."

On the whole, teachers who answered this open-ended question showed positive attitudes and awareness of the part technology will play in the future of education.

"I believe that a teacher who wants to be part of the new millennium must use computers in the classroom."

"I think this is the teaching tool of the future. It is a solution to many teaching problems."

"It’s how people will learn in the future. It facilitates students cognitively and assists students with learning disabilities."
Demographics

The concluding section of the questionnaire asked for information about the participants. The following tables provide the presentation of the findings on demographics.

Most of the teachers are 31-50 years of age (72 per cent). The younger teachers probably get their computer education in the teacher training colleges as part of their studies. The older teachers may be too close to retirement and may be reluctant to embark on innovative adventures. The participants for the case studies belong to the majority group, i.e. 31-50.

Table 4-35: Age of participants

<table>
<thead>
<tr>
<th>Age</th>
<th>Percentages</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30</td>
<td>8%</td>
<td>9</td>
</tr>
<tr>
<td>31-40</td>
<td>29%</td>
<td>31</td>
</tr>
<tr>
<td>41-50</td>
<td>43%</td>
<td>46</td>
</tr>
<tr>
<td>51-60</td>
<td>19%</td>
<td>21</td>
</tr>
<tr>
<td>Older</td>
<td>1%</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>108</td>
</tr>
</tbody>
</table>

When it comes to the teachers’ education, 80 percent have a BA degree, only 15 per cent have a Masters Degree and no one has a PhD. There is a tendency among teachers to return to their university studies to complete their second and third degrees. This may be the result of the appearance of foreign universities that opened branches in Israel and enabled professionals (teachers, nurses) to attain a university degree in a short time span.

Table 4-36: Education

<table>
<thead>
<tr>
<th>Degree</th>
<th>Per cent</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A</td>
<td>80%</td>
<td>87</td>
</tr>
<tr>
<td>M.A</td>
<td>15%</td>
<td>16</td>
</tr>
<tr>
<td>Teaching certificate</td>
<td>5%</td>
<td>5</td>
</tr>
<tr>
<td>Ph.D</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>108</td>
</tr>
</tbody>
</table>

Most participants (55 per cent) teach in junior high schools. As mentioned in Chapter 1, the “Tomorrow 98” project computerised junior high schools in the first phase. This meant that most of the participants in the course “Integrating Computers in the English Class” taught in the junior high classes. In addition to that, teachers in the secondary schools are more
reluctant to introduce innovations such as computers into their teaching since they have to cover a certain amount of material in preparing their students for the matriculation (Bagrut) exams. As for the elementary classes, the level of English is not high enough to perform tasks that require a certain amount of knowledge of the foreign language. It is, therefore, not surprising that the majority of the teachers come from the junior high schools. The sample of five teachers for the case studies also belongs to this group.

Table 4-37: Type of School

<table>
<thead>
<tr>
<th>School</th>
<th>Percentages</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior high</td>
<td>55%</td>
<td>59</td>
</tr>
<tr>
<td>Senior high</td>
<td>38%</td>
<td>41</td>
</tr>
<tr>
<td>Elementary</td>
<td>7%</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>108</td>
</tr>
</tbody>
</table>

This last table provides the mean of the participants' years of teaching experience, the years of their computer use at home and the years of computer use in class. Since most of the participants are in their mid age (30-50) the average of 18.36 years of teaching experience is an expected number. Most teachers serve in the army after completing their high school studies. Their university education usually begins at the age of twenty and ends three to six years later. If their teaching career commences right after they complete their studies, by the time they are forty, they have gained 14-17 years of experience.

The fact that the average number of years that teachers use computers at home is 4.45 may be a direct result of "Tomorrow 98" project that began in 1994. This may have been the direct consequence of introducing computers in schools. Teachers who were asked to participate in basic computer courses discovered the practicality of these machines for their everyday life and purchased them for their personal use. It appears to be more than a year later that they integrated computers in their teaching in schools as well (average of 3.01 years).

Table 4-38: Mean of "teaching experience", "computer use at home" and "computer use in teaching"

<table>
<thead>
<tr>
<th>Question</th>
<th>Average</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching experience</td>
<td>18.36</td>
<td>8.42</td>
<td>107</td>
</tr>
<tr>
<td>Computer use at home</td>
<td>4.45</td>
<td>2.72</td>
<td>104</td>
</tr>
<tr>
<td>Computer use in teaching</td>
<td>3.01</td>
<td>1.86</td>
<td>75</td>
</tr>
</tbody>
</table>

This concludes the presentation and analysis of the findings of the questionnaire survey.
Summary of the survey findings

The analysis of the answers to the questionnaire filled in by 109 ESL teachers who participated in the course “Integrating Computers into the English Class” produced a number of interesting findings. Seventy per cent of the teachers claimed that they integrated computers in their teaching whereas 91 per cent used computers to prepare lessons and teaching material for their learners. The majority of the participants felt that training taught them how to implement computers into their curriculum and improved their teaching capabilities. Some teachers altered their teaching methods as a result of using computers and even changed their perception of their profession. This seems to fulfill objectives of effective training mentioned by Fullan, (1994), Comber et al (1997), Dede, (1997) and others. Teaching methods suitable for technological environment were often adopted in regular classroom teaching. This agrees with Means et al (1993) who saw computers as part of a macro type process aimed at improving educational outcomes by transforming teaching methods.

Positive attitude of the school principals towards teachers’ use of computers encouraged them in their computer usage. Principals who themselves used computers and modeled their use both in everyday life and in pedagogical issues, were more likely to succeed in their integration of computer technology in their schools. Sergiovanni (1996), Fullan, (1991), Bass and Avolio, (1993), Means, (1993) and Rogers, (1995) point that success of principals in introducing and implementing change is linked to their ability to effectively articulate and put into action their vision of excellence in teaching and learning by emphasising and modeling important goals and behaviours in such a manner that it signals to others what was valued in the school. The findings of this study show that schools are by far (71 per cent) the leading body that organise courses and workshops for their teachers. This indicates that schools are indeed aspiring to become learning organisations in charge of the professional development of their employees as suggested by Southworth (1994), Lumby (1997), Senge (1990) and Darling-Hammond et al, (1997).

The following chapter will provide an account of the five case studies sampled from the whole population of the survey participants (108).
CHAPTER 5: CASE STUDY RESEARCH

This case study research chronicles the perceptions and experiences of teachers going through the process of implementing technology into their classroom lessons. It is presented to give voice to the teachers' perceptions of this process. It is the researcher's responsibility to assist readers in arriving at high-quality understandings (Stake, 1995). The first part provides the profiles of each teacher and a description of the context in which they work; a general outline of the school; and a brief profile of the leading figure interviewed from each school. The second part presents the findings in reference to the research questions.

The data collection for this study was conducted in field settings. Observations, interviews, e-mail diaries, and surveys were all used in the data collection process (Robson, 1993). The information from the study is presented as a description of the process the teachers experienced in infusing technology into their classrooms. The study was an inductive study which attempts to identify patterns or trends in the process of implementing technology in the classroom.

Teacher Profiles

Five ESL teachers from five different schools in different neighbourhoods in the Tel-Aviv district participated in this research study. All of the teachers in this study participated in at least one course organised by the Ministry of Education “Integrating Computers in the English Class” and volunteered to be a part of the case study research after filling in a questionnaire sent to all the ESL teachers who participated in the course mentioned above. The following is a description of the context in which each of the participants was teaching while participating in this research study. The profiles of the teachers are also represented in a matrix form (See Table 3-3 in Chapter 3).

User 1

User 1 is an eighth grade ESL teacher who has been teaching at the junior high level for twelve years. She started learning about computers by attending workshops offered by her
school on computer-managed instruction in 1994. She enrolled in the course “Integrating Computers in the English Class” in 1996 to gain more computer knowledge targeted to her teaching discipline. User 1 participated in three additional courses organised by her school principal giving her further knowledge on how to use the computer, different software applications and integrating Internet in her teaching. She started using the computer room in her school while taking the course in 1996 and has been using computers for about five years. She owns a computer and uses the Microsoft Office tools and the Internet to prepare her lessons on a regular basis.

User 1 feels confident enough using computers that she can help other teachers in her school troubleshoot or solve problems they encounter when using computers, but still experiences frustrations with new problems that sometimes require her to find help. She recognises that she is an early adopter among the teachers in her district.

“I feel that I'm in the upper segment of teachers that have already integrated technology into the classroom. Many more are just now realising how the curriculum can be enhanced with technology, while several of us have been trying new things for several years. Sometimes I forget how comfortable I am using the computer in the classroom until I'm around a group of teachers that are just now getting excited about some of the programmes I have already been using.”

The computer room in the school where User 1 teaches contains 20 Pentium II computers wired to the Internet. Since there are not enough computers for each student to work individually (an average of 37 pupils per class), teams of pairs are formed. User 1 often recruits volunteer help from colleagues to come and help her supervise the students working in the computer room. The students work on word processing creative writing activities and projects, work with software programmes and use the Internet both as a resource and a means of communication.

The technology specialist at the school is the designated computer coordinator who is responsible for the computers. She is one support person whom User 1 could request help from, however, she also asks the mathematics teacher who is good with computers when she needs help with a problem she cannot solve.
School profile

User 1 teaches in Alef High School, a comprehensive six-year high school in Northern Tel-Aviv. The school has a total of fifty-two classrooms, three computer rooms, five science laboratories, a gymnasium, a library and a cafeteria. At the time of this study, Alef High School had one principal, two assistant principals, for the junior high school and the secondary school and one guidance counselor. The school staff included ninety seven classroom and subject-area teachers, four special education teachers, a computer coordinator, two computer technicians, two librarians, seven clerical personnel, and two maintenance personnel. The student population, 1630 in number, ranged in grades from seventh to twelfth and included special education services for 53 students with learning disabilities.

Interviewed Leader’s Profile – Computer Coordinator

The computer coordinator of Alef High School, who is referred to as Leader 1 in this paper, is 42 years old and has been in her position for three years. She was a computer skills teacher for five years before she was offered the post. She works full time and is present in school five days a week, eight hours each day. She is almost always available when needed and makes it her duty to be constantly updated about any new materials, software, and Internet sites relevant for the teachers in her school.

“Many subject teachers turn to me for advice. I feel I have to know everything about every subject taught in school which is of course very hard. I try to learn all the time and keep updated as much as possible in spite of the fast changes.”

User 2

User 2 is a ninth grade teacher in a school located in one of the most affluent neighbourhoods in the Tel-Aviv area. User 2 has been teaching in this school for 14 years and has been using computers for about six years. She started integrating computers in her instruction while taking the course “Integrating Computers in the English Class” in 1994 and has participated in a number of courses and computer workshops since then. In fact she has participated in the course “Integrating Computers in the English Class” three times – 1994, 1996 and 1999. She
purchased a used computer for home in 1994 and felt that was an important step in her computer use.

“I ended up buying a used computer during that class, and that’s when I had a turn around for myself because I sat at that computer every evening and went over the information that was given, and by actually using the computer myself and having some ownership in that computer, I learned how to use it.”

She views herself as an early adopter and confident computer user.

“I feel very confident, but I’m also always learning new things.”

She feels that she acquired most of her computer knowledge through practice on the machine.

“I think most of my knowledge has been picked up from the courses and then going home and just messing with things and playing. Spending a lot of time on the computer has been important.”

In addition, she has helped instruct school workshops on the integration of Internet for other ESL teachers. She has worked with a variety of software programmes but uses mostly open tools such as Microsoft Office software and Internet.

The computer room in which she teaches includes twenty Pentium II computers with direct access to the Internet. All the computers are connected to a device called “class net” which enables the teacher to control all the screens and demonstrate through his/her screen. The device is easy to use and is a solution for teachers who are afraid to ‘lose control’ when teaching in the computer room. Since there are not enough computers for all the learners (an average of 35 pupils per class), the students work in pairs thus encouraging collaborative work. User 2 works in close cooperation with her colleague who is also an active user of computers in her teaching. They usually plan their lessons together and help each other when help is needed. The students work on word-processing activities, computer games, and project work. They often use the Internet to e-mail other students and to search for relevant and updated material for their project and research work.
The computer technician is always present in the computer room and is responsible for the computers and other equipment. She is the main support person whom User 2 and her colleague can request help from, however, they also ask their students some of whom are real computer experts, when they need further support. User 2 feels that both her partner and herself are mutually benefited from being able to work together to integrate technology.

School profile

User 2 teaches in Bet High School, a comprehensive six-year high school in one of the most affluent neighbourhoods in Tel-Aviv. The school is a small school compared to other schools in the district. It has a total of thirty classrooms, two computer rooms, two science laboratories, a gymnasium, a library and a cafeteria. At the time of this study, Bet High School had one principal and, two assistant principals, for the junior high school and the secondary school. The school staff included fifty-eight classroom and subject-area teachers, two special education teachers, a computer coordinator, one computer technician, one librarian, four clerical personnel, and one maintenance personnel. The student population, 880 in number, ranged in grades from seventh to twelfth and included special education services for 12 students with learning disabilities.

Interviewed Leader’s Profile – Computer Coordinator

The computer coordinator of Bet High School, who is referred to as Leader 2 in this paper, is 35 years old and has been in her position for five years. She first joined the school staff as a lab technician and served as one for three years when she was offered the post of computer coordinator. She works full time and is present in school five days a week, eight hours each day. She tries to spend most of her working hours in the computer rooms, helping and advising both teachers and learners.

“When I first came here only two teachers were using the computer lab. Today it is occupied all the time and we really need at least two more computer rooms to satisfy the demand.”
User 3

User 3 is a 9th grade teacher who teaches in a school located in one of the low socioeconomic areas. She has been an ESL teacher for 19 years but in another school. She was in the first year at a brand new school and has experienced some strife in adjusting to a new teaching environment. The computer room has twenty brand new Pentium III computers connected to the school network. The school wiring for Internet access was completed a few days before the beginning of the school year. They do not have a projection device in the computer room, but will have one by the end of the semester.

User 3 has 19 years teaching experience and has been using computers for about five years. She feels that she is getting better at using computers and developing her computer skills.

"Well, it's getting better, now I like it. I've seen its benefits and so now I'm seeking more workshops, does that make sense? So if I want to pick up something new technology-wise to use in the classroom, I usually take another course or workshop."

She is working hard at integrating technology into her teaching and designing new technology lessons for her students to make use of the technology facilities in the new school. Unfortunately, she has no collaboration from her colleagues since it is her first year in this school but she is confident that things will gradually change and other ESL teachers will join her in preparing and implementing computer based lessons.

"In the last year I have used more technology than ever. I'm probably ahead of most—which is really scary because I have a long way to go."

In December of 1998, User 3 upgraded her home computer to a Pentium II. She now feels that she has the resources at home which will allow her to do more computer work. She reads computer magazines and picks up little tips and tricks as well as other information about the computer she uses from these sources.
School profile

User 3 teaches in Gimel High School, a comprehensive six year high school in the southern parts of Tel-Aviv. Gimel High School has just moved to its brand new building and both staff and students are in the process of getting acquainted with the new environment. The school has a total of forty-two classrooms, two computer rooms, three science laboratories, a gymnasium, a library and a cafeteria. At the time of this study, Gimel High School had one principal, two assistant principals, for the junior high school and the secondary school and two guidance counselors. The school staff included eighty-seven classroom and subject-area teachers, four special education teachers, a computer coordinator, two computer technicians, two librarian, seven clerical personnel, and two maintenance personnel. The student population, 1320 in number, ranged in grades from seventh to twelfth and included special education services for 46 students with learning disabilities.

Interviewed Leader's Profile – Computer Coordinator

The computer coordinator of Gimel High School, who is referred to as Leader 3 in this paper, is 38 years old and has been in her position for two years. She is a new immigrant from Russia (seven years) where she worked as a computer technician. She found a position in the school as a lab technician and was offered the post of computer coordinator after three years of work. She works full time and is present in school five days a week, eight hours each day. She is very helpful and efficient and tries to participate in most of the workshops organised for computer coordinators.

"I believe it is very important to keep updated about what is going on in this field of ICT… Changes are continuous and there are always new things to learn and teach the other teachers."

Non-user 1

Non-user 1 has been teaching 7th grade for 9 years. The school she works at is located in a low socio-economic neighbourhood. She has participated in the course “Integrating Computers in the English Class” in the year 1996 and has since attended other workshops to learn more about computers. She has had an old home computer for five years, but has
recently upgraded it in January of 1999 to a Pentium III. She prepares all her worksheets and
class management material in her computer; however, she is frustrated since she has not been
able to take her students to the computer room for their English lessons. The computer room
is used by the computer teachers only who use it to teach computer and keyboard skills. In her
school, subject teachers, except the computer skill teachers, do not have any access.

“I really want to work with my pupils in the computer room and I know that learning
and teaching in a technological environment will be wonderful both for my pupils
and me. I don’t understand what good it is to teach them computer skills without
letting us, the subject teachers, ask them to make use of that knowledge in our
lessons.”

The school does not have a computer technician and a computer coordinator. The two
computer teachers have ‘invaded’ the room and are in charge of it.

School profile

Non-User 1 teaches in Shin High School, a comprehensive six-year high school in a low
socio-economic neighbourhood. The school has a total of fifty-five classrooms, one computer
room, three science laboratories, a gymnasium, a library and a cafeteria. At the time of this
study, Shin High School had one principal, two assistant principals, for the junior high school
and the secondary school and one guidance counselor. The school staff included ninety-eight
classroom and subject-area teachers, four special education teachers, no computer
coordinator, no computer technician, one librarian, seven clerical personnel, and two
maintenance personnel. The student population, 1660 in number, ranged in grades from
seventh to twelfth and included special education services for 63 students with learning
disabilities.

Interviewed Leader’s Profile – School Principal 1

The principal of Shin High School, who is referred to as Principal 1 in this paper, is fifty-five
years old and has been in post for six years. He started his teaching career as a history
instructor and has been a principal in two other schools before his present post.
Non-user 2

Non-user 2 is a 9th grade ESL teacher and has been teaching for 13 years in a very dilapidated school in Jaffa. The school has one computer room with very old computers and the room seems to be abandoned. The room is very rarely used by the science teachers who have software installed in the thirteen computers. Non-user 2 who participated in the 1994 course of “Integrating Computers in the English Class” accepts this reality with no complaints.

“From what I remember from the course, preparing lessons for the computer room is time consuming. Will anyone pay me for the extra time? As far as I am concerned I prefer it this way. Anyway, my principal doesn’t care so why should I?”

Non-user 2 was not required to take any computer classes as a part of her teacher training since 1994. She has taken one Internet workshop out of curiosity but has done nothing with the knowledge acquired. She has a computer at home but she never uses it.

“It’s my children’s domain and I am not allowed near it. Anyway, I don’t find the Internet such a great innovation. Too many negative influences, especially on the youth”

School profile

Non-User 2 teaches in Tuff High School, a comprehensive six-year high school in Southern Tel-Aviv. The school has a total of twenty-four classrooms, one computer room, one science laboratory, a gymnasium, a library and a cafeteria. At the time of this study, Tuff High School had one principal, two assistant principals, for the junior high school and the secondary school and one guidance counselor. The school staff included fifty seven classroom and subject-area teachers, two special education teachers, no computer coordinator, no computer technician, one librarian, three clerical personnel, and one maintenance personnel. The student population, 720 in number, ranged in grades from seventh to twelfth and included special education services for 13 students with learning disabilities.
Interviewed Leader's Profile – School Principal 2

The principal of Tuff High School, who is referred to as Principal 2 in this paper, is 58 years old and has been in her position for fourteen years. She was a mathematics teacher for twenty years in another school before she became the principal of this institution.

The Case Study Findings

The case study findings will be presented as responses to the main research questions:

Research Questions:

1. Has the training teachers received influenced their use of computers in their instruction?
   In terms of:
   - teacher training and implementation;
   - purposes of usage;
   - teaching strategies.

2. To what extent do school leadership and school culture influence the teachers’ incorporation of computers in their teaching?
   In terms of:
   - the principal as the leader of infusion of change;
   - school as a learning organisation;
   - support – leadership, professional, technical, environmental

3. What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?

4. Which of the following factors predict teachers’ computer use in classroom instruction?
   - attitudes and beliefs - computers;
   - continuous training – life long learning;
   - acceptance of change;
Has the training teachers received influenced their use of computers in their instruction?

Teacher training and implementation

All five participants, users and non-users, participated in at least one course “Integrating Computers in the English Class” and therefore could discuss their attitude towards the course and reflect on the influence it had on their teaching. They all enjoyed the course:

User 1 states that:

“I must admit that I was skeptic as to its practicality – I had been disappointed too many times in the past with courses provided by the Ministry. But this was a very pleasant surprise. Everything about the course was practical – the content, the way it was taught, the materials prepared for us and those we were required to produce, the reflections, the teamwork, the atmosphere.”

User 2 points out that:

“The fact that I participated in the course three times proves my opinion on the course. I must admit that the second time I was worried of it being repetitive – it was a totally new experience and just as enjoyable and exciting. Enrolling for the third time was only natural and I guess it will not be the last time. Each time I got so many new things, new ideas for activities, new technological tools, new sites, new teaching techniques.”

The non-users also voiced positive attitudes. Non-User 1 exclaimed:
"What can I say? It was attending this course that enabled me to understand my teaching profession better. It opened my eyes to a wide variety of possibilities which I was not aware of. Unfortunately I do not teach in the computer room because it is not available but I do integrate much of what I have learnt in my teaching — I word process all my materials, I use teaching methods that I adopted, Internet is my regular teaching resource."

Non-User 2 added that:

"It was quite a while ago but I remember the sensation of the discovery. I did not expect too much from this course but it was a kind of an adventure we went to each meeting. It was fun. I know I must be a disappointment to you since I do not implement what I had practiced then, but I really enjoyed it while it lasted."

All five teachers identified common components from their experiences of acquiring technology knowledge and skills. They also feel that because of time schedules and access issues; teachers learn only what they need or are able to use on a regular basis. In many instances the teachers will learn a new programme or skill when they are actually ready to use it with their students. User 1 recalled the early in-service technology training that she attended.

"It wasn't until I took my class to the computer room that I knew I could use it that I really started listening and learning from the training that was given. You learn it when you need it."

User 2 identified the importance of meaningful learning in acquiring technology skills. Teachers must have a need to know before the new information sticks or is meaningful to them.

"From my personal experience, when it's relevant to you and you see a use for it, that's when it becomes meaningful. And you have a reason to want to learn how to do it. A lot of times those things are presented in the course, but they don't stick until you come across it, and the real learning happens when you need it. It's so true when you teach someone else to do it or when you have to really think about how to do it, that's when the learning takes place. When you've really learned it and it's not just a, "Oh, that's neat." But when you can apply it somewhere, then you know it."
Non-User 1 admits that relevance is essential to enhance learning and since she has no access to the computer room she is not motivated enough to update the knowledge she has already acquired. Non-User 2 tries to justify the fact that she does not use computers:

"The day is just so full. I don't know anyone who has the opportunity to go out and investigate things further. Like maybe next year, I want to try doing this... and then actually following through with it."

The teachers admit that the course has provided them with educational applications that bear explicit connections to their needs which is one of the conditions for a successful and effective IT course according to Harrari, (1992) and Fullan, (1994). Training should help teachers understand how technology relates to learning processes both their students’ and their own (Salomon, 1996; Hargreaves and Fullan, 1998; Lawson and Comber, 1999; Chen, 1995). Schild (1997) who studied the progress of the "Tomorrow 98" project in Israel concluded that

"training that failed to satisfy the teachers’ professional needs and did not provide them with practical tools to incorporate computer technology in the curriculum of the discipline they taught, very often failed to achieve its goals" (p. 44) (Translated from Hebrew).

