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PROMOTION OF SOCIAL INTERACTION IN THE CLASSROOM BY EFFECTIVE UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGICAL TOOLS

531.01. – General Theory of Education

PhD thesis in pedagogy

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CONTENT

ADNOTARE

Baranetz Efrat, **„Promovarea interacţiunii sociale în clasă prin utilizarea efectivă a instrumentelor tehnologice de informare şi comunicare”,** teză de doctor în ştiinţe pedagogice, Chişinău, 2015.

Structura tezei. Teza este constituită din introducere, trei capitole, concluzii generale şi recomandări, 136 de pagini de text de bază, adnotări în limbile română, engleză şi rusă, bibliografie (119 surse) şi 7 anexe. În textul tezei sunt inserate 2 tabele şi 27 de figuri.

Publicaţii la tema tezei - 7 lucrări ştiinţifice: 5 articole în reviste ştiinţifice de profil, naţionale şi internaţionale, 2 comunicări la conferinţe naţionale (1) şi internaţionale (1).

Cuvinte-cheie: instrumente tehnologice, predare-învăţare asistată de calculator, constructivism, interacţiune/dinamică socială, implementare TIC, pedagogie avansată, profesor eficient, mediu de învăţare, evaluarea implementării TIC.

Domeniul de cercetare: Teoria generală a educaţiei.

Scopul cercetării este de a identifica aspecte ale potenţialei contribuţii unice a computerului în promovarea dinamicii sociale în clasă şi în dezvoltarea unui model de angajare în maximizarea eficienţei instrumentelor tehnologice şi a nivelului de impact a acestora asupra dinamicii sociale în clasă.

Obiectivele cercetării: analiza dificultăţilor cu care se confruntă profesorul în promovarea interacţiunii sociale în clasa computerizată prin documentarea detaliată şi examinarea reflexivă a întregului proces în baza elementelor teoretice, precum şi a descoperirilor rezultate din cercetare; examinarea oportunităţilor oferite de utilizarea calculatoarelor în procesul de predare-învăţare pentru promovarea dinamicii sociale în clasă; compararea activităţilor de învăţare reciprocă care au loc în cadrul „clasei computerizate” şi a relaţiilor reciproce în „clasa care maximizează eficienţa utilizării calculatoarelor”; determinarea obiectivelor schimbării la nivelul interacţiunii, promovată de cercetarea actuală.

Noutatea ştiinţifică şi originalitatea constă în descrierea provocărilor cu care se confruntă domeniul educaţiei în secolul al XXI-lea, examinarea perspectivei constructiviste asupra procesului de învăţare cu accent pe perspectiva tehnologică şi viziunile interpersonale, consolidarea importanţei interacţiunii sociale în procesul de învăţare, indicarea legăturii dintre tehnologie şi pedagogie, analiza aspectelor sociale ale mediilor de învăţare care utilizează TIC, interpretarea contribuţiei TIC la procesul de predare şi învăţare calitativă, investigarea modalităţilor care permit utilizarea cu succes a TIC, descrierea, analiza şi interpretarea rolului cadrelor didactice în integrarea TIC în procesul de învăţare-predare, precum şi evaluarea eficienţei TIC în procesul de predare.

Problema ştiinţifică soluţionată în domeniul ştiinţific constă în elaborarea, argumentarea şi proiectarea unui model de utilizare eficientă a TIC în clasă, în scopul sporirii interacţiunii sociale.

Semnificaţia teoretică constă în demonstrarea complexităţii procesului de adaptare a inovaţiei şi schimbării de către sistemul de învăţământ; stabilirea obstacolelor pentru ca profesorii să pună în aplicare mai eficient tehnologia în strategiile lor de predare, cu prezentarea modelelor diferite pentru utilizarea maximă a instrumentelor TIC în procesul de predare-învăţare; stabilirea indicatorilor pentru a evalua şi a reflecta asupra procesului.

Valoarea practică a cercetării rezultă în validarea preliminară a ipotezei conform căreia interacţiunea socială în clasa computerizată poate fi încurajată prin integrarea eficientă a TIC. Rezultatele cercetării, identificarea obstacolelor şi diferitor criterii pentru utilizarea maximă a instrumentelor TIC în procesul de predare-învăţare şi accentuarea importanţei sporirii dinamicii sociale în cadrul acestor lecţii pentru promovarea reuşitelor academice pot fi folosite de către profesori, formatori şi conceptori ai cursurilor de dezvoltare profesională şi de curriculum în domeniul educaţiei.

Implementarea rezultatelor ştiinţifice s-a efectuat într-o şcoală elementară din Israel, în care cercetătoarea activează în calitate de cadru didactic şi ca formator şi au fost prezentate în cadrul conferinţelor naţionale şi internaţionale.

ANNOTATION

Baranetz Efrat, *"Promotion of social interaction in the classroom by effective utilization of information and communication technological tools",* thesis of doctor in pedagogy, Chisinau, 2015.

The research has pages of core text, including introduction, three chapters, conclusions and recommendations, annotation in Romanian, English and Russian, key words, references (119 sources), 7 appendices, 136 pages of main text: The basic thesis is presented in 7 scientific papers. There are also enclosed 27 figures and 2 tables.

Key-words: technology integration, social interaction, constructivism, technology and pedagogy, ICT in education, effective use of technology, computerized classroom, learning environment, evaluation of ICT use.

The field of research: General Theory of Education

The aim of the research is to identify the aspects of the computer's unique potential contribution to promoting social processes in the classroom and develop a model engaging in maximizing the effectiveness of technological tools and their level of impact on social processes in the classroom.