In a number of other studies conducted in American and British schools the IT teacher training has been criticised for not making connections between technology and its educational uses (Dede, 1997; DfEE, 1997; OTA, 1995). Russell (1995) concludes that technology will be used successfully in the classroom when an individual teacher identifies a relevant application and is able to connect it to his/her curricular needs.

The participant teachers prefer long, thorough courses to the short two day workshops. Studies have shown that courses provided over long periods of time prepare teachers for the use of computers in their teaching (Dwyer, 1994; Hargreaves and Fullan, 1998). Dede, (1997), Aviram, (1999) and Becker, (1994) point out that inadequately trained teachers, who were just provided with the mastery of basic facts, typically see computers as a non-essential source of enrichment and far from being integral to classroom learning. Teachers often have
difficulty in realising its immediate and direct usefulness in their daily teaching practices. David (1996), therefore, finds it necessary to develop training applications that redefine the technology within an educational context so that it can be perceived to help meet existing needs of the teachers.

The teaching methods used throughout the training course “Integrating Computers in the English Class” were mostly hands on which seems to agree with the learning styles of the five participants. User 3 advocates learning by doing, a technique which was used throughout the entire course. She is confident in her abilities to figure things out given enough time.

“I learn best by doing. If I can just sit down and start in on a project or a programme, I usually can figure it out and get a lot done. Finding the time to do it is the problem. I need a little uninterrupted time (1-2 hours to really absorb everything). I also learn by having other people show me how they work. I am usually a quick learner.”

User 2 is another learn-by-doing person. She feels that she has experience with enough different programmes that she can figure out new programmes fairly quickly by experimenting with them. She does recognise that she needs time to devote to learning the programme before feeling comfortable with it.

“My learning process with the computer is to just dig in and try. I do work better if I’m trying and there’s someone around that can help me if needed. I am definitely a hands-on type of person.”

User 1 likes to have someone show her how to use the programme and then have time to experiment with the programme.

“I like to learn with someone there to show me the basics and then I just need the time to play with the programme and to try things out. I learn a lot through others.”

She also identifies the critical issue of learning out of necessity when describing her learning process. She had to learn to use the computer in her teaching not because she wanted to, but
because the school principal asked her to lead the ESL teaching team in her school towards such a change.

Non-User 1 prefers using the tutorials and other written material provided to learn the features of the technology or software, and then experiment with it.

“My process involved reading the instructions and trial and error. There was usually an assignment to practice and I went through it. Time spent varies on how much I use it and how complicated it is.”

Even though Non-User 1 has taken previous classes that were helpful, she still felt that she had acquired her knowledge by "spending a lot of time on the computer."

Non-User 2 also believes that computer technology is best acquired through hands-on experience.

“That's basically how we've acquired our computer knowledge. Just messing around doing it. Sitting down and trying things, and not being afraid to blow up the machine. That's probably the foremost important thing we've learned.”

Teachers need experience using technology with their students. This is essential and the only way to acquire this practical kind of knowledge is by trying the lesson in the classroom. The experiences add to the teachers' knowledge base. Even though there will be problems to overcome, the only way the teacher will learn how to work around these issues is to test the technology lesson with students in the classroom. User 3 feels that experience has given her more control when using technology in her classroom.

“And I think that scares some people because I don't know if a person would think of all of the issues. If you hadn't taken enough classes, if you haven't had enough experience, you wouldn't know that the server could be down. I thought that was just something that always existed and worked." And see that just goes back to what it is that you want to learn and what you want to know and how much control you want to have.”
User 2 also feels that experience is required to acquire the necessary skills to use technology effectively in the classroom. The more experience and technology skills the teacher has, the more control they will gain over the variables that a computer introduces in the classroom.

This consensus among the teachers is justified in the literature. Pedler et al (1988) conclude that teaching involves thinking through how the content and processes of learning can be redefined in ways that engage students and teachers in the active pursuit of learning goals—a joining of experiential learning and content knowledge (Pedler et al, 1988). Kolb, one of the most influential researchers in the field of experiential learning, declares, "learning is the process whereby knowledge is created through the transformation of experience" (p38).

Fielding (1994), however, warns that learning may suffer where there is marked mismatch between the style of the learner and the approach of the teacher. Nevertheless, in the five case studies reported in this paper, the teachers' learning styles matched the experiential approach which was the one adopted for the course “Integrating Computers in the English Class”.

When it came to the implementation and infusion of technology the user teachers all described benefits from working with a partner to integrate technology into their teaching. They identified the importance of collaborating with a peer, discussing technology, learning new skills, planning new lessons, and solving problems. User 1 and User 2 have colleagues in their school with whom they plan and prepare activities which can be used in the computer environment. User 3 does not have a teacher that she works closely with since it is her first year in this school and collaborative work does not seem to be common among the English teachers but she hopes to gradually change things. User 2 views her partner as a support person as well as someone to create and design new lessons with.

“I always work with Ronit. She seems to be one of those people that if you show interest, she will help you out a lot. We complement each other’s ideas.”

User 2 feels that working with a partner has also helped her with the amount of time that she has had to spend to incorporate technology into her teaching.

“There is just too much to know in technology and not enough time for a typical classroom teacher to learn it. Having a partner to share in learning the process or to
share in all the preparation makes it possible to use technology. I also lack a lot of computer knowledge so I need that person to help back me up and to lead the way."

User 3 affirmed User 2's perspective on working with a partner.

"It is very helpful to have someone to work with. No one has the time or the energy to devote to a project on his or her own. You need moral support for when the computer crashes. You need someone to laugh with when things fail."

User 2 also feels a partner is valuable to review or assess the effectiveness of the technology lessons that they create.

"Having a partner helps me tremendously because I have someone to share ideas with, to say, "Let's do it this way." It is helpful to have someone to do the planning with and review, "Did this work? Is this something we feel really met the curriculum needs as well as technology needs?" Someone to sit back and say, "Are we doing this just for the technology or are we doing it to enhance curriculum?" And, I don't know if we have a unique situation, but my friend and I just work well together. It's wonderful having someone to bounce ideas off and to get feedback."

The teachers felt having a partner was important for those who were incorporating technology into their instruction. When asked for their recommendations, the teachers all suggested that other teachers should find someone else to work with. User 3 summed up the teachers' recommendations.

"Find a partner. Work with someone else, otherwise it's quite frustrating. Or have someone that you can troubleshoot with or go to. Someone that you can go to so you don't get frustrated and just completely quit. I think that's important. Just have some support there."

Collaboration with peers is an important means to enhance computer use (Geoghegan, 1995). Kozma and Johnson, (1991), Chen, (1995) and Means and Olson, (1994) indicate that efficient training takes place in heterogeneous, collaborative groups and school cultures that encourage cooperative practices among the teachers provide the suitable environment for the
widespread and successful implementation of computer technology (Leithwood, 1992). Putnam and Borko (1996) suggest that teachers find it easier to construct their new and innovative teaching practice in a computer-based environment within "the context of supportive learning communities" (p. 16).

User 3, who failed to team with her peers seems to have found a solution.

"Whenever I need help, especially in technological matters, I turn to my students. They are such geniuses!! They know everything about computers. But I also turn to them for advice about the type of activity they prefer in certain occasions when I have a dilemma. They now what they like to do and as long as it is in English and accomplishes my teaching goals what do I care what the activity itself involves – be it a game, a puzzle, journal writing, research or any other."

This shows that collaboration may be multifaceted. Phillips (1997) claims that learning with computers is almost always likely to involve an element of collaborative learning, but not only collaboration with peers. Teachers should expect to learn at the same time as pupils and to take the lead in learning with them. Pupils are likely to understand the technology better and support teachers and learners when needed.

**Purposes of usage and teaching strategies**

**Planning the Lessons**

All the participants of the course "Integrating Computers in the English Class" were involved in planning and producing computer based lessons as one of the course requirements. In addition to that, the user participants have been engaged in teaching in a computer based environment for a few years and planning lessons for such an environment has become almost a routine. Therefore the three user teachers, when asked to plan a lesson for the study, were experienced enough to proceed with the task with relative ease. However, to be able to follow the process, the three user teachers were involved in an active e-mail correspondence with the writer of this paper describing the process of their lesson planning, their frustrations, their achievements and satisfactions. The final products of this correspondence were three learning units, the lesson plans and the instructions file the learners get. (See Appendix E). This
section provides a description of how the teachers plan for and use technology in their classrooms, the types of activities they engage their learners in and the progress they see in their learners’ achievements as a result.

The planning process is very often time consuming and frustrating. User 2 feels that the process of planning new technology lessons could be overwhelming.

“I'm not learning everything about teaching when I try to do the technology, I'm just learning a new method. It is overwhelming at the beginning. Well, when you try to do something new with technology, it can seem overwhelming at the beginning.”

Planning a classroom lesson is a complex process that gets easier with experience. User 1 states;

“It seems like no matter what it is we do, there are things we haven't planned for, no matter how carefully we thought we've planned because it's so new to all of us. I don't think our administrators have a clue how much time we've spent, our team's spent on technology this year.”

Through their descriptions of the planning process, the teachers identified factors which were new and took more time in planning technology lessons.

Users 3 identified the frustration of not finding the team to work with.

“I turned to three ESL teachers in my school to work with me in planning the computer lesson. None showed any signs of enthusiasm. They have never done it before and were reluctant to try. So I did the whole unit on my own. Things were different in my old school!!”

The teachers experience a variety of frustrations in planning technology lessons because of new variables involved when using technology in the classroom. User 1 discussed several components that needed to be addressed when planning a technology lesson.

“With so many things to think about that are not considerations in the classroom, i.e.: computers working, enough computers for class, is the lesson a valid idea to the topic, can you handle a technical issue that arises? It does take more planning. When
using the Internet, a teacher must do searches, locate sites, create a flowing lesson, and question at the right level.”

User 2 feels that thorough planning is the key to using technology successfully in the classroom. She views planning time as a "painfully fun process." User 2 likes working with the technology, but the time consuming process of planning for it to work well is the painful part.

“I think not only because kids say, "Yes, I can do technology," but they really can't do a lot of technology, so not only do you have to plan a lesson, you have to plan a way to teach the process to do the lesson. But you get into a technology lesson, now you have to deal with things like, "How do I move a mouse? Where do I save? Is my disk going to crash? I don't have enough room, What if I run out of time?" Those sorts of things make you break lessons down into a lot smaller chunks than you would a standard quote unquote 'classroom lesson' would have to be done in, and so that is why it requires more time.”

User 3 feels that planning a technology lesson takes more time because she must consider a lot of variables before she is sure the lesson will be effective.

“Planning a lesson including technology takes more time for me because I need to plan on how to present it so that there is as little wait time as possible for my students. Teenagers tend to get restless and bored. I also want the technology to enhance the curriculum and don't want to throw in the technology just because I think I should be doing it. When I'm doing a class project using technology I need to have a plan for how to best carry out the assignment, making sure that all learners have the opportunity to use the technology.”

User 3 also explains that her planning includes time for all of the "unknowns" that she has to be prepared for.

“I think our problem is we really need about an hour or two of uninterrupted time on the computer to work out the bugs. Also, there are a lot of unknowns out there. How will scanning the pictures work? Can the students successfully download pictures
they would like to use onto the programme? What about other sound effects from other programmes?"

User 3's view of the "unknowns" is that it forces her to be very organised. There are things that can go wrong in a technology lesson that would not be an issue in a traditional teaching setting.

"I think I'm more organised probably. You have to be prepared for anything, the computer might shut down, what are you going to do, you don't usually have that happen in the classroom. So you have to be very organised. Organisation, I guess is the biggest one."

Thinking through all of the variables which go into making a successful classroom lesson is a process which requires practice. When a new variable, such as technology is introduced, the teachers have to experiment through trial and error to discover which instructional methods will work best for their classroom.

These issues of time and frustration are often mentioned in the literature. Chen (1995) lists these as common obstacles encountered by teachers who are willing to use computers in their teaching. A variety of studies have shown that teachers complain that they lack the time to learn, incorporate new technology, to develop lessons and plans for computer based instruction (Sheingold et al, 1993; Becker, 1994; OTA, 1995; OFSTED, 1995; Schild, 1997). However, in spite of this, more and more teachers overcome these barriers and integrate computer technology in their teaching (Ager, 2000; Aviram, 1999).

**Designing the lesson**

Organising a classroom lesson involves making decisions about which instructional strategy would be most effective for the lesson and the students. The course "Integrating Computers in the English Class" was designed to follow the constructivist approach in the attempt to model the kind of teaching and learning suitable for a technological learning environment. Following the constructivist approach the participant teachers have tried and continue to experiment with different teaching strategies to determine which are the most effective for students in their classrooms.
User 1, with great enthusiasm, expresses her pleasure in deciding which strategy to use for each teaching goal she has.

“It’s great to figure out where my students will lead me in their work. I try to plan my lessons in such a way that they may reach the sky if they want to, and they do indeed in so many occasions. “

User 3 often turns to her students for advice concerning the type of activity that best fits the unit and its goals. She tries to provide choice as often as possible in order to satisfy the different learning styles of her learners. User 2 admits to being more traditional by planning very organised schemes for each lesson and trying to leave little to chance although she admits that:

“very rarely do things work out exactly as I planned them. In fact I always learn something new from my own lessons or rather from the things that happen in class during the lesson.”

All three users expressed their belief that the constructivist approach seems best for the computer environment. They, however, pointed that since they began using the computers they have adopted constructivist methods in their regular classroom teaching as well. (This issue will be discussed in further detail later in this chapter. Land and Hannafin (1997) conducted a qualitative study of a constructivist, open-ended learning environment and concluded that effective constructivist environments rely on the quality of the learner’s task management and on how well the learner is guided or cued throughout the lesson. Consequently, skilled teachers and well-designed lessons are required to facilitate constructivist learning (Idan, 1998). Von Glaserfeld, (1996) adds that teachers cannot transfer meanings or concepts to passive Learners are expected to have ownership of the learning process, experience with construction of their own knowledge, and self-awareness of the knowledge construction process (Boyle, 1997).

Effective lesson design also involves understanding the technology application well enough to understand how it will best be used in the classroom. Teachers have to prepare the computers, sometimes check out equipment, or load software before the lesson is ready for use with students.
The teachers should understand how to use the technology resources effectively with students when they design the classroom lesson. User 3 feels that some teachers don't spend enough time with a technology resource to fully understand it before they use it in their classroom.

"I would like other teachers to understand the amount of time "playing" with computers before a lesson can be used. The worst thing that a teacher could do with a technology lesson is think that they will just "send kids to the lab" to do a lesson and have the computer teach for them. So often a kid is sent to get on the Internet and search for a topic, with the teacher thinking that they are dealing with a very sophisticated encyclopedia. This is so far from the truth."

The level of understanding the teacher has about the technology resource itself is one factor in determining how well the teacher will be able to integrate it successfully into his or her teaching.

One issue for teachers is the difference between creating new instructional projects and using commercial software programmes that can be purchased. User 3 described the difference in designing a lesson using a commercial software programme or creating custom technology projects for the classroom.

"Time" is a critical factor for me because I don't have "time" to create quality technology lessons to use in the classroom. "Time" isn't a problem when using Into Reading (a commercial reading comprehension programme) because it has been created already. It is when you have to create something specific to the curriculum area you are on that takes so much time."

User 1 refuses to use any commercial software. She feels that it is too structured and soon tends to become boring. She claims that the efforts she puts into preparing her lessons are worthwhile since once she has invested time in developing a technology project for the classroom, she plans to use it for more than just the current school year.
"Hours can be spent preparing a multimedia presentation to use for sharing information with a class. I'm sure that I have ten or more hours in preparation time (in a project). Now that it is made, I use it every year which saves time."

Teaching Strategies

Adopting teaching strategies that best fit a computer setting is one of the difficulties encountered in the process of integrating computers in teaching. Hargreaves and Fullan, (1998) point out that teachers are very much inclined to teach in the way that they were taught and even when they are presented with new possibilities, there is evidence that they filter and select those parts that fit their personal perspectives and intuition (Rosso et al, 1998). Throughout the course “Integrating Computers in the English Class” the teaching methods were thus chosen to fit the setting and the teaching goals. Each session was then followed by reflection on the teaching methods used. This was intended both to model a constructivist approach as well as to deepen the understanding of the benefits of particular teaching strategies in certain situations.

The researcher of this paper, who also taught the course “Integrating Computers in the English Class”, observed the three user teachers using a variety of instructional strategies when incorporating technology into their classrooms. However, all of the instructional strategies had one thing in common. The three teachers used strategies in which the students were actively involved in using the computers to achieve an instructional objective. This seems to agree with the views of constructivists such as Bruner (1995) and Inge (1996) who claim that learning is considered to be most effective where learners are pro-active in and control the construction of their own knowledge through active engagement with realistic tasks in authentic contexts using actual tools. There is an emphasis on process rather than specific learning outcomes, and as a result, these will be less predictable and may vary from learner to learner (Boyle, 1997). In all of the classroom observations, the students were working with a partner to do the assigned activity. The students sometimes chose to work independently when doing searches on the Internet. In User 3’s class she had them assigned in groups to do their research and projects. This also follows the constructivist approach that encourages collaborative work (Phillips, 1997) who concluded that, when working in collaborative computer supported settings, pupils are likely to investigate and develop not only their own ideas but the ideas of other group members.
The three participants incorporated technology into their classroom primarily as a student productivity tool. User 1 described why she feels using technology for student projects is effective for her students.

“I guess that we’ve always done projects, but in other ways. This just seems to keep the student’s interest and they’re more willing to find out things on their own.”

Observing the lesson User 1 had prepared it was evident that the pupils enjoyed every minute. They were involved in looking for information on famous singers and basketball players. The Hebrew language was mostly used in the discussions they held, although User 1 made several attempts to encourage them to switch to English.

User 2 feels that her students are more motivated when they are actively involved in using the technology. User 2 with her colleague designed a classroom lesson which required the students to find information on their own computers and work together to complete the assignment. User 2 explained why she felt the lesson design was effective for her students.

“I like the way we did it. We had teams of two working together. The team work encouraged a lot of discussion and provided decision making.”

The observation notes confirm her impressions. Throughout most of the lesson the pupils (34 were present in the computer room) were engaged in active discussions in the English language, which is a foreign language to all of them. User 2 was busy moving from pair to pair joining in their active conversations.

User 3, as part of the email correspondence which accompanied the planning and designing of the lessons, described a lesson design in which she was incorporating Internet and word processing and encouraging creativity:

“I figured what we would do is, I would come up with a way of using the Internet that the students could investigate all three countries. I’m going to get them into groups of probably two to do their computer investigation and then, using some questions, they’ll have to go back and do some investigation out of the book and see
what background information the book gives them. Then I have tried to find some sites out on the Internet that are real valuable, that at least I thought were valuable, and then have the pupils read through some of that, and then answer some questions based on what they read out of the web page itself.”

Even though User 3 was planning the technology lesson very carefully, she acknowledged some concern because the lesson design would create a different teacher role for her in the classroom. It is important to note that User 3 has previously taught in such an environment but it is her first attempt in her new school with that particular class. Her concern is that her learners might not be accustomed to the new role their teacher is undertaking.

“I’m going to turn the pupils loose to be their own learners, and I’m really going to be the instruction facilitator. I’m just going to kind of help them where they have problems. So, we’ll see how it goes.”

Observing her lesson proved that User 3 had nothing to fear. After a very short (eight minutes) frontal introduction, the pupils were sent to the computers to read the instructions on their screen and work accordingly. User 3 was busy helping those who needed her help. The last five minutes were frontal again during which User 3 attempted to understand her learners’ impressions of the lesson. They all admitted to have enjoyed the activities very much. When asked whether they had learned anything new, here too many of them came up with new expressions and vocabulary, pieces of information on the countries they investigated, new technological skills they were not previously acquainted with.

It is important to note that in all three lessons the learners were provided with choice and the activities were open enough to fit a wide variety of learning styles. When asked about it in the interviews, the teachers admitted that it was intentional. User 2 said:

“Since I started working in the computer room I have somehow become more aware of my learners’ heterogeneity. I prepare my lesson, for regular classes as well, as open and varied as I can make them. Once it took a lot of effort to do it. Today it is almost automatic”
This seems to fulfill both Gardner's (1993) and Kolb's (1987) theories which emphasise the different learning styles and the necessity for a wide range of teaching methods to meet the learners' individual needs.

The three teachers acknowledged that their technology lesson designs created change in their role in the classroom during the lesson. The teachers saw changes in their teaching role in the classroom when they designed technology lessons where the students were actively involved. After providing instructions and information about the process necessary to use the technology, the teachers worked more as a facilitator than instructor. During the interview User 1 explained that teaching with technology allowed her to teach more as a facilitator.

"I guess it's something that I've always believed in, but technology has allowed me to do it. Computers have allowed me to do that more so. And what I see happening now with the computer is the interest level is so much higher that they are willing to do more research and seek out new information. So yes, it's changed on my part. I don't have to do as much prodding at all, they do it on their own. They even come to me with ideas, "Can I do this?"

The observation notes point out the continuous active participation of all the learners in the activity. When the bell rang to declare the end of the lesson, no one even noticed it; they all went on working until User 1 firmly demanded that they leave and go to their next lesson, promising to let them continue with their work during the following English class.

User 2 doesn't see this teaching role as much of a change from the way she does most of her teaching.

"My role is to assist them after they've gotten started and also to give them the tools they need to start in the first place."

User 3 describes her role during a technology lesson in much the same way.

"To begin with, I would say I'm more of the teacher role because you need to show the pupils exactly what they're going to be doing if it's something brand new to them. From then on, I hope to be more of a facilitator, troubleshooter, someone there in case they need me."
While she doesn't feel technology forces her to change much, User 3 noted that she probably taught more in a "teacher role" than a "facilitator role" when not using a technology lesson.

In the interview User 2 described how her role as a teacher in the classroom has changed as a result of using technology.

"The more I experiment with different programmes and the more chances I take working with the computer with my students, the better I get at using the computer and solving its endless problems. I have gotten over the feeling that I have to know everything about the computer or programme in order to use it in the classroom. If I didn't, I would never use the computer. I have gotten used to the fact that I am not always the teacher in the classroom; many times using the computer the students have taught me things I didn't know and sometimes I teach them and sometimes we even discover something together."

This change of role is noted by a number of educationalists. Murphy, (1997) believes that the role of the teacher and the purpose of learning materials is to facilitate active learning, during which learners construct their own holistic understandings, rather than design tightly specified, linear teaching programmes that impose given knowledge structures on the learner. Reformed classrooms that focus on student-centred learning rely on teachers as facilitators (Kozma and Johnson, 1991; Means and Olson, 1994; Chen, 1995).

Designing technology lessons where the students are actively involved not only changes the teacher role, but also seems to impact on classroom management issues for the teachers. The user teachers felt that if the technology lessons were well designed and planned, the classroom management while using the technology lesson was usually easier than on a traditional teaching day. User 1 pointed out that

"the pupils are so busy in performing their task that they forget to be 'naughty'. Very often they don't even want to leave the class when the bell rings."

During the three technology lessons it was observed that the teachers were usually on the move answering student questions, but the students were focused and "on task" and there did not seem to be any unusual problems relative to the inclusion of the technology.
User 2 had her students working on a technology project in class and described management issues she encountered during the experience.