The objectives of the research: examination of the opportunities, provided by using computers in learning-teaching processes, to promote social processes in the classroom; understanding and describing the teacher's difficulty in promoting social processes in the computerized classroom based on the theoretical background; definition of the objectives of the change on the levels of interaction the current action research seeks to generate; comparison of reciprocal activities taking place within the "computerized classroom" and reciprocal relations in the "classroom maximizing the effectiveness of computers."; carrying out detailed documentation and reflectively examine the entire process while creating contacts both with theoretical elements at the foundation of this research as well as findings of the process.

The scientific novelty and originality of the research: the description of the challenges facing the education field in the 21st century, the examination of constructivism approach to learning focusing on technological perspective and interpersonal views, reinforcement of the importance of social interaction in the process of learning, indication of the connection between technology and pedagogy, analysis of the social aspects of learning environments using ICT, interpretation of the contribution of ICT to quality teaching and learning, investigation of ways to enable successful use of ICT, description, analysis and interpretation of the role of teachers in integrating ICT into the learning-teaching process, evaluation of the effectiveness of ICT in teaching.

The scientific problem solved in the investigated area consists in the elaboration, the argumentation and projecting of a model to effectively use ICT in the classroom in order to promote social interaction.

The theoretical value of the research: consists in demonstrating the complexity of the education system to adapt innovation and change; deducing the obstacles for teachers to effectively implement technology into their teaching strategies, displaying different models for maximal utilization of ICT tools in the learning teaching process, offering indicators to evaluate and reflect on the process.

The applied value of the research lies in innovation and optimism of the practice of implementing ICT effectively into the lesson in order to promote social interaction. Results of the research, exposing the obstacles and the different criteria for maximal utilization of ICT tools in the learning teaching process, and pointing to the importance of promoting social dynamics in these lessons in order to promote academic achievements, can be used by teachers, teachers' instructors professional development courses planners, and curriculum planners in the education field.

The implementation of the scientific results was realized in elementay school from Israel and through presentation at conferences and publication of scientific articles in several international and national academic magazines.

АННОТАЦИЯ

Баранец Ефрат, ***Развитие социальной активности у учащихся за счет эффективного использования информативных и коммуникативных технологий***, докторская диссертация по педагогике, Кишинев, 2015. Исследование имеет 136 страниц основного текста, в том числе введения, три главы, выводы и рекомендаций, аннотации на румынском, английском и русском языках, ключевые слова, библиография (119 источников), 7 приложения.Включает в себя 27 рисунков и 2 таблицы.Основные выводы представлены в семи научных работах.

К**лючевые слова:** технологическая интеграция, социальное взаимодействие, конструктивизм, технология и педагогика, ИКТ в образовании, эффективное использование ИКТ, компьютерная грамотность, обучающая среда, оценка внедрения ИКТ, межличностное обучение, социальное взаимодействие.

Область исследований: Общая теория образования

Целью данного исследования является выявление уникальных аспектов потенциального вклада компьютера в продвижении социальной динамики в классе и в разработке модели занятности, чтобы максимизировать эффективность технических средств, и их влияние на уровень социальной динамики в классе.

Задачи исследования: изучить возможности, предоставляемые за счет использования компьютеров в обучение / преподавании для продвижения социальной динамики в классе, понять и описать трудности учителя в продвижении социальной динамики в компьютерном классе, руководствуясь теоретическими принципами, определяющих цели изменения на уровнях взаимодействия. Текущее исследование направлена на получение взаимного сравнения деятельности, осуществляемой в "компьютерном классе" и взаимоотношения в "классе в котором максимизирует эффективность компьютеров", что делает подробной документации и рефлексивное рассмотрение всего процесса путем создания связей между теоретическими элементами, которые находятся в основе этого исследования и результаты научных исследований.

Научная новизна и оригинальность состоит в описании задач, стоящих перед образованием в XXI веке, изучая конструктивный взгляд на обучение с акцентом на технологической точки зрения и межличностных видений, усиливая важность социального взаимодействия в процессе обучения, что свидетельствует о связи между технологией и педагогикой, анализ социальных аспектов учебной среды с использованием ИКТ, вклад ИКТ в интерпретации преподавания и обучения качества, процедуры расследования, которые позволяют успешно использовать ИКТ, описание, анализ и интерпретацию роли учителей в интеграции ИКТ в процессе преподавания и обучения, и оценки эффективности ИКТ в преподавании.

Научная проблема решена и заключается в разработке, аргументации и создания модели эффективного использования ИКТ в классе, в целях повышения социального взаимодействия.

Теоретическое значение состоит в демонстрации сложности процесса адаптации инноваций и изменений в системе образования; установки препятствий для учителей, чтобы осуществлять более эффективную технологию в своих стратегиях обучения, представляя различные модели для максимального использования ИКТ в преподавании и обучении; установление показателей для оценивания и рефлексией над этим процессом.

Практическая ценность исследования состоит в предварительном проверки гипотезы, что социальные динамики в компьютерном классе можно стимулировать путем эффективной интеграции ИКТ. Результаты исследования, идентификация препятствий и различных критериях для максимального использования ИКТ в преподавании и обучении и подчеркнуть важность повышения социальной динамики в этих уроках по развитию академических достижений могут быть использованы учителями, тренерами и разработчиками курсов по персональному развития для разработчиков куррикулума в сфере образования.

Внедрение научных результатов осуществлялось в начальной школе в Израиле, где исследователь работает в качестве преподавателя и в качестве тренера и были представлены на национальных и международных конференциях.

ABBREVIATIONS

ICT= information and communication technologies

OECD= Organization for Economic Co-Operation and Development

Web= World Wide Web

TALIS= OECD's Teaching and Learning International Survey

MEITAL= The inter-university knowledge center to assist in ICT in Israel.