"I guess it is going OK. Some of them are moving right along and others are struggling....Some of the kids are doing a great job and they are really enjoying it. Others are a bit frustrating...they act like they are scared to try it and experiment..."

User 2's final report on the experience during the interview helped explain the entire scenario of incorporating this particular technology project into her classroom.

"And there was a moment there when I thought, why in the (whispering) hell are you doing this project? Are other teachers saying the same thing? (I nodded yes to User 2) Good. But in the end it's been worthwhile. Oh, the projects are beautiful."

The quality of the students' final projects along with the skills she feels they acquired convinced User 2 that the management of incorporating the technology lesson was worth the extra effort required. User 3 offered a concise summary of the role planning plays when incorporating technology into the classroom.

"I want teachers to understand how much time, learning, and creation goes into a lesson that may only take a single class period. Like anything else, what you put into a lesson is what you will get back. With a computer lesson if you put nothing into it as far as time and preparation, nothing is what you will get back coated with a good dose of frustration on the part of the students and management issues to be handled by teachers."

Changing classroom lessons to include technology components takes planning time and energy. Most teachers need motivation to change their teaching strategies.
To what extent do school leadership and school culture influence the teachers' incorporation of computers in their teaching?

The extent of the influence of school leadership and school culture on successful implementation of ICT in schools has been one of the main issues investigated in this research. In situations where the teacher is willing to perform the change, has received all the relevant training, has access to the equipment and yet fails to take the final step and teach in the computer environment it is necessary to look beyond the teacher in order to find the reason why, and to look at what has been referred to in this thesis as "external forces", the principal, the school culture, the peers, the students and, the community, the government.

The principal as the leader of infusion of change

Both the teacher and leader interviewees indicated that principals are the primary initiators of change and that the compelling factor motivating principals to examine and consider change(s) is improvement to the instructional programme. The participants saw their school principals as their leaders towards either success or failure as the case may be. This agrees with the conclusion derived from the research conducted by Hall et al (1984) which examined the principals' ability to bring about change in schools. These studies found a clear relationship between teachers' success in implementing new curriculum practices and a particular principal's leadership style.

Leader 1 stated with total confidence:

"In our school it is the principal who initiates change. It is true that often the necessity is a top down policy regulation initiated, for example, by the Ministry of Education, as is the case with integrating computers in our school."

Leader 2 added that in her school the principal initiates the change but he is very consistent in including teachers in the decision making process (Bush, 1995; Bass and Avolio, 1993).
"Before introducing computers to the school, our principal organised a team of teachers consisting of the math teacher (who had some knowledge on the topic), the English teacher who was participating in a computer course at the time, the two supporting principals (junior high and high schools) and an advisor from the Ministry of Education. I joined the team later in the process. Today, many members of our staff are somehow involved in teams that decide on different school matters, not only computers. It works wonderfully for our school."

User 1 believes that the principal in her school does a very good job:

"Our principal played the role of facilitator for staff and guide for the change process. He encouraged and provided personal and professional growth opportunities; he promoted teachers to leading positions and gave them new responsibilities. Teachers who were "grey" before the introduction of computers in school became leading figures almost overnight. They worked very hard and still do but they wouldn't trade this opportunity for anything else. I should know since I am one of these teachers."

Leader 1 adds to this:

"The principal in our school provides any means of support required for successful infusion of change. He funds workshops, provides teachers with extra time, takes an interest in his staff on personal and professional levels. This behaviour, undoubtedly serves as a catalyst to fuel and energise a system of change."

This seems to be a description of collegial management structure where power and decision-making are more widely shared (Bush 1995; Crawford, 1999), which may explain the widespread and successful implementation of computer technology in Bet High School.

This may also be the case with Alef School. User 1 recalled that introducing computers to school was a very strong experience which started long before "Tomorrow 98".

"My principal discussed the innovation in one of our teacher meetings in 1990. We really did not understand what he was talking about. However, his enthusiasm was soon spread to all of us – it was a really interesting period and we all felt like
pioneers. He trusted us, teachers, to decide on crucial matters such as how to organise the rooms, what training we needed, which software to buy. We didn’t know much about computers but learning about it together was so helpful.”

However, some interviewees mentioned outside forces as the main influence of change. Non-User 1 complained:

“I don’t believe that anything innovative would have happened in our school without the forceful intervention of the Ministry of Education. It is a fact that our schools have computers but unlike other schools, nothing is done with them because our inspector from the Ministry couldn’t care less. I compare this to my children’s school and the difference is enormous.”

Principal 1, the principal of the school Non-User 1 works in, thinks otherwise:

“All the really significant changes in my school were initiated by me with no interference of external forces. When it comes to computers, I don’t think that subject teachers should teach in the computer rooms, despite of what the Ministry believes. When all the classrooms will have computers in them things might change. I am the principal and I decide on policy and priorities, with all respect to the Ministry.”

Principal 1 adopts the more formal managing model. The attitude of the school principal, Principal 1, is the most important factor in influencing attitudes towards computers and IT (Crawford, 1999). This is the main reason Non-User 1 does not teach in the computer room although she expresses her desire and willingness to do so. According to Principal 1’s understanding computer rooms should be occupied by computer skills teachers only rather than disciplinary teachers such as Non-User 1.

Another force mentioned as that which infuses change in schools is bottom-up initiatives generated by students, teachers, and parents.

User 2 recalls that

“...it all started when a group of parents turned to the principal with “an offer of money he couldn’t refuse” to buy computers... I realise that without the enthusiasm
of these parents things would have happened much more gradually...In our school parents are very involved and very influential, for the better and for the worse.”

Leader 2 from the same school agrees with the teacher participant.

“Our principal is a “doer” but he always turns to the parents’ committee for advice, support and budgets...He is always eager to please the parents and students and teachers often complain that they are last on his list.”

This principal may be seen as the “political” type whose efforts are concentrated on the successful outcome of bids for funding rather than on the integration and support of new and existing technologies (Bush, 1995). However, Bet High school is very successful in the implementation of computer technology and Leader 2 points out that more than 80 per cent of the teachers use computers at least once a week.

Non-User 2 thought that bottom up decisions are definitely not working in her school

“The students complain all the time why they never use the computer rooms. I have heard parents mentioning it in several occasions to the principal, but nothing really happens as a result. I guess that in this area parents’ and students’ opinions do not really count. Sad but true.”

When the principal of the school (Principal 2) was confronted with this complaint, he refused even to consider it. All he was prepared to say was:

“I was given the post and it is I who will decide what is best for the school and act accordingly! ....For change to be considered it needs to be meaningful and beneficial for teachers and students. I don’t believe that infusion of computers fits this need and there is research to back my belief.”

It is this formal model of management that Principal 2 demonstrates, that fails again, like the case of Principal 1, to infuse computer technology into the school in spite of the demands of the internal (teachers) and external (parents) communities. Research has shown that if computers are ignored or merely accepted by the formal principal, they will be marginalised within the school (NCET, 1994, p26).
Infusion of change and school culture

All respondents mentioned that whenever change was introduced into their schools a process or framework existed, known to all in the school culture. They all admitted that change was a regular part of their school culture. It is interesting to note that the amount of change occurring in each of the five schools might have been different to an outsider, yet the participants' impressions were that in their school change was a never-ending occurrence and an integral part of their school culture. The term "change" was used for every type of change introduced to the school system and not necessarily computer technology in teaching.

User 1 discusses her school culture and the way change is implemented within that culture:

"Our principal values the idea of "the human element" and the importance of taking both a personal and a professional interest in people leadership, good positive communication, and an ability to facilitate ideas, processes, and people. Change is something easy to introduce in our school since we are all part of it and want it to succeed."

Leader 1 confirms these claims:

"Our school principal identifies the qualities of the "big picture" and realises that personal satisfaction occurs from regular contact, involvement, and interaction with different groups in the school community on a day-to-day basis as well as in weekly and monthly meetings. This is a sure recipe for successful infusion of change."

This assurance may be found in the literature. Joyce et al, (1990), Sergiovanni (1996) and Busher (1999) realise that to perform change in school, values, beliefs, perceptions, and assumptions should be altered to permit the system to shift in orientation and thinking, allowing it to develop new paradigms. This may be done with relative ease in a trusting and collegial environment. Idan (1998) argues that culture is continually being recreated in an ongoing process of production and reproduction.

Both User 3 and Leader 3 agree on the role their principal plays in creating a cultural environment which enables introduction of change. User 3 sees his role as:
“...providing a process or road map for how change is examined in the school culture and posing the question, "How do we look at new ideas?"... Strong elements of the process are communication, opportunities for participation, and involvement in decision-making.”

Leader 3 claims that:

“...the principal’s role is recognised as an element that can fuel and positively charge the school culture as well as the whole process.”

Leader 2 and User 2 emphasise the importance of the teachers’ satisfaction in their work place. User 2 humbly admits that she loves her job.

“When I hear teachers from other schools complaining about their work I really find it hard to understand. I love being within the school boundaries, teaching my pupils, gossiping with my colleagues, learning new things, discussing matters and making decisions that help promote certain ideas. I know that the pupils love it too. There is something in the air!!”

Barth (1990), Fullan and Hargreaves (1991) and other researchers are aware that better schools have a culture where teachers enjoy work and help establish a disciplined environment. Where teachers are respected for their professionalism, supported in their work, and given responsibility for school planning, their culture reflects a shared belief that they are important to the school. Such a school culture as described by User 2 is suitable to successfully infuse computer technology as is the case in Bet High School.

Non-User 1, however, describes a different school environment:

“It is not so much what the principal does to influence change, but how he does it. The principal has to be a good communicator, facilitator, and leader who has a true interest and concern for people to ease the change process. However, our principal isn’t. He does change things but without really bothering to find out how we feel about it. Maybe he shouldn’t? He has a job to do and he does it in the best way he thinks it should be done.”
This may coincide with Conley's (1993) view that a leader's job is to make conscious
decisions that have an impact on school culture in a way that makes that culture more
amenable to change and more functional in its delivery of services to students. Non User 1
admits that change does occur in her school when the principal makes the decisions which
influence the school culture and implements them with no staff interference. Computer
technology is not one of the changes that Principal 1 is interested in and therefore it is not
implemented.

Staff Development - the School as a Learning Organisation;

There was a consensus among all ten interviewees concerning the need for staff development
programmes to successfully enhance change into the school systems. Both teachers and
leaders expressed the importance of life-long learning for all staff members. This fact is
mentioned in the literature as well. The document published by the DfEE (1993) on the
reform of teacher training in Great Britain deals with the growing recognition that to perform
effectively requires a commitment to the development of skills throughout working life. The
report adds that investing in staff development is a powerful force for improved standards.
Other British reports, the Impact Report commissioned by the DES in 1993, the Stevenson
use of ICT-based work is primarily dependent on the teachers' participation in on-going,
carefully planned programmes of in-service training. The Harrari report (1993) emphasises
the importance of staff development in the Israeli schools who participate in the "Tomorrow
98" project and integrate computer technology in their teaching. The Schild (1997) study
further emphasised the crucial role staff development played in successful implementation of
IT in the Israeli schools. The Office of Technology Assessment in USA report establishes the
importance of professional development: "helping teachers use technology well may be the
most important step to helping students" (OTA 1995, p. 95).

Leader 1 claims that:

"... for any change to occur, the school has to provide its teaching staff with
continuous training and development. Participating in various courses has to become
part of the school culture.'
Bowles (1999) claims that since organisations are constantly changing and organisations find it hard to respond to change except through the development of their individuals, ways should be found that enable staff to recognise the necessity of learning and developing.

User 1 compliments her school principal.

"He (the principal) really turned our school into a learning organisation. It seemed like everyone wanted to know more about computers and how to integrate them in their teaching. I don’t know how he did it. There was suddenly this atmosphere in school of wanting to develop and improve – a kind of a 'mania'. I don’t recall our principal ever imposing it on us."

Both Principal 1 and Principal 2, although they do not approve of computers in teaching, strongly believe in turning their schools to learning organisations. Principal 1 provides continuous training and development.

"Participating in various courses has to become part of the school culture. I participate in as many as I have time for. I also encourage peer learning, especially among subject groups. I allocate at least one hour per week for each team."

Principal 2 imposes regular learning sessions on his staff.

"There are five different courses organised for teachers throughout the school year. Tuesday evenings is our study time and I expect all the teachers to participate in at least two. I try to participate in all three since I strongly believe that professionalism is achieved through learning. The topics chosen come from direct needs or general interest. We had an Internet course as well which was very popular among the teachers."

It should be noted that the principals claim that they participate in the learning to set an example to the rest of their staff. Researchers such as Southworth (1994), Fullan (1994), Sammons et al, (1994) and Lumby (1997), see the principal as the “leading learner” (Southworth, 1994, p. 53) who creates the right school culture and the kind of learning
organisation which promotes learning and generates a general involvement. Such a learning organisation provides a model of lifelong learning which leads to improving school effectiveness. Goldberg and Richards, (1995) realises that establishing learning organisations is a complex task which requires careful planning and effective management. Senge (1990) sums up the issue by stating that the leaders are the “designers, stewards, and teachers” (p.352) in a learning organisation and are responsible for building organisations where teachers “continually expand their capabilities to understand complexity, clarify vision, and improve shared mental models” (p.352).

Non-User 2 strengthened her principal’s remarks.

"The courses organised in our school are of a wide variety and usually very interesting. It is convenient that they are held in school on a fixed day so that no further organisation is needed."

User 2 points out that in her school one of the teachers is in charge of planning and organising the courses.

"All the teachers are welcome to offer topics of interest and lecturers and very often give the courses themselves. It really adds to the atmosphere of learning and wanting to know more."

Leader 1 describes the programme exercised in her school:

"The one factor that I believe is important in our school is cooperation, and just getting along with each other. Our principal has tried to fashion the staff as a coach of a sports team would fashion a team. We have a committee structure which has various initiatives worked upon, and teachers lead these. The principal does not lead any of these committees. Each committee is set its mandate and asked to set goals for the year. These goals are brought to the staff for endorsement and the committee then goes about its business. The principal does not intervene but is available to assist. He
often states that if a committee is to have autonomy to work, it must have autonomy to make mistakes as well."

Nevertheless, although all interviewees expressed satisfaction with the courses and workshops organised by the schools, professional development was not being exploited because, as User 3 voices it:

"We have too little release time to meet with colleagues for shared professional learning."

Leader 3 is aware that for professional development to have its ultimate influence,

"...teachers need to have regular professional sessions in various group settings and discuss professional issues. They should be paid for the time devoted to such sessions".

Putnam and Borko (1996) are in agreement with this statement. They believe that teachers need to construct their complex new roles and ways of thinking about teaching practice "within the context of supportive learning communities." (p. 16). Senge (1990) sees the learning organisation as a learning community "where people are continually learning how to learn together" (p. 3).

Leader 1 and User 1 both discuss the quality of the staff development programme provided in their school. Leader 1 describes a programme which:

"enables the teachers to share their knowledge as well as to acquire new knowledge. Some of the teachers know so much about so many things!!"

User 1 describes the training the teachers received in preparation for the introduction of computer technology into their school.

"In addition to the regular workshops to develop our basic skills, we sat with professional computer counselors who directed us towards creating practical materials to be used in the computer sessions. We were expected to practice within
our classes what we learned the previous evening. It sounds hard. It is hard. But this is what made it work!!!”

Deciding on the type of staff learning is a significant issue. Chen, (1996) claims that there is still widespread acceptance that staff learning takes place primarily as a set of workshops, a conference, or a project which mainly aim at providing teachers with information and skills. However, in the case of the adoption of computer technology in teaching, staff development often aims more than just to improve the teachers’ computer skills (Harrari, 1993). Staff development aims at having an impact on the teaching approach and alter teaching techniques both in the computer environment and in the regular classroom (Hargreaves 1994).

Similarly to User 1, User 3 points out that the hands on practice and the fact that she was expected to take her classes into the computer room from the very beginning of her training is what helped her most in her implementation of computer technology.

“Theoretically everything seems easy. It was frightening to go to the computer room with 37 pupils for the first time. Although I had a very well planned lesson as part of my training, I still could not anticipate all the possible problems and there were quite a few. To my complete surprise, I enjoyed every minute and so did my pupils!”

Kolb (1984), one of the influential researchers in the field of experiential learning explains User 2’s experience in that "Learning is the process whereby knowledge is created through the transformation of experience" (p38). Pedler et al (1988) state that a learning company is one in which learning and working are synonymous.
What limitations and obstacles do teachers have in their attempts to incorporate computers into classroom lessons?

Time, Training, Access and Support

Time, training, access and technical support are the major factors which determine whether teachers plan for and use technology in their classroom lessons (Rosso et al, 1997; Schild, 1997). Regardless of the amount of financial resources that a school spends on technology, the planning for time, continuous training, access both in school and at home, available support are issues will determine the level of integration of technology into the classroom (Green, 1996; Becker, 1996; Ross et al, 1997). Time is an issue which underlies every theme identified in this research and is included in the examples and discussion of each theme. Training is crucial since technology changes rapidly and teachers need to be updated on a regular basis. Teachers need to have reliable access and a personal comfort level with the technology before they will start planning content lessons which utilise technology resources. The issue of reliable support, especially technical, is a crucial issue especially for those teachers who lack the confidence.

Time

All the interviewed participants, teachers and leaders, recognise the complexity of integrating technology into the teaching. Finding time to learn technology skills and acquiring access to hardware and software to teach with is a complex process (Plomp et al, 1990; Schild, 1997).
However, interviewing the teachers failed to reveal any serious complaints about time problems.

User 2 acknowledges that using technology in teaching is something that takes time and requires practice.

“It isn't something you begin doing well. I'm not sure I will ever do it well, but the rewards of incorporating technology are worthwhile.”

The teachers view the time to learn technology skills as an investment, and something that is important. User 2 explained her view of the time required to learn technology skills.

"Today I feel fine about the time investment. At the time, sometimes it's real frustrating, but it's all been worth it. I feel that it hasn't been wasted time at all. It has taken a lot of time if I look back on the hours that I've spent doing things one way and then later on finding out an easier way and thinking, "Oh why didn't I do that earlier?" But for me the hands-on time investment is really important. That's how it sticks. And it's been worth it. Overall, some of the time that I've spent has also saved me a lot of time as far as for the personal use, teacher use, and notes that go home. I go in the next year and plug in a new date. So it's worth it. In the long run, I know it will save me time.”

User 1 feels that learning more about technology and how she can use it in her classroom is a benefit to her as well as her students.

“It's kind of like it's for me too. The more I use it with the kids, the more I know about. And I think as a teacher, it's important for me to stay up on technology. It's important to know what's new and what to do with it, and what kinds of things can be done in the classroom with the computers.”

User 1 feels that it is important enough to use in her teaching that she finds the time to work on it.

“I wish it wouldn't take so much time, (laugh) but I feel that it's important enough to designate as much time as needed to incorporate technology into my lessons. I wish I could do it this year which is not the case, but hopefully by next year, an additional
computer room will be built so I am creating new learning units and polishing the ones created as part of the course just in case. I think the time is very well spent.”

Non-User 1 refused to relate to the time issue as a problem.

“It is true that we constantly suffer from lack of time, but every minute I spend using technology is worthwhile. I wish I would be given access to the computer room. This is my problem!!”

Non-User 2 was the only interviewee who mentioned lack of time as a barrier:

“Teachers are expected to be supermen!! Even if my principal had insisted that I incorporate computers in my teaching, I would have refused. Where am I going to find the time for that!!”

The leader figures all agreed that the time issue is one of the major obstacles. Leader 1 spoke of her own experience:

“I know how long it takes me to prepare a PowerPoint presentation for a staff meeting when the principal asks me to. Expecting the teachers to prepare it for each lesson is really asking too much.”

Principal 1 also expressed his concern about the time needed to prepare a computer-based lesson:

“My computer skills teachers are very experienced in preparing lessons for the computer room and they still complain how time consuming the process is. When I think about letting the other discipline teachers, the ESL teachers for example, teach in the computer room, I can imagine the complaints then.”

Leader 2 mentioned the time and effort to keep updated with the technological innovations:

“I spend hours reading the relevant literature, visiting Internet sites, learning new technologies. For teachers to do that in addition to their regular work really seems mission impossible. But I see it as part of my work here.”
The interviewed participants, unlike research mentioned in the literature (Sheingold and Hadley, 1993; Lieberman and Rosenhertz, 1997; Becker, 1994; OTA, 1995), did not put the "time" issue at the top of their barriers list. Users 1, 2, 3 and Non-User 1 voiced mild complaints about the lack of time to learn more, practice, prepare materials and advance their knowledge, but in none of the cases was lack of time a reason to cease working with computer technology.

**Access to computers**

Unlike the issue of time as a barrier, both Non-User 1 and 2 blame lack of access as one of the reasons for their not using computers in their teaching. They both put the blame of no access to computers on their school principals. The former does not get access into the computer room because "it is always occupied by the computer skill teachers". The latter does not use the computer room because the equipment is outdated and since "the principal does not care", things will probably remain the same in the near future.

When confronted with the teachers' complaints, both principals refused to accept the blame. Principal 1 moved the blame to the Ministry of Education for not providing enough computers. Principal 2 blamed the Ministry for imposing change on schools without even checking its effectiveness – change for change sake.

Leader 1 summarises the issue of access:

"In order for teachers to use computers freely and confidentially, they (the computers) have to be everywhere – in the teachers’ rooms, libraries, offices, teachers should be able to borrow computers for home use. Principals should invest in technology if they want successful implementation."

The literature tends to agree with these claims and researchers point out that scheduling access to computer rooms is often difficult if not impossible (Russell, 1991; Becker, 1994; Sheingold and Hadley, 1993).
School Access

All five teachers report that time spent in course sessions was of great value to them but only when they had reliable access to computers did they get a holistic experience. Non-User 1 recalled a rare and early experience when computers were first introduced in her school.

“They gave us some background and then we were to sign up for an hour block of time to have it in our classroom to use it with our students. Most of us were afraid of the computer, and an hour is not enough time to really use the computer or to give the students enough time to use the computer, and what eventually happened was nobody was signing up for the computers.”

Eventually, Non-User 1 enrolled in the computer course “Integrating Computers in the English Class” which she found very difficult but intriguing and interesting. In order to better understand the course, she purchased a used computer to do the assignments at home. This seemed to be a turning point for Non-User 1. She described making "huge strides" in her knowledge of computers as a result of having ownership and access to a machine. Unfortunately, due to a number of reasons she has no access to the computer room and therefore, in spite of her desire to do so, she is prevented from teaching in a technology environment.

Principal 1, when confronted with the complaints of Non-User 1, blamed it all on the Ministry of Education for providing him with one computer room only.

“I was promised one computer for every ten students but since they count the computers previously purchased by the school and parents, we only got thirty five computers instead of more than a hundred. I should have gotten rid of the old computers before their count!!! Anyway, I believe that next year we will get an additional fifty Pentiums.”

Reliable access to the computer room was a prerequisite before User 1 started planning on using technology in her classroom.
"The computer lab may not be available when you need it, so you have to shuffle your classes around which takes time because it affects the other teachers on your team."

Using a computer lab not only involves flexibility from the teacher who wants to use the lab, but also from the other teachers who may have to switch their daily schedule to allow the teacher to schedule her class when the lab is available. Working out schedules in shared situations can be frustrating for teachers. User 2's frustrations include scheduling computer access to correspond with the sequence of her lesson plans.

"The lab is so popular and everybody wants to get in. It's hard to fit in the technology at the time most appropriate in your lesson plans, so you really have to be flexible that way. If you want to teach, for example, a different country at one time, and the science teacher has booked the lab for 2 weeks, you're going to have to change in order to do what you want to do."