HE= Higher Education

WETEN= Western-eastern teacher education network

UK= United Kingdom

USA= Unites States of America

UNESCO= United Nations Educational, Scientific and Cultural Organization

TARGET= Task, Authority, Recognition, Grouping, Evaluation, Time.

PISA= Programme for International Student Assessment of the OECD

BECTA= British Educational Communication and Technology Agency

INTRODUCTION

The actuality and the importance of the problem addressed. We live in one of the most challenging periods in human history: human knowledge, that has become common knowledge, covers the entire reality of human life. We live in a "global village", where improved means of communication, and advanced technology turns our world into one environment, where all its residents are able to communicate and exchange information with each other in real time. Since the dawn of humanity until today, technology is a mirror of the development of human life in general and human culture in particular. Tracking the close relations between the development of technology and the development of human social life, can teach us a lot about our lives today, the options opened for us and the problems we face. This understanding will help us make responsible decisions related to the essence of our present life. History is interwoven with major milestones, in which the relations between the development of technology and the development of civilization are highlighted: The agricultural revolution, the invention of the printing press and the Industrial Revolution are examples where the development of technology led to a significant change in lifestyle and in the perception of the world.

Technology in education was a debatable topic amongst the society. Experts had their own views on modernizing education and making it technology aided. There were positives as well as negatives to technology in education. But, gradually as technology was embraced by the educational institutes, the educational system has been transformed owing to the ever-advancing technology. Technology and education are a great combination if used together with a right reason and vision. A technical education system exposes the students to the world of employment and work, promotes teamwork skills, and forces planning and dealing with challenges that often require finding solutions "outside the box".

Today it is widely believed that the teachers can and should prepare all students to global norms, serve as a central pivotal in various educational reforms, and produce skilled workforce carrying the knowledge to design, maintain or enhance the status of their countries in the global economy [Marilyn Cochran-Smith, 2009 in 12].

With the entry of the educators into the new age, a complete picture emerges where important technologies of interactive and collaborative environments are central, and allow students to demonstrate what they have learned in a variety of ways. The challenge facing policy makers in education is how to keep the rules of the virtual infrastructure connected to the learning world and to know how to integrate the next generation in activities that promote social

interaction, as students today do not learn only through planned teaching, but also through shared social experiences.

In the dissertation "Promoting social dynamics in the computerized classroom through integrating the computer in teaching: A case study" [9], levels of social interaction were examined during computerized learning sessions in the classroom. Despite the similarity between students' and teacher's perceptions on encouraging interaction and reciprocal relations in the classroom as well as the perception of the teacher's role in promoting social processes, the teacher found it difficult to implement her theory-based perceptions in practice in the classroom. As a result of the gaps described above in implementation of this approach, the teacher did not fully utilize the new technological tools to promote social processes, resulting in low levels of observed social interaction.

In light of these understandings, it was necessary to examine what are the factors causing the difficulties experienced by the teachers in implementing their perceptions in practice in class, and why do they not see their students' role in the social events that take place inside their classroom. The hypothesis was, that the reason lies in the fact that there is no sufficient training and support for teachers to channel computerized teaching opportunities to the promotion of social processes in the classroom

This raises the **research problem** whether social dynamics in the computerized classroom can be promoted through effective maximal utilization of technological tools.

The **aim of the research** is to identify the aspects of the computer's unique potential contribution to promoting social processes in the classroom, and develop a model engaging in maximizing the effectiveness of technological tools and their level of impact on social processes in the classroom. By investigating over time, the following **research objectives** are expected to be achieved:

1. Analyze the teacher's difficulty in promoting social processes in the computerized classroom while carrying out detailed documentation and reflectively examine the entire process with regard to the theoretical elements at the foundation of this research as well as findings of the process.
2. Examine the opportunities provided by using computers in learning/teaching to promote social processes in the classroom.
3. Compare reciprocal activities taking place within the “computerized classroom” and reciprocal relations in the "classroom maximizing the effectiveness of computers."
4. Define objectives of the change on the levels of interaction the current action research seeks to generate.

The scientific novelty consists of:

- Analysis of the challenges facing the education system in the 21st century with regard to ICT implementation.
- Examination of the relations between technology and pedagogy.
- Identification of explanatory factors and conditions for the effectiveness use of technology by the teachers.
- Development and definition of criteria enabling successful use of ICT in the learning process, and the ways to evaluate it.

Scientific novelty of the results is due to the analysis performed on young learners of the primary education system and their teachers, focusing on ICT integrated lessons and examine actual social interaction, not virtual, that takes place in the classroom.

The scientific problem addressed in this area lies in the identification and analysis of the components that allow effective maximal utilization of the technological features integrated into the lesson, specifying the difficulties the teachers have in implementing these elements into practice, thus develop criteria to overcome these obstacles, subjected to reflection and evaluation indicators, for the promotion of social processes in the classroom.

The importance of the paper stems from preliminarily validation of the assumption that social dynamics in the computerized classroom can be encouraged while effectively integrating ICT. Aspects of the computer's unique potential contribution to promoting social processes in the classroom were identified and the research has also been successful, indicating students' and teachers' attitudes toward effective technology integration and has provided an understanding regarding the gap between teachers' perceptions of technology integration and the difficulties to implement it in practice. Action plans were presented at all levels of the education system: decision makers, schools and teachers.

The **value of the work** is composed of:

- Establishment of the importance of promoting social dynamics while using technological tools.
- Clarification of the effects of the computerized environment components on social dynamics in the classroom.
- Introduction of criteria and models for assessing the effective use of computers.
- An experimental study was conducted comparing effective and ineffective use of ICT during the teaching-learning process.

- An investigation was held of the attitudes of teachers and students regarding effective uses of ICT for the promotion of social interaction in the classroom, focusing on the gap between the teachers' perceptions and their implementation into practice in the classroom.
- Experimentally verification of the importance of effective use of technology in order to promote social interaction in the classroom, and thus achieve the main objective: promoting students' achievements, especially low achiever students.

Approval of thesis results. Scientific research results were presented and disseminated at international articles in scientific papers. Conferences: Levinsky College of Education International conference "100 Years of Research Innovation and Discourse in Education, teacher education and Music education" 10 to 11 December 2012; Moldova State University International Conference "Integration in Research and Innovation" 26 to 28 September 2013; The 39th annual conference of IAEA "Educational Assessment 2.0: Technology in Educational Assessment" 20 to 25 October 2013. Moldova State University International Conference " Postmodern education: efficiency and functionality" November 15, 2013.

Summary of thesis components

The paper consists of introduction, three chapters, conclusions and recommendations, bibliography and appendices. The **Introduction** includes the actuality and the importance of the problem addressed, the aim of the research and objectives, the scientific novelty and the importance of the paper, value of the work and the approving of the results.

In chapter 1, **"The importance of promoting social dynamics in the computerized classroom"**, I described the new conditions for culture and social life especially recognizable in the education field. I also indicated the change and innovation educators are obliged to cope with in the globalization of the 21st century, with emphasize on constructive learning as a social matter. With view that using technology will not be indefinite, advanced pedagogy suitable for the 21st century, is recommended to be integrated seamlessly into the curriculum. This explains the central essential role of an effective teacher in promoting social interaction in the computerized classroom: the increasing presence of technology forces educators to be more imaginative and it encourages them to use teaching methods that are more appealing to learners. In light of all this, findings are not surprising: It seems that pedagogy was forgotten while technology invents itself daily. Finally, integrating ICT in teaching is discussed while distinguishing Israel, Moldova, Britain and the USA, while Israel's and Moldova's education policies are examined closely.

Chapter 2, **"Effective use of ICT for education with regard to the teaching learning process"**, includes a presentation of the potential of ICT in education and the challenges to adapt and integrate it into the teaching-learning process. There is also an examination of the implementation of ICT and its learning environments focusing on the social aspects. The contribution of ICT to quality in teaching and learning is viewed from six aspects: cognitive, pedagogy, convergence, alignment, data, and culture [28], and the role of teachers in integrating ICT effectively is being analyzed accordingly. Two main solutions are given in order for teachers to use ICT effectively in the teaching-learning process, as well as ways to evaluate the effectiveness of ICT use. Finally, new ICT tools are described.

Chapter 3, **"Promoted social processes in the classroom: maximizing the effectiveness of technological tools"**, describes the experiment conducted comparing reciprocal relations activities taking place within three different classrooms: the traditional classroom, the computerized classroom, and the "classroom maximizing the effectiveness of computers." Data was collected, while considering the different conceptions of all the participants in the computerized teaching-learning process: the decision-makers strategies, school policies and planning, the teachers, including the ICT coordinator, and the learners. In seeking evidence for the effectiveness of the changes between the three different types of classrooms, and the obligation to look at it from different perspectives, a triangulation of methods was employed [94]. These methods are comprised of: class observations of interactions, monitoring of learners' achievements, analysis of learners' questionnaires, interviews with teachers, an interview with the ICT coordinator, and external documents containing education policies regarding ICT use in schools, published by formal bodies of decision makers. A dialectical analysis [93] was formed on the final results of the experiment. These results were subject to inclusion and allowed final conclusions and further recommendations.

The main research findings show that:

1. When using technology effectively, Pupils work in collaboration as an enjoyable learning activity and hence more pupils take part in the learning process.
2. Technology used effectively encourages a great deal of talking, brainstorming and exchanging ideas.
3. Technology used effectively involves peer teaching.

Findings also revealed an unexpected effect of integrating technology effectively on the academic promotion of sub-achievers students.

Conclusions and recommendations summarize the theoretical concepts with reference to the results of the experimental research conducted. While using effective maximal utilization of technological tools, social interaction processes are encouraged as well [Koren, 2012 in 35]. Moreover, there is also an increase in learners' achievements [Schacter & Fagnano in 68]; this is especially true regarding sub-achievers learners. In light of this, recommendations are drawn in three levels, for decision makers and schools use, as well as for teachers who intend to progress towards effective maximal utilization of technological tools.

One of the roles that justify the existence of the future school is to enable the younger generation to develop in a variety of social contact [Salomon and Almog, 99 in Salomon 78]. Responsibility lies with the teachers and students alike. The potential of technology and the educational rationale are not enough, in order to serve this role: the education system is responsible for the development of the long-awaited graduate considering the special characteristics of the future society.

1. THE IMPORTANCE OF PROMOTING SOCIAL INTERACTION IN THE COMPUTERIZED CLASSROOM

1.1. Challenges of the Education Field in the 21st Century

The world today is not the same world ten or even five years ago. With the development of new markets, new technologies and new communication systems, the global society sets up unfamiliar challenges. New conditions for culture and social life are created rapidly [Cochran-Smith in 12;34]. This is especially recognizable in the education field, where teachers, student teachers and their instructors are obliged to cope with change and innovation [42].