User 1 expressed frustration at having to take extra time to try and work out the scheduling just to get access to the computers.

"Scheduling has been a problem in the past. This happened when we were trying to share computers and other equipment. Sometimes it felt like it wasn't worth the time spent trying to use the computer with the students."

Non-User1 complained that the one computer room in her school has been "invaded" by the computer skill teachers and no other teacher is allowed access.

"I really don't understand how this is allowed. I complained to the principal but since he does not really understand anything about computers his claim was that providing the pupils with computer skills is the most important goal."

Non-User 2 also realises the importance of access to technology but since in her case access is not a problem, this issue could not justify her lack of use.
When Principal 2 was asked about his attitude to his teacher's reluctance to integrate computers in her teaching although they were available, he remarked that as a teacher he is not convinced that integrating technology in schools is a positive turning point.

"I myself do not use one (a computer) and I don't believe that it is my duty to encourage my teachers to use technology, especially since I am not convinced of its effectiveness. I have excellent teachers who prove their excellence in so many different ways other than technology. When I wish for change to occur I have no problems in infusing it into my school organisation, but I must first be convinced of its effectiveness."

Home Access

Home access is also important to teachers who are working to integrate technology into their classrooms. Studies (Comber et al, 1997; Dede, 1997) show that for efficient implementation of ICT, computers must be available for teachers to use at school and home. The user group of teachers had invested in a purchasing or upgrading their personal home computer. The access to a computer at home is important enough to these teachers that they made not one, but two personal investments in machines for home use. The teachers cited speed, memory and Internet access as being reasons for upgrading their home computers.

User 3 describes the role her home computer has had in determining her use at school.

"The biggest advantage or role has been allowing me time to practice, play, create outside of the school atmosphere. Something about working on school work at home doesn't seem the same as coming to school and working on the computer. I don't get "burnout" as fast, but the distractions are greater, of course."

An underlying premise of home access is that the teacher would be spending personal time going back to school after school hours or during the summer to use a computer. There was not time during the school day for the computer use they were doing.
User 2 feels that home access is important because she finds quiet time to work later in the evenings. She feels that school time is just too hectic to try and do much work with technology.

“Yes, I have a computer at home. My best work is probably done at home when everyone has gone to bed or is outside. Without the resources at home, it would be very tough for me to get anything done.”

Non-User 1 is a very active user of her home computer. In addition to creating materials and doing her grades, Non-User 1 uses her home computer to evaluate and work on student multimedia project which they prepare using their home computers.

“Although I have no access to the computer room, I still use my home computer to prepare my teaching materials and I often involve my pupils in projects which require the use of computers. Since they are computer literate, the get computer skill lessons, they are enthusiastic about performing such projects.”

Non-User 2 is the only participant who makes no use of her home computer.

“It is my two sons who are the only users of the home computer. I never touch it and I guess I never will.”

Having access to a home computer is important to these teachers. Home access creates more opportunities for them to work on technology projects, learn new technology skills, or do teacher productivity chores at their convenience. It does mean that the teachers work on school projects at home and it extends their teaching day into their personal time. Whether the work involves a computer or not, it is very common for teachers to spend time on school work beyond the school day. The teachers cited benefits of being able to work at their convenience at home as a reason for investing in a home computer.
The time, access and skills are all necessary for teachers to begin planning how to use technology effectively in their classrooms. Creating lesson plans and developing projects that integrate technology into the curriculum is another part of this complex process.

**Support – leadership, professional, technical, environmental**

Among the gravest obstacles mentioned by the participants is that of lack of support. All the interviewees agreed that support of any kind added to the confidence and ability of the teachers in integrating computers in their teaching (Rhodes, 1996a; Chen, 1995; Schild, 1997). When asked about the types of support they needed and whose responsibility it was to provide it the responses were various.

Non-User 2 blamed it all on her principal and school culture:

“Our principal does not really encourage us to use computers. He himself is a bit intimidated by them. I think it all begins here. There is no lab technician in charge of the technology so teachers who are not technology experts refrain from using the computer room. This creates an anti-computer atmosphere in school so even the courageous teachers soon feel that the extra work they put into designing computer lessons is a total waste. With no support from the management, from the peers and from the technicians why should anyone bother?!”

Leader 1 puts emphasis on leadership support.

“He (the principal) is totally involved in everything that happens in school with computers. He inquires on the progress of the variety of computer-based projects; he volunteers advice; he publicly praises teachers for new adventurous teaching strategies and for their students’ satisfaction, motivation and achievements. He really makes it his duty to know everything and to make sure that everyone is aware of it. Although it is not payment, for many teachers this positive and supportive attitude is much more than payment.”

As to the contribution of the “right” school atmosphere that provides the basic support, Leader 2 and Leader 3 both agree that if the “spirit” of the school is computer oriented than
the teachers' performance will follow naturally. However, appropriate working conditions are essential - a working computer room, well equipped with the right hardware and software, and a lab technician to call whenever something doesn't work. Research mentioned in the literature tends to support these findings. In USA the Office of Technology Assessment (1995) researchers reported that only six per cent of elementary and three per cent of secondary schools have full-time school level computer coordinators. In Israel, Faba-Sack (1998) who performed a study in schools that integrate computers in teaching, says that only ten per cent of the participating teachers felt that there is adequate support in their school.

User 1 and User 3 both added professional support to the ones mentioned above. User 1 would like:

"a professional computer counselor to be available when needed to provide the professional advice, ideas for new lessons, information about the latest international project, new teaching strategies and more. We had such a person from the Ministry a day per week during the first two years of "Tomorrow 98". What do they expect in the Ministry, that two years is enough??"

Technical Support

Obstacles are common when using technology. They are defined for this research as problems that keep a teacher from using technology for instruction. An obstacle may be something as simple as not having the right cable to connect a peripheral device or much more serious such as a complex system conflict which keeps crashing an application the students are trying to use in a lesson. Obstacles take time to solve and can hold up a teacher anywhere from five minutes to five months. Obstacles might require outside assistance to solve and are sometimes beyond the control of the teacher because of knowledge, authority or budget. The good news is that obstacles are perpetual and are issues that teachers must deal with on a continual basis when using technology in instruction.

Teachers who use technology in the classroom need to have some problem solving skills in order to survive. There are an infinite number of technology problems, some small, some large, that can appear without notice at any given time. This makes using computers in the
classroom a risky undertaking and sometimes stressful for teachers. Teachers' descriptions of troubleshooting problems are the war stories of using technology in the classroom. All teachers who have used a computer in the classroom have a story to tell and no two stories are exactly the same. Most important, perhaps, is the fact that the teachers develop their own strategies for how to work through the problems they encounter. User 1 described her problem solving strategy as a series of levels or stages she goes through to solve the problem.

"Usually if I play with the computer long enough, I can figure out problems with software. If that fails I get out the guide and read. If I still have a problem, I call Benny, the math teacher, because he can figure out anything. I would rather figure it out myself though."

User 3 acknowledged things can go wrong when using technology and uses the support staff in her school to overcome the problems she encounters.

"It always seems like things go wrong when using technology, probably a reflection upon the use! We are very fortunate to have a computer literate media specialist who helps a lot and also, the computer technology coordinator is housed just down the hall. We use them a great deal."

User 2 relies on working together with her colleague to solve the problems they encounter.

"My co-worker and I troubleshoot a lot during the day with each other. I just tried this, I can't get it to work, what can I do? We rely on each other to get things going during the day."

User 1 feels that she has learned to deal with the problems.

"I flow with the disasters much better now. I feel I'm better at trying to problem-solve on the computer, or I know who to call or talk to when I can't figure it out."

She is very confident in her ability to solve problems. She is more adept at solving the obstacles that might hold up other teachers.
“Something that I can't fix? I look at the kids and I go "It won...the computer won." And then I go back later on and figure out why it did. I have yet to have a problem that hasn't been able to be solved by the next class period.”

User 3 feels that she can reduce the number of potential problems by thorough planning for a technology lesson.

“There's a reason that I haven't had a problem, that's because of the preparation...making sure that I've tried stuff before the kids get there. So I really play with things first. I really run through them first to make sure I can foresee a problem before a problem actually happens. I try to get rid of as many teacher mistakes before I do kid mistakes.”

User 2 also cited preparation as her first line of defense against the technology problems that occur.

“I think they're to be expected and you try to anticipate as many of them as possible before actually starting the lesson. You can't always do that, but hopefully, if you're prepared enough, you can alleviate some of those problems. I always try to come in early the morning of the technology lesson just to make sure everything will work okay. Prevention is the key for me!”

Thorough preparation takes time and energy to make sure that all of the equipment is ready to go and has been tested when the students walk into class. Even the best planning, however, will not insure elimination of all obstacles. The time to solve the obstacles is always limited and available in short blocks of time for teachers.

A problem-solving strategy that User 2 described using was letting the students problem-solve and helping each other first before asking the teacher to solve the problem for them. She thought it was as important for the students to develop problem-solving strategies as it was for the teachers.

“We've let the kids figure out the problems and we've watched them help each other and really that's probably the way it should be. They've been very frustrated and when their frustration level gets too high we step in and help, but because there's
been so many of them, they've had to figure out their own problems. Why don't you look up in the “help” menu and see what it says? or why don't you ask the computer technician?"

Non-User 2 claimed that her inability to solve technology problems is a major reason for her not using technology in her teaching.

“What am I supposed to do when the computers stop working? We do not have a lab technician to help me. So it seems like a wasted lesson. Definitely not for me!! I don’t like to feel helpless and I certainly refuse to let my pupils see me in such embarrassing situations!! (an angry tone)”

User 1 noted that other teachers might stop using technology when they encountered a problem that they were not able to solve.

“It probably could have made someone give up on technology. I mean, I did for a short time because I was so frustrated. I did go back to it, to that particular problem area we were working on. I did go back because I thought it was important for the kids to finish what they'd started, but I don't think I'd give up on technology completely. I mean, I don't think I would say, "I just won't use it anymore," but I bet some people might. They might say, 'Well this happened, forget it'.”

User 2 also believes that obstacles might stop some teachers from using technology in their classroom.

“I think that they could probably discourage enough teachers to stop using it. I know that there are some teachers after they've been in the lab a day with us would say it's not worth the headaches.”

User 3 viewed obstacles as "Just one more headache." She thought the positive aspect of problem-solving through the obstacles was learning the software more thoroughly. The teachers seem to take the obstacles in stride even though they can be a frustrating part of using technology in the classroom.
Finally, when asked if they thought that technology obstacles would ever be eliminated to make using technology in the classroom easier for teachers. The teachers thought obstacles would be something they would always deal with when using technology. User 1 offered her view.

“You'll always have that problem, no matter what you're using, whether you're on the Internet or you have conflicts between the software you've loaded. It seems like I'm always trying to find why something isn't working right. I think the obstacles will always be with us.”

User 3 feels that there are always obstacles in any activity that is creative beyond traditional lecture methods and that she will get better at solving the problems she encounters.

“The obstacles are always going to be there. That's going to be there in anything, I think, that you do if you're creative and just don't lecture all the time. Usually I can figure them out if I have enough time. A lot of times we have to rely on someone else, so you're pretty out of control a lot of the times. It just depends on the situation. I think with more practice, I'll get a lot better and maybe I'll have a lot more control than I have now.”

User 2 agrees that the obstacles will always be there, but she sees things improving in the future.

“I do see the software coming out which will give you more messages on screen, guiding you through that so that you don't make those mistakes and get yourself into as many holes as you used to. But so initially, I said, yes, I see them, but I do see them less frequently.”

User 3 summarised the role that unexpected obstacles have for teachers using technology in the classroom.

“It would be the same as if all of a sudden you didn't have copies for the day or somebody all of a sudden came across a textbook that didn't have a page printed in it. You just deal with it. It's just part of the game. You decide to use technology; well you also decide to deal with the problems at the same time. It is just trial and error,
trial and error. Process of teaching? It is just part of the game. You mess with the bull, you get the horn sometimes. You just stay away from the horns as much as you can.”

While technology obstacles and troubleshooting can be frustrating to teachers in the classroom, the problems haven’t discouraged the User teachers from using technology for instruction. Overall, they remain confident and optimistic about conquering or at least dealing with the technology problems that do arise. It is important to note that the findings in Schild’s survey (1997) in Israeli schools, where computer technology is integrated, emphasise the existence of successful implementation in schools where computer technicians and computer coordinators are employed on a full time basis and assist the teachers during the lessons. Munns, (1997), Ringstaff et al, (1997) and Symes, (1997) also believe that it is important that school educational computing expertise be available to provide assistance and advice when needed by classroom teachers.

There was no technical or professional support available during the three observations sessions in which the researcher participated. There were a number of problems involving technology in all three cases and in none of the lessons observed was there a technician or any other assisting staff present. In User 1’s lesson, three of the teams lost their work somewhere in the hard drive although they were instructed to save their work in a pre-prepared folder of the class. User 1 turned this problem into a mini tutorial on how to find your lost files using the ‘find’ option. She “wasted” eleven minutes on something she did not pre-plan but based on the remarks of satisfaction from her pupils, she certainly did the right thing and provided her learners with the necessary skills to find their lost files whenever this event occurs. User 2 had to struggle to solve a problem with an idle printer and was helped by one of her students who seemed to know so much about the computers and other equipment in the lab. Further investigation about this pupil explained his expertise – he is a “pupil assistant” who works in close collaboration with the lab technician. There are twelve “pupil assistants” in the school and they were all trained to help both teachers and pupils while working in the computer lab. The obstacles that User 3 encountered during her lesson had to do with very slow Internet connection. Unfortunately nothing could be done about this except encourage the students to wait patiently for their screen to appear. User 3 advised them to work on the planning, organisation and decision making while waiting for that to happen. There were a number of complaints verbalised concerning the problem but on the whole it was accepted with a relatively positive attitude.
Obstacles are not anticipated and so it is very difficult to learn the necessary information prior to the glitch's appearance. The teachers view these as learning experiences and try to remember the solutions acquiring their own remedies, tips and tricks in order to use technology in the classroom. An ideal situation according to all the participants is to have an assisting staff present in the computer rooms all the time to help solve the problems when they occur (Schild, 1997; Munns, 1997; Ringstaff et al, 1997; Symes, 1997) although not having such support did not seem to be a serious obstacle in the three cases of the User teachers.

**Which of the following factors predict computer use in classroom instruction?**

**Attitudes of teachers toward computers in the classroom**

As expected the three user teachers were very enthusiastic and sincerely believe that their teaching improved since they started using computers. Researchers mentioned in the literature (Means et al, 1994; Dwyer, et al, 1994; OTA, 1995; Sheingold et al, 1990, Chen, 1995) believe that teachers who adopt computers in their teaching often perceive that technology supports superior forms of learning and understand that computer-based technology can change the way teaching/learning occurs. Non-User 1 also belongs to that category and although she has no opportunity to teach in a computer environment she is very willing to do so and will probably face little difficulty when she is granted access to the computer room. User 3, however, admits that she was scared when she was asked by her principal to attend the course. User 3 claims that:

"Joining the course was a traumatic experience for me. I was actually forced by my principal. I am very grateful to him today and he knows it. The course really changed my professional career."

From the interviews with the User teachers, the three-stage model (Comber et al, 1998) - familiarisation, utilisation, and adaptation - could be detected. The first stage was participating in the course during which the teachers started using computers both for professional and personal purposes. Integrating them into their teaching was the next stage. It began with successful use of technology at a basic level and once the potential was discovered
moving to the third stage was only natural. In this stage of adaptation, the teachers who have
gained mastery over the technology used it to accomplish various classroom goals and were
active in the development of new active techniques using the technology.

It is only Non-User 2 who voiced negative attitudes towards technology. In her case it is hard
to determine whether it is her opinion that she is stating or that of her principal whose attitude
seems to influence the whole school. She does not use her home computer either which seems
to indicate a rejection of computers in general. She, however, excuses her lack of use with
arguments very similar to her principal’s. She claims that:

"the effectiveness of computers on students’ achievements has not been proven yet.
When serious research will show significant improvement, I guess I will start
thinking differently. Till then I will stick to the old and familiar methods which have
served us teachers for so long with relative success."

She may be termed as a “laggard” according to Kershaw (1996). Stoll (1995) argues that
some of teachers are not yet convinced that using ICT can be a way of improving the quality
of learning for their students as is the case with Non-User 2.

On the whole, throughout all the interviews with the teachers, mostly positive attitudes were
voiced and the interviewer’s impression was that in most cases, the interviewees were positive
and even enthusiastic about IT.

Continuous training of teachers in computer use – lifelong learning

There seems to be an agreement as to the importance of continuous training and life-long
learning among all the participants. Both Principal 1 and 2 declared that encouraging their
teachers to take courses and advance their knowledge was an important issue in their schools,
although it must be pointed out that neither of the principals mentioned computer technology
as the learned topic. The coordinators admitted that they were in constant pursue to enhance
their own knowledge in computer technology. Leader 3 has been participating in almost every
course on technology provided by the Ministry.
"these courses are both good and cheap. I cannot afford the more sophisticated and very expensive courses offered in the free market."

The literature emphasises the need for continuous learning especially when computer technology is involved since ICT skills quickly become outdated as technological innovations are constantly introduced (DfEE, 1998; OTA, 1995; Schild, 1997). Rhodes and Cox (1990), in their study in UK schools, found that short courses were not very effective in promoting uptake and that teachers need an ongoing training programme.

User 1 believes that training courses alone are not enough to get teachers started using technology.

"I don't know if courses can get a teacher prepared for using technology in the classroom, I really think it's got to be something that the teacher is intrinsically willing to do. I think there are plenty of opportunities; I just think that a teacher has to be intrinsically ready to use technology in the classroom. If they are not ready, it's not going to happen. There's no sense forcing the fit."

User 2 on the other hand claims that the training course had made all the difference for her.

"I played around with computers before the course but what really opened my mind to the abilities of this machine was this course. It made the implementation in class so easy. All I had to do is try with my class what we did in the course. It worked!! I took it three times altogether and learned new things each time."

User 3 reported that her learning is often more of a "hit and miss," ongoing process of acquiring technology knowledge.

"We don't have the luxury of the time to sit down and have someone teach us everything there is to know about the computers because we're all working and we don't have that time to do it. So we hit and miss and we learn here and there. We learn a lot from each other."

User 1 credits her acquisition of technology skills to having a home computer to practice on.
“I seldom have time at school to just sit down and play with the computer. At home I do my learning about the capabilities of programmes and my computer. I also do a lot of problem solving on my home computer when I have problems with something not working. I don’t think that I would even be close to where I am now in the area of technology if I hadn’t had my home computer.”

In some instances, teachers felt that some technology skills were acquired as they worked through the programme with students. User 2 described using a multimedia-authoring tool with her students, and although she had used the programme before, enough time had passed since she had used it that she had to relearn some of the features of the programme.

“There’s a lot more to this programme than I remembered. We are learning together.”

User 1 admitted that:

“using technology required learning all the time in order to keep updated with all the innovations. Bill Gates provides us with new versions of Windows and Office Tools every year. I have to keep my knowledge updated.”

User 2 concluded that learning is best achieved:

“when the learning becomes something that you see as a benefit for you to use. If you don’t see it as a benefit, I don’t think you’re going to retain what you’ve learned anyway, even if you sat down and read it all, if you’re not going to be using it, you won’t remember it.”

Although the term “life-long learning” was not mentioned by any of the interviewees, its relevance, especially when dealing with technology was perceived.

The Process of Change

In an attempt to understand the teachers' perceptions of infusing instruction into their teaching, they were asked to describe various types of changes that they experienced.
The teachers described the pace at which they integrated technology lessons into their classrooms in percentages. User 1 reported she incorporated technology into about 15 to 20 per cent of the new lessons that they developed. User 3 reported approximately 20-30 per cent of her new lessons were technology lessons. User 2 had the highest estimation at about 40 per cent of new lessons involving technology during the school year. At this rate of change, it would take several years before the teachers were teaching with technology lessons on a regular basis.

Non-User 2 explained that she felt before teachers could incorporate technology into the classroom, they had to be ready to make a change.

"There are teachers who simply refuse to accept any new changes and it does not have to be technology. For example, two years ago the new English curriculum was introduced to all ESL teachers and although many agree that it is much better than the old one, many teachers have not adopted it yet because it requires new teaching methods other than computers."

User 2 feels that personalities are a factor in which teachers are willing to try new teaching strategies using technology. She feels teachers need to be willing to stretch outside of their comfort zone when incorporating technology into their classrooms.

"We'll try anything, my colleague and I...We're risk takers I think (pause). I think it has a lot to do with personalities. We know we're not perfect and a lot of people, I think teachers especially, are perfectionists. And technology is still kind of new. There are so many new things out there and they're always changing and they're afraid that they'll do something and it'll be outdated next week. I see that as being a problem, so you're always taking a risk."

The teachers provided several explanations why they felt it was important to make the changes necessary to incorporate technology into their teaching. User 1 feels that changing to incorporate technology into her teaching is important for her students.

"I think because of technology and all the knowledge out there, I'm not doing so much of the memorising facts, because there's no way that they'll ever be able to
memorise everything they know, it's more skill oriented, how do you find it, and that's changed a lot because I know ten years ago when I was teaching, first teaching, it was more memorising. You've got to remember this and put it in the old memory bank, and that's just not the way the world is going to be anymore, now it's you need to know how to find it, rather than memorise this for life and technology is a great way to do that. I mean you can find so many things out there on the Internet so much faster than going to the book...and time's important.”

User 3 views changing to use technology lessons is a way to keep the students interested in learning the content material.

“I think that right now, technology is the key to keeping kids interested. You know there's only so much creativity that a teacher can get out of kids, but all of a sudden, if you put something else in front of them, it just seems like opening up a whole other door. I choose to use technology because I think it's fun, first of all. Yes it is frustrating, yes it does take a lot of time, yes it does create a whole new range of issues that teaching out of the textbook won't have to deal with, but on the other hand it is a creative way to teach. It's a way that really helps incorporate higher learning, thinking skills. students talk about it.”

User 2 explained that she felt a responsibility to provide her students with experiences that would be helpful to them in the future.

“I guess it's the kids’ future. I feel it's important that they have hands-on technology access because that's what we're here for, to prepare them for their future and they need to know about it hands on. They're highly motivated by technology and they love it.”

User 3 feels that technology helps her adapt her teaching to the different learners in her classes.

“I think I use it because the kids love it. And I try to focus on different ways of teaching to bring in all of the tools, to help kids learn. Kids learn by different modes and they seem to be so much more excited about sitting down at a computer than
maybe sitting down with a paper and pencil to learn something new or maybe just for a review.”

User 1 included her feeling that deciding when technology was the best teaching tool to use was also important in her decision of when to integrate technology into her teaching.

“If it has the children’s attention and they’re learning. There have been times when I’ve created something on the computer for instruction and I think my time could have been used in better ways because they, the class, could have learned the same things if I had just told them, or just maybe taught it without the technology. There are other times when I think the technology is the better tool to use.

User 1’s view of using technology appropriately and not just to use it for all instructional objectives is an important consideration that teachers must make when deciding whether to use technology as part of an instructional strategy.

In discussing change, change in the technology tools themselves was included. User 2 had experienced some problems when she was required to upgrade software and was not looking forward to dealing with more upgrades. However, User 1 and 3 viewed dealing with upgrades as a step in the process of getting better teaching tools.