Globalization emphasizes teaching and the quality of teachers; there are extremely high expectations for teacher performance in the 21 century [12]. In its 2005 report "Teachers Matter", the OECD (Organization for Economic Co-Operation and Development) points out the importance of high quality teaching and the central role of teachers:

"All countries are seeking to improve their schools, and to respond better to higher social and economic expectations. As the most significant and costly resource in schools, teachers are central to school improvement efforts. Improving the efficiency and equity of schooling depends, in large measure, on ensuring that competent people want to work as teachers, that their teaching is of high quality, and that all students have access to high quality teaching." [109, p.1]

In the past few years, researches have shown that the skills and qualifications required to the job market are changing as a result of the development of new technologies and their rapid penetration to everyday life and the global financial market [46;25].

The fast paste of technological changes influences directly on every aspect of a child's life. The difficulty of the education system to adjust and to update itself in the paste of these changes forms a gap between a child's everyday life and the learning environment school is offering him [46].

"The demands on schools and teachers are becoming more complex. Society now expects schools to deal effectively with different languages and student backgrounds, to be sensitive to culture and gender issues…to use new technologies, and to keep pace with rapidly developing fields of knowledge and approaches to student assessment. Teachers need to be capable of preparing students for a society and an economy in which they will be expected to be self-directed learners, able and motivated to keep learning over a lifetime." [110, p.2]

Today we stand on the threshold of an era in which technology is connected to education, and what keeps them together are both teachers and students. The teacher in the classroom needs to find a balance between the uniformity requirements of the curriculum and the diverse needs and

skills of its students.The environment we live in is changing constantly, which means policy cannot hold a permanent destination. All policies must present solutions for dealing with the unknown technology of the future.

Moreover, there is not one technology, there are plenty of technologies, and they are changing. The significant ones are those that will last the upcoming years, and to those the education system must be prepared, although it may not know them yet.

There are many attempts to make changes in the teaching-learning processes in general and ICT integration in particular, but it is a complex challenge, and there is a large gap between policy declarations and the knowledge how to apply it actually in the field of education. Successful changes in learning and teaching are mostly in small-scale and at projects' level. Systemic computerization of schools indicates many attempts in which technology was implemented, but there was not a fundamental change in the way of teaching and learning.

Governments and education systems around the world have regarded the use of information and communications technologies (ICTs) as an important issue for improving the effectiveness of teaching and learning in schools [75]. As more and more technologies available and affordable along with the rapid expansion of computer network capability in both primary and high schools, there have been continued research efforts in investigating how teachers use ICT to promote student learning [53].

Nevertheless, No research was conducted to investigate the effect of using ICT in teaching on promoting social interaction between the learners, and there is relatively little discussion of this issue in the literature. Moreover, most of the research mentioned above, examine the impact of using ICT in teaching, on learners of high education such as students in universities and collage:

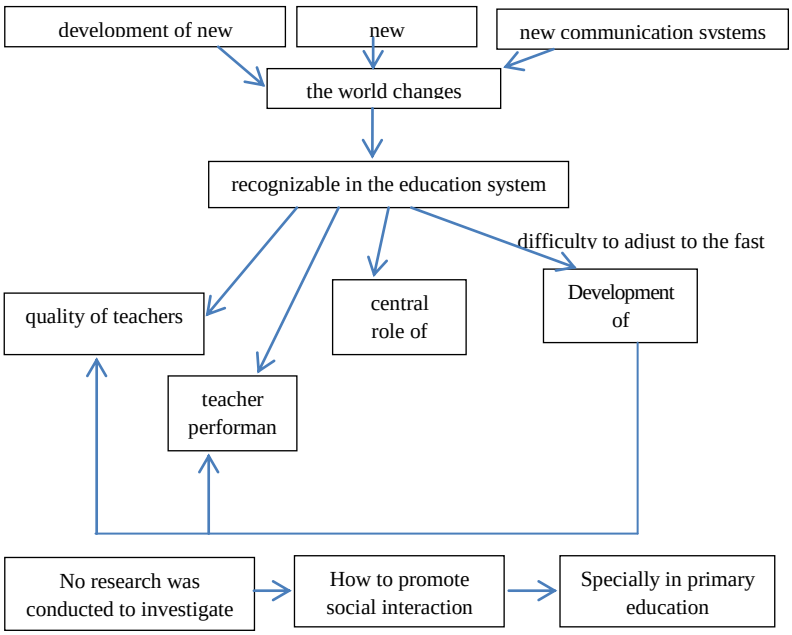


Figure 1.1: Challenges of the Education Field in the 21st Century

The above flow chart shows in clear that changes in the world, especially the development of new technologies, are recognizable in the education system that experiences difficulties to adjust to the fast pace of these innovations. Therefore it is important to improve the effectiveness of teachers' performance and the quality of teachers. Although there are researches to be found as to how teachers use ICT to promote student learning, the question of how to promote social interaction, especially in primary education, is left unanswered.

Innovation and the nature of change in the education field

Innovation is defined as:

"Change, based on a new idea, differs significantly from the existing. The idea also carries a chance to improve the existing situation or the solution to the problem." [20, p.3]

Innovation in education has varied expressions, such as innovative organizational structure, inserting a new teaching method or computers and communications integration in education.

According to the theory of organizations, an organization that does not develop, change and grow, is sentenced to incompetence and withdrawal [20]. The education system is one of the biggest and complex organizations in the world. The reason for its complexity lies in the fact that on one hand, education deals with a complex of human knowledge that is under continuously change and growth, and on the other hand, it nurtures small children that develop via the process of learning [20]. Although the education system is a complex system, it is a conservative organization. The ideas and innovation of the 21 century did not cause an essential change. Chen [20] presents three mechanisms for organizational change:

1. Reform is an overall change that occurs in a short time. Its origin is administrative, and they are characterized as "top-down" approach. Tyack and Cuban [1995, in 20] summarize the experiences in reforms in the USA, and determine that in practice they did not lead to real change.
2. According to the random evolutionary change, many local changes occur randomly, their accumulation leads to more profound and general changes. The direction of change is called "Grass Root". There is no research evidence of such change.
3. Planned and controlled change is based mainly on a process of rational decision making. Change is planned on a theoretical basis, and is experienced in small scale. It is being assessed, and based on the conclusion it is transferred to operation and distribution.