Users and Non-Users felt that they were constantly dealing with change anyway. User 1 pointed out that the newer software and hardware was usually so much better that she really didn’t mind having to make the change. Non-User 2 felt that she was constantly developing new lessons although she was not using computers in her instruction.

“I believe I am an innovative teacher although computers are not involved. I engage my students in project work to achieve my teaching goals but they do their work in a regular class. I don’t hear them complain.”

Non-User 1 has also changed her lesson format although she, too, has not computers in her lessons.

“Nothing I do today in my class looks similar to what I used to do when I first started teaching. I remember wasting most of my energy keeping the class quiet. My
lessons must have been really boring then!!! Lucky for me that change has never frightened or intimidated me and once I was introduced to new techniques I was more than willing to try them and adapt them to fit my environment. So I do not have available computers. So what??!! I can still use technology in my teaching indirectly.”

This claim, that the fundamental change required to use computers for teaching is to change teachers' existing conception of the teaching and learning process and of their pedagogic role within it, has been mentioned by many researchers such as Means, (1994), Blease and Cohen (1990), Harrari, (1992), Idan, (1996) and others. However, teachers' beliefs and practices are very stable and extremely difficult to change, especially pedagogical practices which pose significant challenges to teachers, (Cuban, 1986; Fullan, 1994).

The five teacher participants, Users and Non-Users, do not seem to be intimidated by change. They all claimed in their interviews that their teaching styles and methods have been constantly changing throughout their careers. Introducing computers into their teaching has been enlightenment to yet another form of change.

**Age of the teacher**

The role the teachers' age plays in the implementation of ICT in schools was mentioned several times during the interviews. Since all the teachers belong to a similar age range (30-50), both users and non-users, the tendency is to disregard the issue of age as an influencing element. However, the interviews indicated differently. User 1 believes that age is very important:

"The younger the teachers the more chance there is for them to implement ICT. Younger teachers understand the importance of technology better. In our school the younger teachers all use the computer room.”

User 2 thinks differently:
"For teachers to use computers in their lessons they have to be experienced teachers who have developed enough self-confidence not to be afraid of failure. So many things can go wrong in a computer lesson that self-confidence is essential. We have three teachers who are a few years before retirement and they serve as a model of the implementation of computers in teaching – they are adventurous and creative."

Non-user 2 also referred to the issue of age:

"I really think that age has nothing to do with it. The only things that matter are the teachers’ character and willingness to accept change and the objective environmental circumstances, availability of computers, for example."

Both Leader 1 and Leader 3 agree that "age has nothing to do with it" but Leader 2, just like User 2, thinks that:

"...the more experience the teachers have the better chance that they will have the courage to use computers. In our school, the older teachers use computers more than the younger ones."

No significant conclusions concerning the correlation between age and implementation of computer technology in teaching have been detected in the literature (Kulik, 1994; Schild, 1997).

**Grade level in which the teacher teaches**

Unlike the former issue, here there was a complete consensus. Computers are used most often in the junior high classes in Israeli schools. This consensus may be due to the fact that all the teachers who participated in the case study research teach in junior high schools. However, it should be mentioned that "Tomorrow 98" project was first launched in junior high schools. Computers in the younger classes are less common, especially in ESL, because of objective reasons such as language difficulties. The English language skills of the learners are not developed enough in the elementary school. Schild (1997) in her study, found that 70 per cent of the elementary class teachers and 47 per cent of the Junior High teachers use computers in their instruction. In high school the pressure of the matriculation exams (Bagrut 222.
Exams) and the urgency to "cover the material" deter teachers from “wasting time” in the computer rooms and according to Schild only 34 per cent of the High School teachers integrate computers in their teaching.

**Summary of the Case Studies**

The five case studies described above were based on interviews, lesson observations and email correspondence. The participants were five teachers and five leading figures in their schools. Three of the teachers were computer users and the leading figures were the computer coordinators of the schools. The other two teachers were non-users and the principals of these two schools were interviewed.

The case study analysis points the importance of relevant training ((DfEE, 1995; Peled, 1992; Idan, 1998; Chen, 1995; Ager, 2000; Hargreaves et al, 1998; Schild, 1997). The planning process of three lessons prepared by the three user participants and the observations of these lessons held in the computer rooms indicated the impact the course had on the teachers and their teaching methods which were often adopted from the course. The user teachers showed confidence and were able to solve technical problems with the aid of their learners.

Other findings from the case study interviews indicated that school principals played an important role in determining the success or failure of computer integration by teachers (Fullan, 1991; Bass and Avolio, 1993; Means, 1993; Rogers, 1995). The attitude of the school principal was an important factor in influencing attitudes towards computers and IT (Crawford, 1999). Non-User 2 did not use computers because her principal did not encourage it since he claimed he was not convinced of their impact on achievement.

The findings of the survey and the interviews lead to a number of important conclusions which are discussed in the following chapter.
CHAPTER 6: DISCUSSION, CONCLUSIONS and RECOMMENDATIONS

The research presented here was conducted to better understand teachers' perceptions of the process they go through to integrate computers into their teaching. It is essential to understand the issues of this integration process that teachers face as they begin using technology in their classrooms. Becoming more acquainted with the obstacles they have to overcome in the process may simplify it for others who wish to follow the road. School principals and leaders should realise the crucial role that they hold in the successful diffusion and implementation of IT in their schools, in encouraging their teachers, in creating the correct culture and atmosphere and in providing the relevant training and support.

The discussion and observations identified here are relative to the case described in the research study and as in the chapters describing the survey findings (Chapter 4) and the case study findings (Chapter 5), this discussion will be presented as responses to the main research questions:

1. Has the training teachers received influenced their use of computers in their instruction?
   In terms of:
   - Teacher training and implementation;
   - Purposes of usage;
   - Teaching strategies.

2. To what extent do school leadership and school culture influence the teachers’ incorporation of computers in their teaching?
   In terms of:
   - The principal - the leader of infusion of change;
   - School culture – a supportive environment;
   - School - a learning organisation.

3. What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?
4. Which of the following factors predict teachers' computer use in classroom instruction?

- Positive attitudes and beliefs towards computers;
- Life long learning;
- Acceptance of change;
- Age;
- Grade level.

Introduction

One hundred and nine ESL teachers participated in the first phase of this study by filling in the questionnaire. They all worked in schools which were computerised (one computer per ten learners) as part of the "Tomorrow 98" project and they had all taken at least one course "Integrating Computers in the English Class" organised by the Israeli Ministry of Education as part of the same project. Five teachers continued to the second phase during which all the teachers were interviewed and the three user teachers engaged in e-mail communication with the researcher and were observed during a teaching session. Five leading figures in the schools (three computer coordinators and two principals) agreed to be interviewed as well in order to provide insight to the research questions.

Discussion

Has the training teachers received influenced their use of computers in their instruction?

Teacher training and implementation

Teacher training is one of the main pillars which determine successful integration of ICT in the educational system ((DfEE, 1995; Peled, 1992; Idan, 1998; Chen, 1995; Ager, 2000; Hargreaves et al, 1998; Schild, 1997). In this study, the entire researched population (109 ESL teachers) participated in the course "Integrating Computers in the English Class", and one of the aims in this research was to determine the extent of the influence of the course on the teachers' implementation of its content in their teaching. As determined by Russell (1995) that training should be planned carefully in order for it to be successful, the focus of the
course was on ESL classroom applications rather than on the innovation itself. In the survey analysis, in reply to the question that dealt with teachers' impressions concerning their training experience in the course “Integrating Computers in the English Class” and its influence on their instruction most teachers (93 per cent) felt that training taught them how to implement computers into their curriculum and 74 per cent of the participants claimed that the course had improved their teaching capabilities. In both the survey and the interviews the teachers expressed satisfaction from the course both in content and form. When asked about the extent and form of the implementation of the learned material, most teachers (80 per cent) claim that they have implemented what they have learned in the course, sixty four teachers (59 per cent) have adopted teaching techniques used in the course, forty two teachers (39 per cent) admitted to have altered their teaching methods as a result of using computers and thirty five teachers (32 per cent) claimed that the course had changed their perception of their profession. This seems to fulfill objectives of effective training mentioned by Fullan, (1994), Comber et al (1997), Dede, (1997) and others. It is important to note that 39 per cent of the non-user teachers admitted to using computers to prepare their lessons, worksheets, exams and more. Non-user 1, in her interview, expressed the usefulness of the course in her professional development and her constant use of the computers and Internet in preparing her lessons.

The researcher followed the process of the planning and creation of three lessons. The experience further emphasised the influence the course had on the teachers since the three lessons were designed in the “spirit” of the course allowing the learners the freedom of choice, expression of creativity, interactivity and the use of open tools. Observing the lessons was yet another instance to verify the conclusion that the teachers have indeed internalised the essence of the course which mainly focused on the classroom application rather than on the technology (Russell, 1995; White, 1991).

Teaching strategies and purposes of usage

The ESL teachers in this research study primarily used computers for student activities. The students were using the computers to prepare presentation, find information, word process, or complete an inquiry assignment. This is due to the discipline taught – a foreign language - which requires a variety of interaction with the foreign language. Preparing presentations helps learners organise the form and pattern of their speech (Kitao, 1995); word processing develops writing skills; the Internet enhances reading and communicating in the foreign tongue. User 1, 2, and 3 created activities that were based on student productivity projects.
The students were engaged with the activity and were not passive. The teachers described computer lessons as being more student-centred and less teacher-centred. Existing literature confirms the shift of instruction from teacher directed to more individualised, student directed learning when students are using computers in the classroom (Darling-Hammond, 1995; Crawford, 1998). It should be pointed out that the non-user teachers (39 per cent in the survey and Non-User 1 in the case study) use computers to prepare their teaching materials.

The most frequently used teaching methods practiced by the participants as appear in the survey findings were: teaching topics relevant to the students' interests, providing the learner with choice, working in teams whereas the least frequently used method was textbook usage which was more common in regular classes. Carroll (in Boyle, 1997, p102) mentions all frequently used methods in the list of approaches to the construction of learning materials which seeks to support the natural strategies of learner. It seems that the constructive theory is suitable for the technological environment since the lessons observed in this study validated the survey findings. In these lessons the students were guided to construct their own language ability and develop their communication proficiency (Davidson et al, 1994; Kitao, 1996; Nozawa et al, 1993). The User teachers tried to create authentic language learning environment which encouraged the learners to use the language for both oral and written purposes (Kitao, 1994, 1996; Nozawa et al, 1993). Quotations from the participants such as “Computers have changed the way I teach”, “I believe that I am a better teacher since I started teaching in the computer room.” provide the researcher with some proof that the training not only supplied the in-service teachers with technical knowledge on how to operate the computers but enhanced their understanding and practice of the constructivist learner-centred approach and altered their teaching strategies in the computer room as well as in their regular classroom instruction.

Since the course not only “preached “ but also “practiced” constructivist methods, the participants were exposed to them as learners. Since the survey questionnaire did not refer to this issue, the researcher used the interview to investigate the attitude of the participants to the experience. The interviewed teachers stated that having someone to work with helped them in process of learning and using technology. Collaboration practiced throughout the course developed recognition of the importance of team work (Kozma and Johnson, 1991; Putman and Borko, 1996). All the interviewed user teachers identified a "partner" that they worked with to learn skills, troubleshoot, or plan lessons. Becker (1994) found that exemplary computer-using teachers were more likely to be found where there was collegiality among the teachers using computers. This recognition also led to the introduction of teamwork in their
classes, both computer and regular. Another issue that seemed to have successfully absorbed is the importance of hands-on experience. The entire 112 hours of the course were held in a computer room and the participants spent most of the time (around 90 per cent) working with the variety of possibilities the environment enabled. In the interview, both users and non-users praised this method and admitted to using it in their lessons. Using the computers to perform relevant and creative tasks that enable learning to occur was a message that the course organisers tried to transmit to their learners and based on the interviews, have succeeded to a certain extent. Milton states that "learning should be seen as a qualitative change in a person's way of seeing, experiencing, understanding and conceptualising something in the real world" (Milton, 1992, p.248). In the lessons observed by the researcher, she recognised this method practiced by the teachers on their learners.

Another point that emerges from the study is the apparent impact of the computer course on teachers' strategies in regular classrooms as well as computer rooms. Teaching methods suitable for technological environment were often adopted in regular classroom teaching. This agrees with Means et al (1993) who see computers as part of a macro type process aimed at improving educational outcomes by transforming teaching methods.

To what extent do school leadership and school culture influence the teachers' incorporation of computers in their teaching?

The principal - the leader of infusion of change

This study, both the survey and the case studies, recognises the school principals as the primary leaders of change in their schools. School principals introduce change into their organisations and may enhance it. Change is a process, not an event that happens at a specific time (Hord et al, 1987) which includes participation, communication, and involvement in decision-making. The principals who invited active participation in decision-making, encouraged positive attitudes, and actively involved different members of the school community built trusting and collaborative relationships (Fullan, 1993). The change agent principal characteristics most prominently identified were those of communicator, facilitator, and leader and the level of concern and interest he or she exhibited for the teachers on a professional and personal level often determined successful implementation of the change, which in the case of this study is computer technology in teaching (Hord et al., 1987; Cuban,
This was evident in the answers provided by the participants in the questionnaires and the interviews.

In the survey questionnaire in all the questions asked concerning the principal's behaviour towards the teachers, it was clearly evident that the majority of the teachers were aware of the positive attitude of their principal towards their use of computers and his/her influence on their work. Sixty four per cent of the teachers admitted that their principal encouraged them in their computer usage and seventy per cent of the user participants felt that their principal was supportive. Principals showed their appreciation of the teachers' computer instruction in 82 per cent of the cases. The findings pointed to the fact that principals who themselves used computers and modeled their use both in everyday life and in pedagogical issues, were more likely to succeed in their integration of computer technology in their schools. ). Sergiovanni (1996) points that success of principals in introducing and implementing change is linked to their ability to effectively articulate and put into action their vision of excellence in teaching and learning by emphasising and modeling important goals and behaviours in such a manner that it signals to others what was valued in the school.

Another finding was that principals who openly encouraged teachers who integrate computers in their teaching, principals who showed their appreciation and support, significantly determined the use of computers in their schools (Fullan, 1991; Bass and Avolio, 1993; Means, 1993; Rogers, 1995).

In the interviews, the teachers, both Users and Non-Users, reported that principals who took a personal interest in staff strengthened their relationships on an individual basis. User 3 pointed out the professional interest her principal takes in her work and the positive influence it has on her motivation to devote longer hours. User 1 also found her principal a positive leading figure that encouraged her and her colleagues and promoted “gray” teachers who excelled in computer integration to leading positions. This seems to provide a description of transformational leadership as provided in the literature. According to Bass and Avolio, (1993) transformational leaders do more than set up simple exchanges or agreements. By virtue of the nature of their relationship with followers, they motivate others to do more than they originally intended, more than they thought possible, and to move beyond self-interest and focus on the larger goals of the group or organisation. Burns (1985) asserts that central to transformational leadership is the capacity to inspire and work with others to gain commitment to excellence and high levels of achievement. The attitude of the school principal is the most important factor in influencing attitudes towards computers and IT (Crawford,
1999). If computers are ignored or merely accepted by the principal, they will be marginalised within the school. This is the case described by the two Non-Users. Non-User 1 had no access to the computer room since it was occupied solely by the computer skills teachers and the principal refused to change the situation until the Ministry of Education provided the school with additional computers. Non-User 2 even explained that it was her principal's opposition to technology that deterred her from using it. The computer coordinators, Leader 1, Leader 2 and Leader 3, interviewed for this study, felt strongly that teachers needed to know that principals cared about them beyond their classroom doors and allowed them to be part of the decision-making. Fullan (1993) highlighted the importance of developing a collaborative culture in which participants build a vision together which allowed individuals to personalise their ideas and projects for improvement and fit into a framework that was created by the principal. Leader 1 believed that in her school a flatter, collegial management structure where power and decision making were more widely shared was very effective in the implementation of technology (Crawford, 1999). According to Bush (1995), collegial management cultures provided opportunities for teachers to participate more fully through collective decision making and shared values.

School culture – a supportive environment

The participants, in several occasions throughout the study, expressed the need for a supportive school culture in order to successfully integrate computers in teaching. In the questionnaire, the participants were required to relate to their school culture and the support it provided them in their attempt to integrate computers in their teaching. The findings showed that the mean of school culture support for those who did not use computers was significantly lower (m=1.89) than the school culture support for teachers who used computers (m=2.28) (Table 4-14). This finding further emphasises the advantage of transformational leadership (Burns, 1978; Bass and Avolio, 1993) in creating a supportive school culture by enabling collaboration within the variety of bodies within the organisation (Leithwood et al, 1995). Transformational leaders are thought to engage followers by employing one or more of the four "Ts" to stimulate voluntary and enthusiastic responses to their influence attempts. The optimal leader, Bass and Avolio (1993) argue on the basis of their research results, is someone who is at the active end of the leadership spectrum and combines positive transactional behaviours with the four Is of transformational leadership. Bass and Avolio (1993) claim that good managers achieve good results; transformational leaders, however, in addition to producing higher levels of effectiveness, achieve results beyond expectations. Transformational leaders do not necessarily react to environmental circumstances, they create 230
them with their ability to concretise a vision, to excite others, to change the way problems are thought about.

"The transformational leader is able to get others to react over time in ways that earlier models neither anticipate nor elaborate upon" (p. 36-37).

The four I's of transformational leadership, individualised consideration, intellectual stimulation, inspirational motivation and idealised influence (Bass and Avolio, 1993, p. 51) appear to be relevant in this study. User participants claimed that their school principals gave them personal attention and made them feel uniquely valued. They were actively encouraged to try new and creative methods. The ESL user teachers testified that their school principals increased their motivation by portraying optimism and enthusiasm while communicating high expectations and provided vision and a sense of purpose. This elicited respect, trust, and confidence and encouraged teachers to continue with their effort in spite of the hard work involved. There was also a clear indication that a school culture in which computers were in use for different functions such as communicating with the teachers via e-mail messages, preparing multimedia presentations for staff meeting and word processing all the written material, encouraged computer use by the staff.

In the interviews a similar attitude was portrayed both by the teachers and the leaders. Schools in which computers were not an important element in the everyday life were those in which the Non-User teachers worked. The principal in the school Non-User 2 worked, clearly indicated his lack of interest in computers, and admitted that he himself never used them. This has been seen in previous research. Purkey and Smith, (1983) claim that principals shaped, facilitated, and fostered the development of norms, values, and beliefs. These elements intimately shape the school's culture, ethos, and climate.

The school's culture should provide the relevant support, be it technical, professional, organisational or environmental. The survey findings clearly show that teachers who use computers in their instruction get support from the leadership and their working environment. It is interesting to see that "moral" support (environmental) is widely provided while technical support is perceived as less available. This may be due to the fact that technical support (lab technicians) is still very rare in schools. Only the Tel-Aviv municipality (there are thirteen municipalities in the Tel-Aviv district) has agreed to budget for technicians in schools. Principals in other municipalities are required to find their own financial solutions for
technical support. Another interesting issue is that teachers who use computers in their instruction perceive leadership as being most supportive of their work. A culture that encourages the use of computer technology and supports teachers who teach in a computer environment provides the right climate for successful implementation. The interviewed user teachers admitted to working in a supportive environment. They were constantly complimented for their work with computers and felt that their principal was ready to listen to their requests. Although the term was not mentioned, collegial management (Bush, 1995; Leithwood, 1997) seemed to describe the model of management adopted by the principals of the User schools. The five teacher participants often referred to one or more of the four I's of transformational leadership, individualised consideration, intellectual stimulation; inspirational motivation and idealised influence (Bass and Avolio, 1993, p. 51). The five interviewed teachers felt the significance of the encouragement they received from all the members in their institution, the principal, management, peers, administration their pupils and the parents. User 1 and Leader 1 both praise their principal and the school culture that had been established as a result of collegial management and transformational leadership. The school principal seemed to provide the support and encouragement essential for personal and professional growth opportunities. According to Leader 1 he funded workshops, provided teachers with extra time, took an interest in his staff on personal and professional levels. This behaviour energised the system of change and enabled an effective implementation of technology in the school.

This need for support was mentioned in the literature. Goodlad (1991) argued that research had verified the fact that school culture was reflective of the cooperation and mutual respect for the total school population. Sergiovanni, (1996) maintained that the core values of school culture, the beliefs, assumptions, and perceptions that school community members hold about their work, comprised a theory of organisational acceptability that guided how people behaved and operated. Joyce et al. (1990) and Sergiovanni, (1996) performed studies which supported the effects of school culture on student learning as well as on teacher productivity and well-being.

School - a learning organisation.

The school culture that turns the school into a learning organisation is more likely to succeed in infusing change into the organisation. This maybe achieved through transformational leadership practices that place the school culture on the road to the establishment of a learning organisation. (Glickman et al, 1998)
The findings of this study show that schools are by far (71 percent) the leading body that organise courses and workshops for their teachers. This indicates that schools are indeed aspiring to become learning organisations in charge of the professional development of their employees. It should be pointed out that in the last five years school principals have been instructed by the Ministry of Education to organise 56-hour courses for their entire teaching staff on a variety of topics as part of the professional development plan. (Bulletin Report, 1995)

There was a consensus among all ten interviewees concerning the issue of schools as learning organisations. Both teachers and leaders expressed the importance of life-long learning for all staff members. Nevertheless, User 3 complained that the teachers had too little release time to meet with colleagues for shared professional learning which, as indicated in the literature was essential for staff development. Senge (1990) has emphasised the importance of educational organisations to become learning communities by stating that the leaders are the “designers, stewards, and teachers” (p.352) in a learning organisation and are responsible for building organisations where teachers “continually expand their capabilities to understand complexity, clarify vision, and improve shared mental models” (p.352).

The two interviewed principals admitted that transforming their schools into a learning organisation was one of their main goals and in fact they were sure that their aim was being achieved successfully. It should be pointed out the two teachers, Non-user 1 and 2, agreed to this fact and Non-User 2 admitted to enjoying most of the courses provided by her school. The literature seems to justify such performance Little, (1993) emphasised the importance of transforming schools into learning organisations. According to Pedler et al (1988) a working organisation is an organisation which both facilitates the learning of all its members and continuously transforms itself. The User teachers were all enthusiastic about the courses provided in their school although the emphasis was not necessarily on computers and technology. However, they too emphasised the need for more time to be devoted to collaborative peer learning as part of the staff development plan. It is important to point out that User 1 and 2 work collaboratively with other staff members in planning and preparing materials for computer based lessons but they would have liked a wider circle of teachers to work with. This coincides with Borko and Putnam (1996) who argue that while individual teachers can expand their knowledge and learn about technology, they need opportunities to develop and grow professional relationships with their peers to effect changes in the larger school culture. Fullan (1992) believes that effective management of change is a culture that encourages the existence of peer relationships between members of staff at a school.
User 1 mentioned that her principal was a lifelong learner and participated in most of the courses and workshops organised by the school. Southworth (1994) strengthens this phenomenon and puts the emphasis on all staff learning with the principal as the “leading learner” (p. 53) who creates the right school culture. Not only does the learning organisation promote learning, but it creates a general involvement which provides a model of lifelong learning. Lumby (1997) stresses the importance of establishing the capacity to learn as a central strategic task of those with the responsibility of managing people. Senge (1990) believes that the leaders are responsible for building organisations where teachers continually expand their capabilities to understand complexity, clarify vision, and improve shared mental models. The principal’s job is to create an environment in which the staff can learn continuously. Darling-Hammond et al, (1997 provide examples of schools in which some organisational and pedagogical changes put new and experienced teachers together to learn from one another and created common periods during the school day for planning so that connections could be made across subject areas.

Lieberman, (1995) and Dede (198) among others, concluded that in terms of format, short, one-time training was generally not effective if the goals involve complexity or change, such as the introduction of computers into teaching. Longer-term opportunities for growth and development spread over time with ongoing support were most effective. The findings of this study seem to show agreement with this conclusion since both in the survey and interviews, the participants, both users and non-users, admitted to the constant need to learn and develop.

**What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?**

Lack of time, training, support and access were the main barriers mentioned by the participants of this research. These findings are consistent with findings from existing research which identifies these issues as critical factors in determining whether teachers use technology in their instruction or not (Green, 1994; Schild 1997; Rosso et al, 1997).

**Lack of Time**

The time constraint for teachers using computers is a consistent theme in existing literature (Cuban, 1993; Marcinkiewicz, 1995). Becker, 1994,Rosso et al (1997), Green (1998) and
others assert that meaningful implementation of computer technology requires time to plan lessons, time to learn how to use the equipment or application, and time to solve the problems encountered (Sheingold et al, 1990; Becker, 1994; OTA, 1995; OFSTED, 1995; Green, 1998). The survey questionnaire findings in this study showed very clearly that the time issue was considered a serious barrier to the integration of technology in teaching. It was placed at the top of the list of the user teachers and on the second place in the overall results. Time was also dominant in the teachers' remarks in the open-ended question in the survey:

"I rarely use computers because I don't have the time – it is very time consuming."

"I really find it hard to find the time to do all that I am required to do. Computers only add to the problem."

However, in the case study research, when the interviewees were asked about their barriers, although time was mentioned, it did not prevent the use of technology. The user teachers and Non-User 1 held an overall positive attitude by stating that the investment of time both in learning and implementing was worthwhile. It was only Non-User 2 who stated lack of time as one of the reasons that prevented her from using computers in her teaching. It must be pointed out that the literature (Sheingold and Hadley, 1993; Lieberman and Rosenhertz, 1997; Becker, 1994; OTA, 1995), puts the “time” issue at the top of the teachers' barriers list as does the survey of this study. Although time could be used as an excuse for not starting or doing a task (Non-User 2), four of the five teachers were incorporating and working on advancing their use of technology in the classroom as opposed to not starting at all. Even though they identified time as a constraint or limitation, they had found enough time somewhere to get started using technology in their classrooms. They would all have liked more time to work on developing new lessons and technology skills, but the complexity of finding time had not stopped them from progressing in the process.

Insufficient Training

Research shows that training is needed if teachers are going to successfully use computer-based technology in their instruction (Rosso et al, 1997; Becker, 1994; OFSTED, 1995). It is therefore clear why the majority of the teachers put it at the top of their list of barriers in the survey questionnaire. In the open ended question some teachers complained that the training they received was insufficient:
"I need more training and continuous support in school."

"Things change so fast that simply coping with the technology requires constant training."

Since all the participants took at least one computer course, the fact that lack of training scored so high in the survey motivated the searcher to try to investigate the issue in the interviews. In all the five interviews, both users and non-users tried to avoid the issue. This may be due to the fact that the researcher who interviewed them was their teacher of the course "Integrating Computers in the English Class" and they might have thought it to be politically incorrect to complain about training issues. It should be pointed out that the three users and Non-User 1 admitted to continuous self-learning and self-development. The user teachers mentioned that their schools provided very limited planned time during the school day for learning new skills and teaching strategies with technology (Becker, 1994; Pedler et al., 1988; Russell, 1995). This limited amount of time created a situation where teachers were often learning technology skills by default rather than by design. Learning by default occurred on a need-to-know basis. The teachers learned new technology knowledge and or skills when it was necessary to do so. User 2's instance of learning the multimedia programme because she had to is an example. She learned the programme as she worked through it and not by design. In addition to learning the application, User 2 also had to learn by problem-solving any operating system bugs or conflicts that she might have encountered when using the programme on her computer. While the teachers have participated in at least one course, "Integrating Computers in the English Lesson", the majority of their learning experiences and professional development seemed to occur by default as they worked through the process of using the computer. Some of the skills or knowledge they were required to learn to use technology in the classroom could not be anticipated, and therefore, occurred as they encountered it.

Another interesting aspect of this issue is the fact that the teachers felt this type of learning was necessary even though it was not always desirable. They felt that they learned more about technology as they encountered and worked through the problems. They felt that the "hands-on" time of working with and problem solving was required to learn how to use the technology. This is interesting in light of considering how best to design training or in service courses to help teachers who are starting to implement technology into their teaching. Perhaps
being able to learn by default rather than by design is a prerequisite for working with technology (Marsh, 1990; Fullan 1993).

Lack of Access

The access issues are related to both home and school. Research shows that accessibility, scheduling and availability (e.g., not enough computers or peripherals) are problems for teachers wishing to use computer-based technology (Somekh, 1998; Rosso et al, 1998; Becker, 1994; OFSTED, 1995). Access at school that is limited is not enough to convince teachers to invest time and energy in learning how to teach with technology because it is not a reliable access for them. The survey findings place the barrier of access in the fifth position, however the interviewed teachers claimed that they were reluctant to spend the additional time to plan a technology lesson if they were not assured that they would have access to computers on the day and time when they needed them. In the settings that User 1, 2 and 3 teach in, the complexity of matching schedules of lessons and computer room has been a problem because other teachers, especially computer skills teachers are competing with them for time in the computer rooms. Non-User 1 gets no access to the computer room because it is fully occupied by the computer-skills teachers.

Access to technology, as defined in the OTA (1995) report, has multiple connotations: computers in the classroom, ratio of students to computers, computers at home, current hardware and software, and location of computers. Since all the participants in this research teach in schools that have been computerised as part of the “Tomorrow 98” Project, the ratio was one computer per ten pupils, the location was mostly in secured computer rooms (to avoid burglaries), the hardware and software were defined by the Ministry and there was no indication about computers being provided for home access by teachers or students. In the survey questionnaire the high percentage of teachers with access to the computer rooms (96 per cent) in schools was obvious since all the schools had been computerised. However, it was also interesting to note the high percentage of teachers who had computers at home (94 per cent). The literature shows that for efficient implementation of ICT, computers must be available for teachers to use at school and home (Cole, 1995; Orwig, 1994). Peled (1986) emphasised the need for teachers to use computers in their everyday life in order to internalise the benefits of the machines and acquire the insight to integrate them into their teaching environment in a natural and efficient mode. It was hard to explain why four per cent of the teachers claimed that they did not have computers in their school whereas zero per cent would
have been expected. This finding may have been a result of misunderstanding “we do not have computers in school” with “we do not have available computers in school”. In some schools computer rooms are occupied solely by computer skills teachers thus other teachers do not use them (as is the case of Non-User 2).

The interviewed teachers and leaders indicated that like so many other issues in school, access to computers depended on priorities of the school management. Both Non-User 1 and 2 blamed school management for their not using computers in their teaching. The former did not get access into the computer room because it was always occupied by the computer skill teachers. The latter did not use the computer room because the equipment was outdated and since the principal did not care the situation was not going to change in the near future. The two principals passed the blame over to the Ministry of Education for not providing enough computers and for imposing change on schools without even checking its effectiveness, respectively.

Leader 1 stated that for teachers to use computers freely and confidentially, computers had to be everywhere – in the teachers’ rooms, libraries, offices and homes. She suggested that teachers should be able to borrow computers for home use and that principals should invest in technology if they wanted successful implementation. She saw her principal as a model for successful infusion of technology into the school. This is portrayed in the literature. Dwyer et al (1994) pointed out teachers who had regular access to computer technology over several years time experienced significant changes in their instruction.

**Lack of Technical support**

The need for technical support for teachers on-site has been consistently identified as important to the success of integrating technology into instruction (Becker, 1994; Schild, 1997). On-site support would mean added cost for schools, however it appears to be an important component in the process of integrating computers into classrooms (Salant, 1996). The survey findings indicate that lack of technical support is a major obstacle especially to the non-users (48 per cent of 29 non-users). It is only fifth in the barriers ordering of the user teachers. The three User teachers who were interviewed in this study were generally not put off by the occurrences of technical problems. They felt like they were to be expected. Even though they felt the technical problems could be frustrating, they
associated their solving with learning more about technology. The teachers also felt there would always be technical problems when using technology and more experience would give them more control over solving them without help. As teachers gain experience and skills in using technology for instruction, they begin to anticipate some of the problems that might arise when actually using it in the classroom (Fullan, 1994; Dwyer et al, 1994). However, even the more experienced technology-using teachers in this study felt that even with the best preparation, there would always be occasional problems to solve. Non-User 2, however, was reluctant to use computers in her teaching because she didn’t feel comfortable with the fact that her pupils knew more about technology than she did. Schofield (1995) identifies a relationship between computer competence and authority in the classroom as a possible barrier to computer use in the classroom. Teachers who associate knowledge or competence with control would also be less likely to use the unpredictable machines for instruction.

Which of the following factors predict teachers’ computer use in classroom instruction?

Positive Attitudes and beliefs about computers

Attitude toward computers by the participant teachers is favourable across the whole research. This may be due to the fact that all the participants of the survey came to the course “Integrating Computers in the English Class” from their own free will. In the questionnaire both users (90 per cent of 76 teachers) and non-users (69 per cent of 30 teachers) showed a positive attitude towards using computers. The case study research showed similar attitudes. Four of the five interviewed teachers (User 1, 2, 3 and Non-User 1) showed enthusiasm in integrating computers in their teaching. The three users expressed their satisfaction and conviction that technology contributed to their professional abilities as well as to their learners’ achievement and motivation. Non-User 1 uses technology to prepare her lessons and is very eager to use them in her teaching. She is certain that technology has the potential to enhance her learners' knowledge. Teachers who adopt computer technology realise that computer-based technology enhances teacher/student productivity (OTA, 1995; Sheingold et al, 1990, Givon, 1997), and prepares students for the world of work (Hargreaves and Fullan, 1998). Teachers who hold these perceptions tend to be successful in adopting and using computer-based technology (Chen, 1995; Dwyer, et al, 1997).
The user teachers expressed enjoyment during the computer-based lessons both from their learners and themselves. Both in the survey and in the interviews teachers claimed that the lessons in the computer room were more interesting, motivating and satisfying (Bialo et al. 1996; Kitao, 1996). This fact that teachers who use computers are happier and more confident working in the computer room than in the regular classroom is very significant. User teachers who discover the advantages of teaching in a computer technology environment find such an environment more suitable and satisfying both for their learners and themselves. In the interviews, the user teachers expressed the motivation that such an environment arouses, the ease to deal with heterogeneity among learners and the opportunity it provides teachers to spend more time with the weaker learners. In the survey questionnaire, teachers pronounced their change in attitude towards their teaching profession. There was an agreement among the user teachers that they prefer teaching in the computer room. It should be pointed out that 39 per cent of the non-user teachers and Non-User 1 expressed their desire to teach in the computer room. The reason they did not teach in a computer environment was due to the fact that they had no access to the computer room. Seventy-four per cent of the users claimed that integrating computers in their teaching had improved their teaching capabilities. Thirty five teachers (32 per cent) claimed that it had changed their perception of their profession and altered their teaching techniques. In their answers to the open-ended question (Question 21) some of the user teachers referred to the effect computer integration had on their teaching methods.

"Computers have changed the way I teach."

"I believe that I am a better teacher since I started teaching in the computer room."

On the other hand, Non-User 2 was the only interviewed teacher who showed reluctance. She did not express any open objection to computers but claimed that she was not yet convinced of their effectiveness. This phenomenon is common among teachers are not yet convinced that using ICT can be a way of improving the quality of learning for their students (Stoll, 1995). Kershaw (1996) uses the term “laggard” to describe teachers with a similar behaviour as Non-User 2.
Lifelong learning

The importance of ongoing learning was investigated in this study. The survey findings required an account of the various courses the participants took in the last five years; however, no clear indication was found of a relationship between the number of courses and the integration of computers in class. Since most of the courses mentioned in the survey were relatively short (28 hours). Rhodes and Cox (1990) found in their study that short courses were not very effective in promoting uptake and that teachers needed an ongoing training programme. Faba-Sack (1998) in research performed in one Israeli school discovered that 65 per cent of the participants claimed that in-service training was of short duration and inadequate.

The interviews provided another possible explanation to this fact. The interviewed teachers realised the need to keep updated whenever technology was involved. Things were changing constantly and therefore most of their learning was self-learning initiated by the need at that period and situation. Ellis (1986) who worked with teachers in an elementary school in Sheffield concluded that teachers should be kept continuously informed of technological innovations and available resources.

Teachers' Age

The issue of age as a predictor of using computers is portrayed clearly in the survey results. The majority of the user teachers (77 per cent) are 30-50 years old. Only seven percent of the teachers are younger and 17 per cent are older. It is important to point out that all the teachers volunteered to participate in the course, which means that the integration of computers in teaching interested all the participants although only 70 per cent actually teach in the computer rooms. This coincides with Kulik's (1995) findings that in spite of other interests, the majority of the teachers showed desire to learn more about computers.

In the interviews, User 1 and User 2 had different opinions concerning the age that best predicts computer use. User 1 believed that the younger the teachers, the better the chance that they adopt this technology, whereas User 2 and Leader 2 both claimed that the experienced teachers were more likely to use computers in their teaching. Nothing in the literature could verify either opinion and further study is needed to reach a clear conclusion although the survey of this study clearly supports the fact that the experienced teacher in their mid careers
tend to use computers more often that younger, inexperienced teachers. As for teachers who are close to retirement, the survey shows a low percentage of computer use. No studies were found that relate the number years a person remaining before retirement to the degree of computer use.

Grade Level

Analysing the questionnaire findings did not show a significant correlation between users and non-users and grade level. Thus the grade level in which the teacher teaches does not predict computer usage. Most of the participants (55 per cent) teach in junior high schools. As mentioned in Chapter 1, the “Tomorrow 98” project computerised junior high schools in the first phase. This meant that most of the participants in the course “Integrating Computers in the English Class” taught in the junior high classes. It is interesting to note that the survey points out that only eight per cent of the elementary teachers use computers in their instruction, whereas the literature (Schild, 1997) found that 70 per cent of the elementary teachers in Israel use computers. This discrepancy between the findings of this study and the literature might be explained by the fact that in Israel pupils start their English lessons in the fourth grade (this is gradually changing in autonomous schools where the grade for introducing English is either first or second) and the teachers introduce their pupils to computers in the seventh grade (Junior High). The fact that fifty nine per cent of the teachers in Junior High school (47 per cent in Schild's study) use computers in their teaching may be due to the fact that the first phase of the “Tomorrow 98” project computerised the junior high schools. The interview sessions did not contribute any insight since the five teachers were all from the Junior High schools. A possible explanation to the low percentage of users in the senior high classes (33 per cent in this study and 34 per cent in Schild's study) may be a direct result of the reluctance of the teachers to 'waste time' when teaching for the Bagrut Exams (the Israel matriculation exams).

Acceptance of change

Blease and Cohen (1990) suggest that the fundamental change required to use computers for teaching is to change teachers' existing conception of the teaching and learning process and of their pedagogic role within it. The analysis of the survey questionnaire showed that only eighteen per cent of the teachers claimed that they were reluctant to change teaching techniques. The remaining 82 per cent may be, therefore, considered as willing to change their teaching techniques. Since 71 percent have integrated computers in their teaching, it may be
assumed that teachers who have not done so are still willing to do so. This seems to oppose the idea that teachers' beliefs and practices are very stable and extremely difficult to change (Cuban, 1986; Fullan, 1994). The interviews with the teachers strengthened this fact. The three user teachers expressed willingness to try new approaches in their lessons. User 2 admitted that she was willing to try anything and failure did not deter her from trying again. Non-User 1 was a strong believer in the integration of technology in teaching and although she was unable to use computers in her lessons as a result of access problems, she claimed that her understanding of her profession changed since she uses computers to prepare her lessons. Non-User 2 declared that she was aware of the necessity of teachers to accept change in their professional life and although she did not use computers in her teaching she had adopted other changes introduced in her school. One of the reasons Non-User 2 did not use computers was her not being convinced of their effectiveness. Chen (1995) supports this argument when he claims that successful teachers in particular will be unwilling to drop approaches that work for the sake of something new unless they see that it can work too.

Although it seems that the literature (Cuban, 1986; Fullan, 1994; Loveless, 1996) attempts to emphasise the difficulty of teachers to adopt new teaching approaches such as computers and technology, this study shows a different view. The majority of the participants showed no reluctance to changing their methods and both users and non-users expressed their willingness to integrate computers in their teaching. This may be explained by the fact that all the participants were ESL teachers who have been willing to try innovations in spite of the difficulties. Although no official research has been performed on this issue, introducing many of the innovations in Israel, for example, educational television, interdisciplinary work, research project work, were first attempted by the ESL teachers. When computers were introduced to the schools, the ESL teachers were early adopters. It is important to point out that more than two thousand Israeli ESL teachers belong to the professional Internet virtual community in which professional matters are dealt with, support is constantly provided and sharing materials is regularly practiced.

Conclusions

The purpose of this study was to assess the integration of computer technology among ESL teachers who had participated in the course “Integrating Computers in the English Class”. It also examined some of the barriers teachers face in their attempts to use computer-based
technology in the classroom and solutions to overcome these barriers. The impact of the school principal and the school culture on the teachers’ integration of computer technology was studied. Some insight was gained into possible reasons that prevent teachers from integrating computer technology in their teaching although they were willing and ready to do so. Very limited research has been done on the non-users and this study attempted to investigate their point of view as well. This section will review the conclusions, the impact of the study, the possible uses of the results of the study, and recommendations for further study.

Conclusions to this study evolve from the original research questions. Research question one focused on assessing the influence of the course “Integrating Computers in the English Class” in terms of implementation, teaching strategies and purposes. Although the study had no intention to assess the effectiveness of the course, the fact that the majority of the ESL teachers (70 per cent) who took the course integrate computers in their classrooms was very satisfying. Both the survey and case study findings indicated that the course was very useful and provided the teachers with the relevant training which enabled them to implement computers in their teaching in a similar way to that of their learning. Ninety three per cent of the 108 participants in the survey and all five participants in the case studies stated that the course taught them how to implement computers into their curriculum. This may lead to the conclusion that when teachers who are willing to integrate computers in their teaching participate in a course that provides them with technological skills, disciplinary teaching methods, relevant material, hands-on practice, modeling and reflection for a long period of time (112 hours) the participants are more likely to use computers in their teaching. (Rosso et al, 1998).

Another remarkable finding was that 74 per cent of the survey participants and four case study participants admitted that integrating computer technology in their teaching improved their teaching capabilities and changed their teaching methods. Altering teaching strategies has been one of the main goals of the "Tomorrow 98" project (Peled, 1986; Harrari, 1992) and voiced by leading researchers such as Fullan, (1994), Comber et al (1997) and Dede, (1997). The user participants voiced their preference to teach in the computer room over the regular classroom claiming that the lessons in the computer room were more motivating, interesting, relevant and practical for heterogeneous classes. However, altering teaching strategies go beyond teaching in the computer rooms into the regular classes. The participants admitted to adopting teaching methods used in the computer room for teaching in the regular classroom thus improving their teaching abilities and redefining their role as teachers.
Integrating computers in teaching was the catalyst for that change and it also helped teachers understand how technology relates to learning processes both their students' and their own (Dimmock, 2000; Salomon, 1996; Fullan, 1995; Hargreaves and Fullan, 1998). The teacher-centred approach which was common before computers were introduced to teaching environments was being replaced by the student-centred approach (Darling-Hammond, 1995) which provided the learners with the opportunity to promote their knowledge according to their individual learning styles, based on their interests and in their own speed.

The study discovered a change in the relationships between teachers who taught in a computer environment and their learners. The study did not attempt to study the effect computer technology had on the learners, however some insights were reached through the statements made by the teacher participants. The participants claimed that both they and their learners preferred the lessons held in the computer rooms and enjoyed them more. The lessons were more motivating and efficient since the learners used the English language for relevant tasks. The weaker learners benefited from learning in the computer rooms (based on the teachers' statements) since the teachers had more time to devote to them and they could perform according to their abilities. Another change in the teacher-learner relationship occurred when teachers realised that it was legitimate "not to know" something and teachers and learners often saw themselves as co-learners especially when technology was involved. Teachers felt confident enough to turned to their learners, who were often more knowledgeable with the technology, to help solve technical problems and to help them learn to use new technologies. Teachers and learners worked in a learning environment where the teacher and the learners, in collaboration, could investigate new areas and solve problems thus enhancing their knowledge.

Interesting conclusions concerning the non-user teachers emerged from the study. It should be pointed out that little research has been done on the non-user population. The non-users in this study were motivated and willing enough to participate in the course. However, they were prevented from using computers in their teaching mainly because of school management problems. Non-user teachers did not teach in a computer room but used computer technology for teaching. Most of the non-user ESL teachers (93 per cent) who participated in this survey and one of the case study participants (Non-User 1) used computers for personal use and to prepare their teaching materials. The reason they did not teach in the computer rooms was often due to lack of access to the computer rooms, lack of encouragement and enthusiasm from the school principal and other school leaders and a non-supportive school environment rather than their reluctance or techno-phobia. The findings of this study call attention to the
influence of school management and school culture on determining the success or failure of the integration of computer technology in schools. Most of the non-user teachers were convinced of the advantages of teaching in a computer technology environment but were prevented from doing so because of school management decisions. It should be pointed out that all the participants in this study, both users and non-users, volunteered to participate in the 112 hour course “Integrating Computers in the English Class” and were not forced to take it. It may be therefore assumed that both users and non-users were willing to at least try using computers in their teaching. The non-users were not given access to the computer rooms as a direct consequence of the school policy and not because computers were not available in the schools since all the teachers who participated in the study taught in schools that were computerised as part of the “Tomorrow 98” project.

The influence of school leadership and school culture on the teachers’ incorporation of computers in their teaching is evident both on users and non-users. The research reveals that teacher implementation was affected not only by the course but by the school principal, the school culture, and the staff development programmes within their schools. This study, both the survey and the case studies, recognised the school principals as the primary leaders of change in their schools. The findings indicated that the majority of the user teachers were aware of the positive attitude of their principal towards their use of computers and his/her influence on their work. Sixty four per cent of the teachers who participated in the survey and the three user teachers in the case studies admitted that their principals openly encouraged them to integrate computer technology in their teaching, and showed their appreciation and support in many occasions. Principals who themselves used computers and modeled their use both in everyday life and in pedagogical issues, were more likely to succeed in their promoting the use of computer technology in their schools. High schools Alef, Bet and Gimel were good examples, and although the principals were not interviewed, the user teachers and the computer coordinators emphasised the positive role the principals played in the enhancement of computer technology in their schools. The school principals achieved this by enabling teachers to participate in decision making, by sharing their vision, by creating a school atmosphere that encouraged and supported the use of IT, by generating an appropriate school culture in which computers were involved in the daily routine, creating a supportive and encouraging environment in which teachers were provided with elementary conditions such as access to technology, computer technicians, time to develop materials, professional experts. Fullan (1991), Bass and Avolio (1993), Means (1993), Rogers (1995) and Crawford (1999) are among the researchers who claim that collegial management and transformational
leadership enabled successful implementation of IT in schools. The school culture in which computers were in use for different functions such as communicating with the teachers via e-mail messages (Alef and Bet High schools), preparing multi media presentations for staff meeting and word processing all the written material (Alef, Bet and Gimel High schools), encouraged computer use by the staff. Principals who believed in the potential of ICT in education succeeded in diffusing the change. Principal 1, in his interview, admitted that introducing IT in his school was not a top priority and if not for the instructions imposed on him by the Ministry of Education, he would have done even less. This attitude was portrayed in the school environment in which IT did not seem to play an important role. As a result, Non-User 1 was not provided with access to the computer room in spite of her willingness and enthusiasm. Principal 2, interviewed for this study, openly voiced his doubts concerning the effectiveness of computer technology in education. Non-User 2 who worked in the school, echoed her principal’s statements and beliefs concerning IT and felt reluctant to integrate computers in her teaching since she, like her school principal, was not convinced that IT was effective in teaching. Crawford (1999) stated that if computers were ignored or merely accepted by the principal, they would be marginalised within the school.