Chen [20] believes that experimental schools lead the move of shifting from the perception of reform change to the perception of planned and controlled change.

Schools, which are a reflection of society and means of preparing learners for life in a rich technology society, are bound to confront change and innovation [42]. Education systems aspire to assimilate innovation and generate a change in schools and thus to give learners the essential tools for life in the society of knowledge. As a result a lot of time and resources are allotted for educational programs integrating ICT [52]:

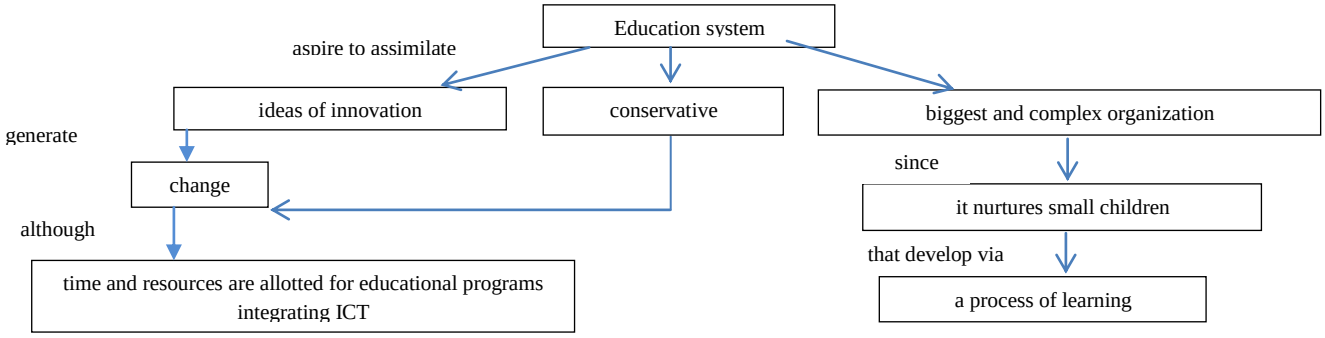


Figure 1.2: Innovation and the Nature of Change

It can be seen in this flow chart, that the education system, which is a big and complex organization that nurtures small children developing via the process of learning, is also a conservative one. Therefore it experiences difficulties to generate change that occurs as a result of ideas of innovation, although time and resources are allotted for educational programs integrating ICT.

- The global society sets up unfamiliar challenges.
- This is especially recognizable in the education field, where the education staffs are obliged to cope with change and innovation.
- The difficulty of the education system to adjust and to update itself in the paste of technological changes forms a gap between a child's everyday life and the learning environment school is offering him.
- Governments and education systems around the world have regarded the use of ICTs as an important issue for improving the effectiveness of teaching and learning in schools.
- No research was conducted to investigate the effect of using ICT in teaching on promoting social interaction between the learners, and there is relatively little discussion of this issue in the literature, especially in primary education.
- Three mechanisms for organizational change are: reform, random evolutionary change, and planned and controlled change.

- Education systems aspire to assimilate innovation and generate a change in schools and thus to give learners the essential tools for life in the society of knowledge. As a result a lot of time and resources are allotted for educational programs integrating ICT.

1.2. Three Approaches to Learning: Behaviorism, Cognitivism and Constructivism

Three alternative schools of thought on how people learn have strongly influenced the design of instructional technologies: Behaviorism, Cognitivism and Constructivism [27].

Dabbagh [2006, in 27] describes Behaviorists theories of learning as one that assumes knowledge is an absolute, reflecting universal truth about reality. Learning is indicated when a correct response follows the presentation of instructional environmental stimulus.

The psychological theories that underline Behaviorists instruction initially were developed about a century ago. Dabbagh [2006, in 27] indicates that the purpose of education in this school of thought, is for students to acquire skills such as: discrimination (recalling facts), generalization (defining and illustrating concepts) and association (applying explanations). Knowledge and skills are transferred as learned behaviors.

According to Dabbagh [2006, in 27], Cognitivist theories of learning assume reality is objective, but mediated through symbolic mental constructs. Successful learning is not only dependent on what the teacher or pedagogical medium presents, but also on what the student does to process this input, storing the retrieving information organized in memory.

Cognitive theories focus on internal processes of information processing, mediate between stimuli and responses. According to these theories, learning is related to how a person perceives the situation and interprets it, the context in which it occurred, not only to external factors such as reinforcement. Cognitive theories first appeared in the last century, trying to answer the question: what happens inside our brains when we are undergoing a process of learning. Mayer's [1977, in 27] theory illustrates goals for instruction characteristic of this school of thought such as linking facts, skills, and ideas via conceptual frame works, and helping students develop skills that involve improving their own thinking progress.

According to Dabbagh [2006, in 27], Constructivist theories of learning assume that meaning is imposed by the individual rather than existing in the world independently. People construct knowledge and understandings based on what they already know and believe, which is shaped by their developmental level, their prior experiences, and their sociocultural background and context. Learning involves mastering authentic tasks in meaningful, realistic situations.

Instructors can foster learning by providing guidance that encourages meaning-making without imposing a fixed set of knowledge and skills. The role of the teacher is to support knowledge construction rather than communicate knowledge, to be a guide rather than an expert transferring knowledge, to encourage the student to reflect on his experience and to seek alternative views.