The perceived influence of school leadership in the integration of computer technology in teaching is a notable feature of the findings of this study. Teachers are often blamed for the failure of ICT in schools (Schild, 1997; Mor, 2001; Fullan, 1994; OTA, 1995) but in this study, the participants were teachers who were willing and ready to integrate computer technology in their teaching (they voluntarily participated in the course). Another common reason for failure is lack of appropriate hardware and software within the schools (Schild, 1997; Pedler et al, 1988; Fullan and Hargreaves, 1998; Idan, 1997; OTA, 1995). In this study, the ESL teachers taught in schools that were equipped with the relevant hardware and software as part of the “Tomorrow 98” project. However, in spite of the ideal conditions, prepared teachers and appropriate equipment, thirty per cent of the ESL teachers did not use computers in their teaching. The main reason for this failure, as it emerges from the study, lies with the school principals and the culture of the schools examined.

Interesting conclusions were derived concerning the barriers teachers faced in their attempt to integrate computer technology in their teaching. The survey questionnaire findings in this study showed very clearly that the time issue was considered a serious barrier to the integration of technology in teaching. It was placed at the top of the list of the user teachers and in the second place of the overall results. The time constraint for teachers using
computers has been a consistent theme in existing literature (Cuban, 1993; Marcinkiewicz, 1995). Becker, 1994, Rosso et al (1997), Green (1998) and others asserted that meaningful implementation of computer technology required time to plan lessons, time to learn how to use the equipment or application, and time to solve the problems encountered (Sheingold et al, 1990; Becker, 1994; OTA, 1995; OFSTED, 1995; Green, 1996). However, the case study participants, both the users and non-user teachers, although they mentioned time as a possible barrier, complained more about limited or no access to computers in their schools as the main obstacle to their integrating computer technology in their teaching. This may lead to the conclusion that the issue of time as a barrier is often used as an excuse by teachers who are reluctant to use computers for other reasons such as fear of technology, unwillingness to change, laziness and lack of enthusiasm. The study provides no proof for this assumption. Nevertheless, teachers who were really willing to use computers in their teaching and discovered the advantages of integrating computer technology in their professional life, were also willing to invest the extra time needed both to learn the new technology and prepare the lessons.

Access was another obstacle that seemed to be crucial in determining the integration of computers in teaching among the interviewed teachers. It should be pointed out that lack of access was in fifth place on the list of obstacles according to the survey findings although the non-users blamed lack of access as one of the main obstacles. Research performed by Dwyer et al (1991), Boyle (1997) and Schild (1997) emphasised the importance of access to computers both in school and at home. Teachers, both users and non-users needed access to computers to at least prepare material. Those who had access to computers at home, found it easier to progress in their knowledge and understanding of computer use from the early stage of the course participation. Needless to say that teachers who were not provided with access to computers in school could not integrate technology in their teaching. It should be pointed out that computers (one for every ten learners) were available in all the schools where the participant teachers worked since these schools were computerised as part of the "Tomorrow 98" programme. Access in these schools was not available to ESL teachers as mentioned above, mainly because of preferences and decisions of the school principal. For example, in Alef high school only computer skills teachers use the computer rooms.

Another disagreement occurred over the issue of technical support. The survey findings indicated that lack of technical support was a major obstacle especially to the non-users (48 per cent of 29 non-users). The interviewed non-user teachers did not mention lack of technical support as the reason for their not using computers in their teaching. As for the user teachers,
although the survey findings place "lack of technical support" fifth in the barriers ordering of the user teachers, the three user teachers who were interviewed in this study were generally not put off by the occurrences of technical problems. They were quite comfortable with 'not being in control' and learned to solve technical problems on their own or with the help of their pupils and peers. They often used the mistakes as a learning experience for themselves and their learners. The user teachers claimed in their interviews that technical problems were inevitable and became an everyday issue which they learned to solve collaboratively with their learners and peers. They found this collaboration very useful for all the participants and for their own professional development.

In the attempt to determine factors that could predict computer use in classroom instruction, no significant conclusions were reached. Since all the participants volunteered to participate in the course, it may be assumed that they were all positive in their attitude towards computers and even if some suffered from techno-phobia to some extent, it did not deter them from trying to use computers and know more about their potential in teaching. The ability and willingness to become lifelong learners was evident among the interviewed teachers. Both users and non-users were aware of the need to keep updated whenever technology was involved since technology was changing constantly. The participants were constantly engaged in self-learning and updating knowledge (Ellis, 1986; Fullan, 1994; Harrari, 1992; Chen, 1996; DfEE, 1997). The study checked whether flexibility and willingness to change predicted computer use among teachers. The analysis of the survey questionnaire showed the majority of the participants (82 per cent) were willing to change their teaching techniques. The three interviewed user teachers and Non-User1 expressed willingness to try new approaches in their lessons. Even Non-User 2 declared that although she did not use computers in her teaching she had adopted other changes introduced in her school throughout her career. Teachers' age as a predictor could not be established in this study. Most of the participants were between 30 to 50 years of age but this is true for the entire teacher population in Israel. There was disagreement among the interviewees whether young or more experienced teachers are more likely to use computers. Nothing was found on the topic in the literature. Grade level was also investigated. Since “Tomorrow 98” project was implemented first in junior high schools, it was not surprising that the majority of the participants in this study (55 per cent) taught in these grades. Elementary school teachers rarely (eight per cent) used computers in teaching English as a second language because of language difficulties. High school teachers were also reluctant to use computer technology in their teaching because of the need to prepare the learners for their matriculation exams and they felt it was a waste of time.
The following diagram (figure 6-1) that illustrates the summary of the main conclusions of this study, like the diagram on page 85 that summarises the literature review, shows the four dimensions, teachers, leadership, culture and staff development, required to enhance computer technology in schools. The perfect condition for success is a balanced environment in which teachers are both willing and well trained and work in an environment in which the leadership is collegial and supportive. However, the study emphasises the importance of the role of school principals in the process. In this study, teachers were willing and well trained and yet thirty per cent did not use computers in their teaching mainly because of the unsupportive and unsuitable leadership and school culture.

This study concludes that teachers, the first dimension, both users and non-users, once exposed to computers, learn to use them to prepare materials. The teachers who integrate them in their teaching often alter their teaching methods to suit the technological environment to a more student centred teaching. This new approach to teaching is then adopted to regular classroom teaching to the satisfaction of the teachers (and their students) (Borko and Putman, 1996; Lawson and Comber, 1999; Dwyer et al, 1994; Fullan, 1994; Rosso et al, 1998).

Good school leadership, the second dimension and the most dominant one, should provide teachers with the conditions for successful implementation of technology in teaching. In the situation described in this study, where the teachers were willing and prepared to teach in an ICT environment and the equipment, both hardware and software, was available, the school principal was the main force that determined the integration of computers in teaching.

School culture, the third dimension, which is a direct outcome of leadership, should provide a suitable environment to assist teachers in achieving the desired goals of the institution. Integrating computers in teaching becomes easier for teachers within a school culture where computers and technology are an integral part of school routine and computers are available for use in the teachers' rooms, libraries and even their homes (Fullan, 1994, 1999; Hord et al., 1987; Joyce et al., 1989; Leithwood, 1994).

Staff development, the fourth dimension, ensures that the learning and development of the teachers is continuous. Technology changes rapidly and for teachers to keep updated, they have to be provided with the appropriate training and support (Lumby, 1997; Fullan, 1994; Leithwood, 1994).
Figure 6-1: Integrating Computers in Teaching

TEACHERS
- Relevantly trained
- Flexible
- Willing to change
- Positive in attitude
- Take the role of change agents

LEADERSHIP
- Transformational Visionary
- Collegial
- Change agent
- Provides modeling
- Enables access to computers

INTEGRATING COMPUTER TECHNOLOGY IN TEACHING

STAFF DEVELOPMENT
- Relevant
- Constructivist
- On-going
- Collaborative
- Professional

CULTURE
- Collegial
- Collaborative
- Learning organisation
- Supportive
- Access to computers

Users
- Adopt new methods
- Enjoy teaching
- Control technical problems
- Non-users
- Use computers for material preparation

Non-users
The model may be regarded as a contribution to a better understanding of the Israeli Ministry of Education in detecting the elements that are responsible for the slowing down of the process of integrating computer technology in schools. However, a further development of the model requires future research of the school leadership in Israeli schools. Such research could investigate the different types of principals and management styles and the effects these have on the integration of computer technology in their schools.

Limitations of the Study

This study investigated the integration of computer-based technology of elementary, middle, and high school teachers in the Tel-Aviv District. The researcher is aware that the study is subject to a number of limitations. The limitations can be delineated as:

(1) The study population was taken from a single subject group, all of whom had attended the same course, which had a particular pedagogical approach, and was taught by the author of the thesis. This may represent a potential weakness, since it is clear that this cannot be regarded as a 'representative' sample in terms of generalising the findings to other populations. Further research is called for to establish the extent to which the findings of this study might be applicable to other populations, and the extent to which in-service training provision and policy initiatives could be developed based on these findings.

(2) No attempt was made to check the effectiveness of computer technology on the learners within the classes where it was used. The only evidence collected concerning the learners was the impressions of the teachers gathered from the questionnaires and the interviews. The observations held in the computer rooms focused on the performance of the teachers and their interactions with the learners. Further study is called for to examine the learners.

Impact of the study and recommendations

This study revealed that teachers who get relevant and sufficient computer training over an extended period of time are able to incorporate computer technology in their teaching. These teachers very often altered their teaching methods to fit the computer environment. These learner-centred, constructivist teaching methods were later adapted to the regular (no computers) classrooms. In spite of the technical problems, the time required to plan and
prepare such lessons, the constant need to update knowledge concerning new technologies, the user teachers enjoyed teaching in the computer environment more than in the regular classrooms and claimed that their learners found this environment more motivating and efficient. The main obstacle was accessibility to computers in schools where there were not enough computer rooms.

This study also revealed that the school principals and school culture played an important role in enabling successful integration of computer technology. Both user and non-user teachers emphasised the need for a supportive and encouraging school environment. Such an environment was best achieved through transformational leadership and collegial management. Both the survey and the interviews revealed that the majority of the user teachers were aware of the positive attitude of their principal towards their use of computers and his/her influence on their work. Three user teachers in the case studies admitted that their principals openly encouraged them to integrate computer technology in their teaching, and showed their appreciation and support in many occasions. Principals who themselves used computers and modeled their use both in everyday life and in pedagogical issues, were more likely to succeed in integrating computer technology in their schools. Such principals often enabled teachers to participate in decision making, by sharing their vision, by creating a school atmosphere that encouraged and supported the use of IT, by generating an appropriate school culture in which computers were involved in the daily routine, creating a supportive and encouraging environment in which teachers were provided with elementary conditions such as access to technology, computer technicians, time to develop materials, professional experts. The school culture in which computers were in use for different functions such as communicating with the teachers via e-mail messages, preparing multimedia presentations for staff meeting and word processing all the written material encouraged computer use by the staff. Principals who believed in the potential of ICT in education succeeded in diffusing the change.

An important aspect is the social/cultural context in which the study was undertaken. The fact that this study was undertaken in an Israeli context represents a new contribution to the literature, which, as seen in Chapter 2, currently comes mainly from the US or UK. No similar research has been performed in Israel since the launching of "Tomorrow 98". Although its scope is relatively limited, ESL teachers in the Tel-Aviv district, it may still serve as a model for other disciplines in other districts. It is the hope of the researcher that the Ministry of Education will use some of the conclusions reached in this study as a guide to further enhance the use of technology in the school system. Teacher training programmes should be developed
focusing on providing teachers with new teaching strategies that enable the integration of the technology into the curriculum. The programmes are efficient when they serve as a model, both in structure and content, and they require active use of the technology in developing relevant teaching materials. As technology tools become more affordable and educational resources continue to be placed in digital formats, teachers will need to have command of technology tools as a part of their professional skills they bring to their classrooms. To have such command, good training is essential. The combination of technological skills and curricular issues performed in a computer room environment which involves continuous hands on practice, over a long period of time (112 hours) seems to provide appropriate training for in-service teachers.

Principals should be provided with suitable and relevant training that focuses in developing their abilities to manage their institutions in such ways that will create a culture that encourages computer use for both professional and personal use among the entire staff. Principals should be trained to aim at building collaborative work cultures and concentrate on fostering vision building, norms of collegiality that respect individuality, norms of continuous improvement, problem-solving and conflict resolution strategies, lifelong teacher development that involves inquiry, reflective practice, collaboration, and technical skills (Hargreaves and Fullan, 1998; Leithwood et al, 1998). This study clearly indicates that the influence of the school principals is crucial in the enhancement of computer technology in teaching. Millions of dollars have been invested in computerising the Israeli school system and it is the duty of the Ministry to make sure that the best use is made of this money.

Implications for Further Research

There are several specific areas of focus in relationship to this study that future researchers should explore more deeply. Because of the limitations mentioned above, further research is called for to establish the extent to which the findings of this study might be applicable to other populations, and the extent to which in-service training provision and policy initiatives could be developed based on its findings and conclusions. This study may be repeated after an interval of two to three years to determine if there was any increase in computer use among ESL teachers and if the school principals and leaders create the appropriate culture that enables such use. Another possibility is to perform a similar study on the population of ESL young teachers who have just completed their teacher training studies which included courses
for the use of computers in their teaching. Similar studies may be performed on different discipline teachers (Mathematics, History, Biology and more) who underwent a similar course of integrating computers in their teaching. A research may closely investigate the role of leadership and school culture in the integration of technology in schools concentrating on management models, leadership styles and school size.
APPENDICES

Appendix A: Correspondence

Teacher Consent Form

Ida Heilweil, as part of her Ph.D. degree is conducting a study in an effort to determine the extent and manner of computer use by ESL teachers in classroom instruction. It involves observation and interviews of teachers as a way of describing the context within which each teacher is operating. There are no known risks or discomforts associated with these procedures.

While there may be no direct benefit to you at this time for participating in this project, I am hopeful that I will learn something that will help teachers implement new strategies more effectively and with less frustration.

All information collected will be held in strictest confidence. While this information may be published, at no time will your name be used. In addition, you are free to terminate this consent at any time and withdraw from the project without prejudice. If you have any questions concerning this project or this consent, please feel free to call Ida Heilweil at 03-6850006 or e-mail me: heilweil@netvision.net.il

I, hereby consent to participate in the project described above. I have read and understand this statement and I have had all my questions answered.

Date:
Signature:
Witness:
A Principal Consent Form

Ida Heilweil, as part of her Ph.D. degree, is conducting a study in an effort to determine the extent and manner of computer use by ESL teachers in classroom instruction. It involves observation and interviews of teachers as a way of describing the context within which each teacher is operating. I would like to collect data on the process the teacher is going through to implement this change.

While there may be no direct benefit to you at this time for participating in this project, I am hopeful that I will learn something that will help teachers implement new strategies more effectively and with less frustration.

The data will be collected primarily from the teacher; however, your viewpoint and that of the computer coordinator in your school may be needed and appreciated. All information collected will be held in strictest confidence and at no time will your name be used in publications. You understand that your participation in this research is voluntary and if at any point you have questions, these may be addressed to Ida Heilweil at 03-6850006 or e-mail me: heilweil@netvision.net.il

I, hereby consent to participate in the project described above. I have read and understand this statement and I have had all my questions answered.

Date:
Signature:
Witness:
Appendix B

Survey Questionnaire

Ministry of Education, Tel-Aviv District,
Tel-Aviv Computer Centre

Dear Colleague,

You have been selected to take part in a research since you have participated in one or more of the courses "Integrating Computers in the English Class" organised by the Tel-Aviv District Computer Centres in the last five years. Ida Heilweil performs this survey as part of her Ph.D. degree in an effort to determine the extent of computer use by ESL teachers in classroom instruction. The results of the survey will be used to make recommendations about how the Tel-Aviv district computer centres may better serve their teaching staff with regard to training in computer use in classroom instruction. Your participation is strictly voluntary. Confidentiality is guaranteed; your name will not be associated with your answers in any public or private report of the results. If you are interested in receiving a summary of the finding please check the appropriate box at the end of this questionnaire.

Part I: Training & Professional Development

Our first topic is training. Training is the preparation of teachers to use computers in the classroom. Please answer the following questions.

1. I participated in the training course “Integrating Computers in the English Class” in the year(s). ______  ______  ______

2. The computer training I have received (in this course and others) has been in the following areas: (Check all the answers that apply)

- [ ] Computer operation basics (Windows, Windows95, etc.)
- [ ] Word Processing
- [ ] Presentation software (PowerPoint, etc.)
- [ ] Spreadsheets (Excel, Lotus, etc.)
- [ ] Database management (Access, Dbase, etc.)
- [ ] Internet
Lesson planning
Preparation of worksheets
Curriculum integration
Teaching techniques
Other (please specify): ________________

3. Implementation. Check the answers that are true for you.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>I have implemented what I have learned in the course</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>I have adopted teaching techniques used in the course</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>I use materials prepared in the course (by my colleagues and me)</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>I prepare my own material for computer use</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>I team with my colleagues to prepare materials</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>I have never used anything from the course</td>
<td></td>
</tr>
<tr>
<td>g.</td>
<td>I have altered my teaching methods as a result of using computers</td>
<td></td>
</tr>
<tr>
<td>h.</td>
<td>I will never make any use of the contents provided in the course</td>
<td></td>
</tr>
<tr>
<td>i.</td>
<td>The course has changed my perception of my profession</td>
<td></td>
</tr>
<tr>
<td>j.</td>
<td>No one in my school uses computers</td>
<td></td>
</tr>
</tbody>
</table>

4. Report all professional development related to the use of computers that you participated in over the past five years.

<table>
<thead>
<tr>
<th>Description of course (main topics...)</th>
<th>Organised by (your school, Ministry of Education, other)</th>
<th>Number of hours</th>
<th>Year</th>
</tr>
</thead>
</table>

5. Please list any suggested computer training opportunities you would like to have:

<table>
<thead>
<tr>
<th>Topic of interest</th>
<th>Number of hours</th>
</tr>
</thead>
</table>

6. Please check the answer that best fits your feelings concerning your training. Check all the answers that apply.

My training has:
- taught me to competently operate computers
- taught me how to implement computers into my curriculum
- taught me how to evaluate software/hardware for instruction
- been for self-improvement
- changed my teaching style
- been based on hands-on experience
- changed my understanding of being a teacher
- improved my teaching capabilities
- promoted my career
Part II: Computer-Based Instruction

Another important part of understanding computer use by teachers in classroom instruction has to do with the factors related to computer use.

7. I use computers in my instruction

☐ Yes
☐ No

If your answer is No go straight to – Part VI: Possible Barriers, Part VII: Attitude towards Teaching with Computers, Part VIII: Demographics.

8. Approximately how often do you use each of these applications with your students (one class)?

<table>
<thead>
<tr>
<th>Application</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Once or twice a year</th>
<th>Never</th>
<th>Not Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. MSWord</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Graphical applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. MSPowerPoint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. MSExcel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Internet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. e-mail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Drill/Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programmes, Tutorials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Other/s (please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. For what purpose do your students use computers in your classes? (Check all the answers that apply)

☐ to organise and store information
☐ to collect data
☐ to manipulate/analyse/interpret data
☐ to communicate information as the result of investigations
☐ to create visual displays of data/information (e.g., graphs, charts, maps)
☐ to plan, draft, proofread, revise, and publish written text
☐ to create graphics or visuals of non-data products (e.g., diagrams, pictures,)
☐ to create visual presentations
☐ to support individualised learning
☐ other (please specify): ____________________________

10. Teaching strategies and techniques in the computer room. Please check the answers that are true for you.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>hardly ever</th>
<th>sometimes</th>
<th>very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I engage my students in projects</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
b. My choice of teaching topics is relevant to my students interests

c. My students do research work.

d. My students work in teams

e. My lessons provide the learners with choice

f. I demonstrate the task before asking the students to perform it.

g. I use textbooks in my computer lessons

h. I have teaching strategies that I use only in the computer room

i. I adopt “computer room teaching strategies” in my regular classroom teaching.

<table>
<thead>
<tr>
<th>hardly ever</th>
<th>sometimes</th>
<th>very often</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. List three teaching strategies (from those mentioned above) that you use most frequently in your computer lessons (1. = most frequent):

a. __________________________________

b. __________________________________

c. __________________________________

12. List three teaching strategies (from those mentioned above) that you use most frequently in your regular lessons (1. = most frequent):

a. __________________________________

b. __________________________________

c. __________________________________

Part III: Support

Another factor related to the use of computers by teachers is support. Support is the help needed to use computers in the classroom; i.e., computer technicians, computer literate co-workers, and administrators who endorse computer use.

13. Support. Please check the appropriate answer. (Check all the answers that apply)

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Sometimes</th>
<th>never</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. My colleagues are against computer instruction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Our principal is supportive of computer instruction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Technological assistance is available in our school.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Parents of my students are supportive of computer instruction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Our school’s computer technician provides</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
me with the technical help I need.

f. Our school principal shows his appreciation of my computer instruction.

g. Students in my class are supportive of computer instruction.

h. Our school's computer coordinator provides me with most of the answers to my questions concerning computers use.

i. I can handle most of the technological problems on my own.

j. When I need technical support I turn to my students.

k. Other (please specify):


Part IV: Possible Barriers

14

i. I consider the checked items as being barriers to computer use in education (Check all the answers that apply):

ii. In my opinion the order of significance of the barriers I have selected in item "14i." is as follows (1=most significant):

<table>
<thead>
<tr>
<th></th>
<th>i. Check here</th>
<th>ii. Arrange by numbering (1=most significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Lack of time</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Lack of training</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Lack of access</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Fear of computers</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>Reluctance to change teaching techniques</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>Psychological resistance</td>
<td></td>
</tr>
<tr>
<td>g.</td>
<td>Lack of administrative support</td>
<td></td>
</tr>
<tr>
<td>h.</td>
<td>Past disappointments of</td>
<td></td>
</tr>
</tbody>
</table>
Part V: Access to Computers

Next, I would like to ask about your access to computers. Access is defined as the availability of computers and software.