The Constructivist Approach

Constructivism is a philosophical perspective on our understanding and knowledge [Savery and Duffy, 1996 in 91], it represents a new relationship between learner and knowledge. The basic assumption is that understanding exists in our interaction with the environment. In other words, the learning content and the learning process cannot be separated. Understanding is created in the process of personal construction and the learner becomes the center of the environment [Savery and Duffy, 1996 in 91]. There are three basic assumptions:

A. Cognitive conflict is the motive for learning and determines the nature and the organization of what was learned.

B. Knowledge is created through social dialogue.

C. Teaching principles [Savery and Duffy, 1996 in 91]- the basic constructivist values upon which teaching occurs are: collaboration, personal autonomy, creativity, reflectivity, activity, relevance and pluralism.

Principles of constructivist pedagogy based on these values are [17]:

A. Raising problems of primary relevance to students.

B. Structuring learning around "big ideas" or basic concepts.

C. Providing experience in, and appreciation for student perspectives.

D. Adjusting the curriculum to apply to students' assumptions.

E. Assessing the learning in its context.

Brooks and Brooks [17] emphasize that constructivism is not a theory of teaching, but a theory of learning and knowledge, where knowledge is defined as temporary, developmental and subjective, being a product of social-cultural mediation. They highlight the goal of the constructivist approach by deep understanding rather than imitation behavior, and therefore the teaching patterns which are characteristic for this approach help the learner to re-internalize information. Brooks and Brooks [17] call this process "transformation" [17, p.15], and it is specified by Salomon [78] as:

"A process in which the learner is active in gathering and organizing information, processing it and relating it to previous knowledge, giving it definitions, and turning it from information to knowledge. " [78, p.55] Constructivist learning places knowledge in tentative light, that is,

knowledge is not absolute and there is a space for reflection that enables intelligent reference to information [78]. Salomon adds that the tentativeness of knowledge is a:

"Fruit of friction between the various points of view, obtained via group learning, and thus binds the cognitive aspect and the interpersonal aspect of learning." [78, p.55]

However, Salomon [78] emphasizes that constructivist learning is not limited to certain teaching conditions, but requires the provision of opportunity, and guidance of the learner, to construct his knowledge during the process of building the context network and transforming information to knowledge. Constructivist approach refers to three perspectives: philosophical perspective, technological perspective and psychological perspective.

The philosophical perspective - ideas regarding the nature of knowledge Knowledge, as stated, exists in the process of construction rather than the outcomes. It is not only content accumulated in memory but the task of constructing it, as shown in the following image:

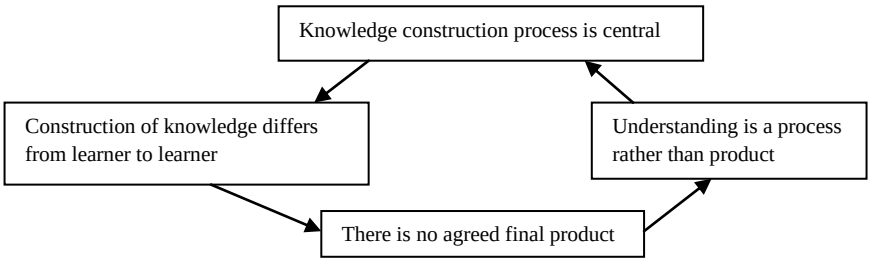


Figure 1.3: The Process of Knowledge Construction

Von Glasersfeld [85] argues that:

"Knowledge is not created as a result of passive acceptance, but as a result of human activity ". [85, p. 31]

That is to say, the process of knowledge construction is activating; activating of a cognitive entity which organizes the experiential world by organizing itself [Piaget in 82]. The main conclusion of Von Glasersfeld [85] is that:

"We cannot interpret our knowledge as an image or a representation of the real world, but as a key opening up possibilities." [85, p. 26]

Von Glasersfeld [85] restricts his comments on the assumption that the success of this key does not lay in finding the right lock, but only in its ability to lead the way to the goals we aspire to reach. This leads him to the realization that all cognitive activity occurs within the experiential world of goal-directed awareness, which means, weighing the steps out of earlier experiences: things we learn are built out of our own materials and are given interpretation according to our own construction concepts.

The technological perspective Technology is the platform upon which all training and learning processes are made. The more technological means, training and skills, construction of knowledge will be more significant. When knowledge is significant and useful, the learner will make the right connections. Effective use of technological tools enables the construction of personal knowledge and encourages the learner to the process of decision making. According to Salomon [78], there are three conditions for computer activity to support the constructivist learning environment significantly:

A. Transferring a part of the "mental burden" from the learner to the computer, namely, releasing the learner from burdensome activities that are not central for task performance.
B. Useful intellectual partnership between the computer and the learner. The computer encourages knowledge-building activities presented in order to share with others, rather than just practicing or mental-saving activities.
C. Learning is better, when ways of organizing the information used by the learner in his thinking, are similar to those computerized tools are based on.

Salomon & Almog [76], divide between two types of technological effects:

A. Effects **with** technology - related to immediate changes in the process of learning supported by computers.
B. Effects **of** technology - related to long-term changes, led to by technology usage.

Methods of ICT learning in a postmodern era have a broad spectrum, yet Salomon [78], Ben-Zvi [99], and Davidson & colleagues [26], are all talking about social interaction in its various aspects.

Four principles of Salomon [78], out of the ten he presents, express the topic of learning environment and social interaction:

A. The principle of the partial construction of learning
B. The principle of involvement in performance and the social recognition.
C. The principle of active integration between individual, team and class.
D. The principle of supportive classroom climate.