15. Access to computers. Check the correct answer.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I have access to a computer room for use with my classes whenever I wish to teach there.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I have both the necessary equipment and software available in the computer room for my instruction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I have a computer at home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I teach in the computer room at least once a month.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I use a computer to prepare my class activities and work sheets.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. I have at least one computer in every classroom I teach.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. There are no computers in the school I work in.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. I teach in the computer room whenever it is available.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part VI: Using Computers in Your School

15. Check the answers that are true to your school

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Sometimes</th>
<th>never</th>
</tr>
</thead>
<tbody>
<tr>
<td>f. Using computers is a major issue in our school.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. The documentation (grades, report cards, etc), in our school is computerised.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Most of the teachers in my school use computers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Our principal uses a computer in his/her office.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Our computer room is occupied</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Always</td>
<td>Sometimes</td>
<td>never</td>
</tr>
<tr>
<td>---</td>
<td>--------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>k.</td>
<td>Our principal encourages computer use among teachers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>l.</td>
<td>Teachers get support from the technician or teacher in charge of the computer room.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m.</td>
<td>Staff meetings are held in the computer room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n.</td>
<td>PowerPoint presentations are used in staff meetings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o.</td>
<td>School material is word processed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part VII: Attitude towards Teaching with Computers

*Attitudes are defined as teacher beliefs and feelings about the use of computers in classroom.*

16. Express your attitude by checking the cell that best reflects your sentiment.

<table>
<thead>
<tr>
<th></th>
<th>right</th>
<th>I do not know</th>
<th>wrong</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>I enjoy using computers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>The computer has more advantages than disadvantages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Computers make people feel worthless and inferior.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>When I see a computer I keep away.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>I am afraid that one day the computers will rule the universe.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. Check the cell that best describes your feeling when you teach in a technological environment.

<table>
<thead>
<tr>
<th>I feel</th>
<th>hardly ever</th>
<th>sometimes</th>
<th>very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. calm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. angry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. nervous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. secure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. confused</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Other (please specify): __________________</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18. Check the cell that best describes the way you usually feel when you teach.

<table>
<thead>
<tr>
<th>I feel</th>
<th>hardly ever</th>
<th>sometimes</th>
<th>very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. angry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. calm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. confused</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. nervous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. secure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Other (please specify): __________________</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
19. Please check the most suitable answer for you for each of the following statements.

<table>
<thead>
<tr>
<th></th>
<th>right</th>
<th>I do not know</th>
<th>wrong</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I believe students in my classes like to use computers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I believe teachers who use computers in classroom instruction are better teachers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I believe my principal thinks teachers who use computers in classroom instruction are better teachers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I believe that computers improve learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I believe that computers help teachers to improve their teaching techniques.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. I believe that my principal is going to promote me if I use computers in my instruction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. I believe that all the teachers will teach in a technological environment by 2010.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. I believe that students will enjoy school more if computers are integrated into their regular studies.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. I believe that successful implementation of computers use depends on good training</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20. Check the correct answer.

My experience with computers so far has been

- very successful
- partially successful
- not successful at all

21. Describe in 20 - 30 words what you think and feel about teaching with computers.

22. Age:

<table>
<thead>
<tr>
<th></th>
<th>20-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>older</th>
</tr>
</thead>
</table>

23. My highest degree (check one)

- Teaching Certificate
- BA (Bachelor)
- MA (Master)
- Ph.D. (Doctorate)
- Other

24. Including this year, I have ___ years of full-time teaching experience.
Average number of students in my class/classes. ___
I teach the major portion of my day in the (check one)

- Elementary
- Jr. High
- Sr. High
- Other ___
25. I have used a computer at home for ____ years.

26. I have used a computer in my teaching for ____ years.

27. I plan to retire in ____ years

28. I classify my main assignment at the school as
   □ Regular full-time teacher
   □ Regular part-time teacher
   □ Other (please specify ________________)

29. Please check if you are interested
   □ I would like to get a summary findings of this survey.
   □ I am willing to participate in the second phase of this study which will include observations and interviews.

**This is the end of the study. Thank you very much for your effort and input. Please return the survey to Ida Heiweil in the stamped self-addressed envelope no later than March 15th, 2000**

Once again, your participation is greatly appreciated.

_Ida Heiweil_  
53, Bilu st.,  
_Tel-Aviv, 64256_  
_03-6850006, 052-589581_  
_heiweil@netvision.net.il_
Appendix C

Interview schedule - Teachers

Has the training teachers received influenced their use of computers in their instruction?

1. Describe the ways in which the course "Integrating Computers in the English Class" helped you in implementing technology into your teaching?
   - Technological skills
   - Teaching methods
   - Ideas for activities

2. Have you taken other courses on ICT? Who organised them? Were they helpful in your work?

3. Do you use computers outside of class?
   - For school-related work?
   - For preparing class activities?
   - For record keeping?
   - For tasks unrelated to your teaching?
   - For personal use?

4. (Skip for Non-Users) Which types of teaching strategies appear to be most successful when you are using technology?
   - Teamwork
   - Projects
   - Choice
   - Research work

5. (Skip for Non-Users) Does the instructional design of your lessons change when you use technology? Is technology changing the way you teach?

Is school leadership and school culture an influencing element on the teacher's incorporation of computers in their teaching?

6. How would you describe the importance of computers in your school?
   a. Do many teachers occupy the computer rooms?
   b. Is all material word-processed?
   c. Is the principal openly encouraging teachers to use computers?
      How does he/she show it?
d. Are teacher meetings held in the computer rooms? Is the material presented computerised?

7. What types of support would help you in using technology in your classroom?
   - Technical
   - Professional
   - Peer
   - School – principal, other leaders

What limitations and obstacles do teachers face in their attempts to incorporate computers into classroom lessons?

8. (Skip for Non-Users) What types of obstacles and barriers do you experience while trying to integrate computers in your teaching?
   - Technical problems
   - Lack of time
   - No access to computer rooms
   - Need for support
   - Need for more training

Which factors predict computer use in classroom instruction?

9. Identify the most important factor or factors that will determine whether you use technology in your classroom lessons.

10. How do you feel about teaching with computers? What are your worst fears and best hopes for this process of incorporating technology into your teaching?

Thanks so much for making time to talk to me.
Interview schedule – Leaders

Is school leadership and school culture an influencing element on the teacher’s incorporation of computers in their teaching?

1. Describe your role and its contribution to the infusion of ICT in your school.

2. Describe the state of technology in your school.
   a. Number of computers
   b. Number of computer rooms
   c. Types of software
   d. Internet connection.

3. How and by whom is change such as ICT introduced and disseminated in your school?

4. How important are computers in your school?
   a. Do many teachers occupy the computer rooms?
   b. Is all material word-processed? (by teachers, administration, leadership)
   c. Is the principal and other leading figures openly encouraging teachers to use computers? How is this portrayed?
   d. Are teacher meetings held in the computer rooms? Is the material presented computerised?

5. What types of support do you believe help teachers integrate technology in their teaching? Does your school provide such support?

6. What, in your opinion, are the most difficult obstacles teachers have to overcome in order to integrate computers in their teaching? How do you help?

7. Identify the most important factor or factors that will determine successful implementation of technology in your school.

8. Is your school pressured by external bodies (Ministry of Education, Municipality, community) to infuse technology? How?

Thanks so much for making time to talk to me.
Stage 1

Hello,
Following our telephone conversation I am opening this temporary e-mail correspondence. The purpose of this correspondence is primarily to follow the process you undergo in planning a computer-based lesson for your class. I would first like to know about the process of decision making. Relate the following issues
1. How do you decide on the
   - Topic?
   - teaching goals?
   - types of activities?
   - the technology required?
   - other?

2. Is any collaborative decision-making involved in this process?
   - The ESL school teachers
   - The computers coordinator,
   - The computer room technician
   - Other teachers
   - Students
   - other

3. If there is any collaboration, how and where is it performed?
   - Regular pre-planned sessions
   - Occasional meetings in the school premises (teachers’ room, computer room, corridor…)
   - In your house
Please send me your reply in three days so we may advance with the procedure. If you need any further explanation, support, help please feel free to contact me via e-mail or phone.

Thanks and
Have a pleasant day
Stage 2

Hello again,
Now that you have completed this first phase please turn to your partners and prepare the lesson for the learners. The lesson may be one or more activities that attempt to achieve your teaching goals. Please provide your learners with any support, technical or otherwise, as an integral part of your lesson. Please feel free to use the technology available in your computer room and is relevant for your lesson.
If you need any further explanation, support, help please feel free to contact me via e-mail or phone.

Try to send me the file with the lesson by next Sunday

Have a nice day
Ida
Stage 3

Hello again,

Thank you for sending your lesson. My final request from you is to fill out the following lesson plan form:

Topic:

Target population:

Technological tools required for the lesson:

Teaching Goals:

Technological skills required from the learners:

Class organisation:

Pre-computer room activities:

Post-computer room activities:

A brief description of the activity/activities:

Bibliography and Webliography:

Leave blank the parts that are irrelevant for your lesson. Please send this document by Tuesday.

If you need any further explanation, support, help please feel free to contact me via e-mail or phone.

Have a nice day

Ida
Appendix E

The Computer - Based Lesson Plans and Lessons

Singers and Basketball Players - Prepared by User 1

Age/Class/Level:
Eighth grade -

Technological tools:
Word processor, Internet

Teaching Goals:
To practice reading and writing skills in a motivating and relevant environment

Goals concerning technological use:
To practice the technological tools previously taught.

Technological skills:
Word processing functions such as paste, copy, open a new file, save
Internet functions such as surfing, transferring texts and pictures from the Internet, basic search skills

Class organization:
Pair work in front of the computer.

Activity description:
The pupils have to create an ID card for 6 different famous singers or basketball players.
They have to get the information from the Internet and organise it in their documents

Sites used
http://www.alltheweb.com/
http://www.ditto.com/
http://www.altavista.com/
http://www.mtv.com
http://www.nba.com
Famous Singers and Basketball Players

This lesson will focus on singers and basketball players.

Your assignment is:

To prepare an ID card on three of the singers or the basketball players mentioned below:

<table>
<thead>
<tr>
<th>Singers</th>
<th>Basketball Players</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madonna</td>
<td>• Michael Jordan</td>
</tr>
<tr>
<td>Brittany Spires</td>
<td>• Magic Johnson</td>
</tr>
<tr>
<td>Sting</td>
<td>• Shaquille O’neal</td>
</tr>
<tr>
<td>Ricky Martin</td>
<td>• Dennis Rodman</td>
</tr>
</tbody>
</table>

- Choose a singer or basketball player
- Using one of the search engines (Altavista, Yahoo, Askjeeves) search for information
- Open a new file and based on the model below prepare the ID card with the relevant information.
- Add a suitable photo to your work. You may search for pictures at www.ditto.com
- The information should be copied from the original text and pasted to your document. Don’t forget to reference ALL the sites used for your work.
- Save your document.
- Print your work.

Repeat three times. Bring the printouts the next lesson.
THE ID CARD

(name)

(photo)

Date of birth:

Place of birth:

Career:

Additional information:
Around the World – prepared by User 2

Age/Class/Level:
Heterogeneous 8th grade

Technological tools:
Internet, MS-Office

Teaching Goals:
The pupils will be able to learn about countries around the world. The pupils will be able to practice their English.

Goals concerning technological use:
The pupils will be able to use the Internet

Technological skills:
The pupils are capable of working with the following technological tools: Internet, Basic function in Word processor, Word art styling, links to the net and to the hard disk, search, E-mailing

Class organization:
Individual Work - each pupil will work individually according to his level and pace.

The Activity:
There are three countries, which are introduced to the pupils. Each pupil first chooses the country he wants to learn more about. Each country contains general knowledge, different activities and interesting ones. Eventually, each pupil uses his imagination, learns about all three countries and is exposed to the various usages of the word processor and the Internet.

Webliography:
http://weather.yahoo.com/forecast/Rabat_MC_f.html
http://weather.yahoo.com/forecast/New_Delhi_IN_f.html
http://weather.yahoo.com/forecast/London_UK_f.html
http://www.plcmc.lib.nc.us/kids/mow/
http://www.hotelstravel.com/morocco.html
http://www.ditto.com/
INTRODUCTION

You are an 8th grade student who is about to join a magnificent and thrilling journey around the world. In your journey you can choose to visit one of the following countries:

India  England

You may begin your journey at any country you wish to.
To your convenience, you may find an answering key for some of the countries at the bottom of the activities (not all activities have answering keys).
We hope you will enjoy your journey and enrich both your general knowledge and your English skills.

Go For It !!!

INDIA
What Does the Flag Mean?

Read the following passage and answer the questions below.

On 15 August 1947, the Dominions of India and Pakistan were established. India adopted the familiar tricolor of orange, white and green with a blue Ashoka Chakra at the centre. The tricolor had been used, unofficially, since the early 1920 as the flag of the India National Congress, with the colors representing Hinduism (orange), Islam (green), and a hoped-for unity and peace (white).

The wheel at the centre represents Gandhi’s call for economy through hand spinning.

Indian states officially do not have flags of their own, except for Jammu and Kashmir. However, some unofficial flags have been reported:

- Manipur: four horizontal bands of yellow, dark blue, red and green.
- Mizoram: the same (or very similar) to Iceland.
Andra Predesh: green with a map of the state in yellow in the centre.
Assam: red with two white Gurkhas *poniards* crossed in the centre.
Sindh: red or dark saffron with a white circles in the centre; in this circle a black hand with a black axe.

<table>
<thead>
<tr>
<th>dominion</th>
<th>established</th>
</tr>
</thead>
<tbody>
<tr>
<td>לוחם</td>
<td>ANDARD</td>
</tr>
<tr>
<td>adopted</td>
<td>tricolor</td>
</tr>
<tr>
<td>לא רשמי</td>
<td>representing</td>
</tr>
<tr>
<td>wheel</td>
<td>economy</td>
</tr>
<tr>
<td>spinning</td>
<td>poniard</td>
</tr>
</tbody>
</table>

Questions

Indian’s flag has three colors, what are they?

What does each color represent?

What is the meaning of the wheel?

What is the date of the flag?

What are the two states which have flags of their own?
Name two more unofficial flags that have been reported.

What are the states of those flags?
Invent Your Flag

Here is a site, which shows flags of countries all over the world.

www.plcmc.lib.nc.us/kids/mow/.

Choose one country and draw your own flag.

Fill in the

following details:
Name of country: ________________________________

Colors of the original flag: ____________________________

Colors of your flag: _________________________________

The meaning of each color and symbol
__________________________________________________

Why did you choose that particular Flag / country?
__________________________________________________

Check yourself
India

Orange, green and white.
Orange for Hinduism, green for Islam and white is a hoped for unity and peace.
Gandhi's call for economy through hand spinning.
August 15, 1947
Manipur: four horizontal bands of yellow, dark blue, red and green.
Mizoram: the same (or very similar) to Iceland.
Andra Predesh: green with a map of the state in yellow in the centre.
Assam: red with two white Gurkhas poniards crossed in the centre.
Sindh: red or dark saffron with a white circle in the centre; in this circle a black hand with a black axe.
ENGLAND

Sharon has been traveling in England for the last month. She sent a postcard to Keren telling her about the places she had been to. By mistake Sharon forgot to send the pictures. Read the postcard and find suitable pictures that match her descriptions in the Internet site below.

Dear Keren,

Here are some pictures of London.
The weather is beautiful. The museums are marvelous and the hotel is great. The food here is very good. The city is quite expensive but you can bargain in the markets.
Up until today I have managed to do many things such as:
Visit the Buckingham Palace and see the queen's guards,
Ride horses on the countryside,
Go boating on river Thames,
Watch professional football at Wembley Stadium,
Visit the Wax Museum and ride on their red double deck buses.
My English is not that good but the people are very friendly and are known by their generous hospitality.

Press on the following web site in order to see the pictures:
After downloading the relevant pictures, paste them below.

Photos from London
Dear Sharon/Keren,

This is a picture of (the beach/the village/the market). The weather is (hot/cold/sunny/rainy). The hotel is (excellent/lousy). I have a (big/small) T.V in the room and a (mini/large) bar. There are (lots/many/a few) of (different/friendly/warm) tourists from all over the (country/world/city).

I have met some (old/new/elder) friends and I am not alone. All of us are having a (beautiful/wonderful/great) time.

See you (soon/ later)

Keren

Write a postcard back to Sharon telling her where you are and what you have been doing there.

Send your postcard to Sharon's Email
Dear Joe/Anne/Sharon/Keren,

This is a picture of the beach/the village/the market. The weather is hot/cold/sunny/rainy. The hotel is excellent/ lousy. I have a big/small T.V in the room and a mini/large bar. There are lots/many/a few of different/friendly/warm tourists from all over the country/world/city. I have met some old/new/elder friends and I am not alone. All of us are having a beautiful/wonderful/great time.

See you soon/ later

Keren
Dominant Characters in the 20th Century – prepared by User 3

**Topic:**
Dominant characters in the 20th century.

**Target population:**
Eighth grade - ninth grade

**Number of lessons:**
Four lessons.

**Learning environment:**
The opening of the unit will be done in the class. The three activities + the closure will be done in a computer lab.

**The rational of the unit:**
Teaching the pupils to acquire computer skills through investigating interesting and very important characters in the 20th century: creating new files, creating links, use the computer dictionary, using the Internet.

**The goals (Goal of each lesson):**

**Albert Einstein lesson:**
1. Appreciation of culture and history.
2. The pupils will be able to use WH questions.
3. The pupils will be able to use the present simple.
4. The pupils will be able to use and improve their writing skills.
5. The pupils will be able to create new file.
6. The pupils will be able to use links to the Internet.

**Charlie Chaplin lesson:**
1. The pupils will be able to create new file.
2. The pupils will be able to use the computer dictionary in order to find definitions of new words.
3. The pupils will be able to enrich their vocabulary.
4. The pupils should be able to copy pictures of Charlie Chaplin from the Internet.
5. The pupils will be able to use previous knowledge and new information about Charlie Chaplin in order to implement it in their answers.
6. Appreciation of culture and history.
Mickey Mouse lesson:
1. The pupils will be able to create new file.
2. The pupils will practice reading comprehension.
3. The pupils will be able to create links to the Internet.
4. The pupils will be able to use and improve their writing skills.
5. Appreciation of culture and history.

Links to sites used in this unit
- www.ajkids.com
- www.altavista.com
- www.aip.org/history/einstein.com
Albert Einstein

He got his Doctor degree from Zurich. Albert Einstein was the most famous scientist in the 20th century. As a pupil he used to miss lessons in the school because he preferred to play his violin. In 1905 University. He was a proud Zionist.

Activities:

Find out facts about Albert Einstein. In order to get into his site click on his name. (write down at least 5 facts about him).
You are a journalist. Write down an interview with Albert Einstein, use the present simple. Ask him at least 10 questions and write his answers. (In order to do that you should open new file)

Name all the inventions made by Albert Einstein. Write down at least 5 inventions.
Charlie Chaplin

*Born April 16, 1889, in London, England*

*Died December 25, 1977, in Corsier-sur-Vevey, Switzerland*

"Talkies are spoiling the oldest art in the world - the art of pantomime. They are ruining the great beauty of silence. They are defeating the meaning of the screen".
- Charlie Chaplin, 1929

Charlie Chaplin was many things to many people. He was first and foremost a great silent artist. He was also a complex individual who equally delighted and enraged those around him. He lived at the top of the world, and his instantly recognizable screen image pierced the psyches of people everywhere, from cities to the most remotest places on earth. While historians are unable to agree precisely on the when he created his "little tramp" character, it cannot be denied that even in silhouette it is unmistakenly Charlie Chaplin.

Previously, his working methods were a mystery until the rediscovered cache of films he had stored away, brought to light after his death. Lady Oona Chaplin, his wife from 1943 to his death, consented to provide generously of Charlie's private film legacy. We now know that one of Chaplin's professional secrets was he rehearsed on film.

Sometimes the film that ends up on the cutting-room floor tells more about the creative process than the final cut. The point is Chaplin's love for the art of silent filmmaking was deep and abiding - the final judgment of replacing silents with talkies was not going to happen to Chaplin without a good fight.

Activities:
Write down your answers in one file. Save it under the name "Charlie Chaplin".

Find the definition for each colored word.
* In order to find out how to do it press double click on the word "Definition".
* Write the meaning of the words in English only.
* In order to write your answers you should open **new file**.

Find a **picture** of Charlie Chaplin. Click on the word – “picture” – in order to get into Chaplin’s site.

* In order to copy a picture you should: mark the picture > press the right button of the mouse > “copy” > go back to your file > press on “paste”.

Write down three facts that you already know about Charlie Chaplin and another three new facts. (Search the web)
Mickey Mouse

Activities:
Write down your answers in new file called “Mickey Mouse”. In order to know how to open new file press here.

1. Answer the following questions:
   How did Mickey start his career?
   Why didn’t the parents like Mickey at first?
   Find out what “goody – two shoes” means?
   What does Mickey “stand for” today?
In order to answer these questions click here
(Go to “character development”)
Find out more information about Mickey Mouse in the Internet. Write the names of the sites and create links to them.
* Press “link” in order to know how to create links.
You are the producer of Walt Disney. Write down a short script with a special part for Mickey. Use your imagination.
Appendix F

Definition and Glossary of Terms

Definitions for technical terminology are often defined according to the discipline or profession in which they are used. In order to ensure consistency throughout the study and for future replication, the following operational definitions are provided.

Access: ability to use computer-based technology without constraints of location, time-schedule, or availability.

Change agent: an individual who facilitates the process of a new initiative or reform.

Computer-Based Instruction (CBI): Instruction that utilises a computer system to present instruction using aural, visual, or aural-visual elements such as video, audio, text, graphics, and animation.

Computer-based Technology: computers or any device connected to and controlled by the computer such as CD-ROMs, Internet access, LANs, Laserdiscs, modems, or scanners.

Continuous training: Training conducted on an ongoing basis throughout the year to provide the teachers with the necessary competencies for employing technology in instruction.

Educational Technology: See section “What is Instructional/Educational Technology/Information and Communication Technology?” in Chapter 1 – Introduction.

Electronic Mail (e-mail) Messages, usually text, sent from one person to another via computer. Can be sent automatically to a large mailing list.

Hardware: The physical, touchable, material parts of a computer - keyboard, printer, disk drives, tape drives, loudspeakers or other system. The term is used to distinguish these fixed
parts of a system from the more changeable software or data components which it executes, stores, or carries.

**Information and Communication Technology:** See section "What is Instructional/Educational Technology/ Information and Communication Technology?" in Chapter 1 – Introduction.

**Initial training:** Training provided at the time when new equipment or software is provided to teachers for use in instruction.

**Instructional Technology:** See section "What is Instructional/Educational Technology/ Information and Communication Technology?" in Chapter 1 – Introduction.

**Just-in-time training:** Training provided only at the time and in the amounts which are necessary at a particular time, not overloading an individual with more information than what is needed at a particular time.

**Laptop:** A computer small enough to sit on your lap. The laptop computer's small size allows you to take it almost anywhere and access the Internet.

**Multimedia:** Human-computer interaction involving text, graphics, voice and video. Often also includes concepts from hypertext. This term has come to be almost synonymous with CD-ROM in the personal computer world because the large amounts of data involved are currently best supplied on CD-ROM.

**Practice:** to exercise, train, drill, or carry on an activity which gives the teacher experience in using computer- based technology for instruction.

**School community:** includes students, teachers, staff, administrators, parents, business leaders, and political affiliations.

**School principal:** school headteacher (in UK).

**Site:** A place on the Internet. Every web page has a location where it resides which is called it's site. And, every site has an address usually beginning with http://.
Software: The instructions executed by a computer, as opposed to the physical device on which they run (the "hardware"). Software can be split into two main types - system software and application software or application programmes. System software is any software required to support the production or execution of application programmes but which is not specific to any particular application. Examples of system software would include the operating system, compilers, editors and sorting programmes.

Telecommunications: Communication over a distance using a means such as telephone lines, Internet, or satellite.

Technology infusion: Refers to the use of technology by teachers and students within the classroom curricula. Examples include student production for reports, spreadsheets in science labs, and research projects.

Technology integration: Refers to the use of hardware and software in the school.
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