In contrast, Davidson and colleagues [26], in their attempt to characterize and conceptualize the learning methods, combine the social reciprocal relation under the title: interactivity, requiring active learning, and cooperation with learning partners, such as discussion groups. They also note the interpersonal communication: personal contact through forums and e-mails between the teacher and the learners and among peers.

Ben-Zvi [99], compares between teaching methods in the past and present with the desired future. She claims that the computer revolution enables the response to different learning styles, while keeping close intercourse not only among the learners themselves, but also between them and their guides and parents.

Moreover, when presenting the learning methods, Salomon [78] also emphasizes the task type given to the learners. Therefore he introduces the following four principles:

A. Acquisition of knowledge through problem solving and design.
B. Inter – disciplinary principle of the problem.
C. Emphasizing knowledge.
D. The existence of an ultimate goal.

Similarly, Davidson and colleagues [26], while presenting learning methods, mention the nature of task, but they emphasize the information to carry it out, and divide it into the four following parts:

A. Dynamism of information - the constituents of the learning unit are not fixed and can be changed according to the changing needs of the learning. The learner can also contribute new information.
B. Updated information - information is updated and matching new learning situations.
C. Vocal and visual information – illustrative way of presenting the material learned as well as creating interest and aesthetics in the learner.
D. Connectivity of information - information is branched and linked rather than linear. The learner is provided with many possible choices about his learning course, such as direct use of many varied and distant databases.

Ben-Zvi [99], calls the connectivity of information by Davidson and colleagues [26], 'varying learning situations'. She agrees with Davidson and his colleagues that the Internet Age enables a number of formats of learning scenarios that are becoming more individual, and each learner can choose his appropriate learning situations. Learning methods have 'technical' characteristics, which Salomon [78] acknowledges in the two following principles:

A. The principle of continuity.
B. The principle of the centrality of technology.

Calderon [1995, in 99] on the other hand, talks about the future ideal learning scenarios that will allow self-study at home. The approaches to learning methods can be summarized in the following image:

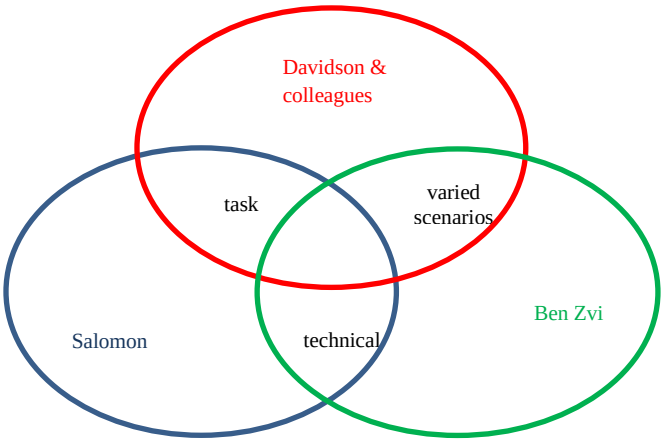


Figure 1.4: Approaches to ICT Learning Methods

As seen in the image all researches emphasize interaction as a basic learning method. Talbot Jackson [1994 in 17] notes that according to the constructivist approach, encouraging interaction between learners, fostering mutual learning and exposure to interdisciplinary curriculum, changes learning methods of students. Students must realize that they are responsible for their own learning within the overall learning atmosphere of all these principles. Salomon [78] summarizes the role of technology in the following image:

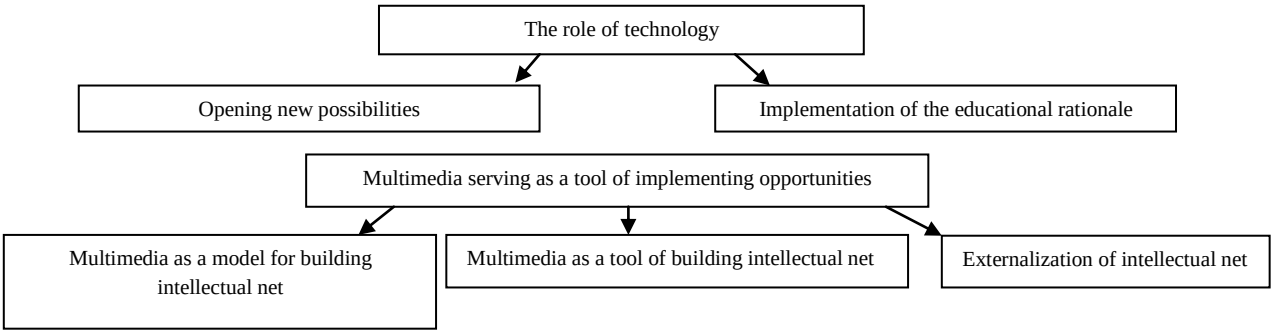


Figure 1.5: The Role of Technology

As shown, technology opens new possibilities and plays a part in the implementation of the educational rationale. Multimedia serves as a tool and a model of building intellectual net, and externalizes them.

The psychological perspective The underlying psychological basis of the constructivist approach is learning as an interpersonal process in addition to its being an intrapersonal process. Bar-Tal and Bar-Tal [1985, in 10] define interaction:

"When two or more individuals, pass information to each other through verbal or nonverbal behavior." [10, p. 7]

They add that interaction also involves cognitive and emotional messages, and introduces seven characteristics for classroom interaction:

A. Interaction involving participants - interaction does not only occur between individuals, but also occurs between groups, two or more, and similarly is possible between the individual and the group or the group and the individual.
B. Interaction is dynamic – interaction constantly changes in its quality and quantity, and is subjected to different intensities, different behaviors of those involved, the number of participants and the dominant content.
C. The interaction is behavior-dependent – whether these are verbal behaviors which are the main communication pattern, or whether such behaviors are nonverbal like body movements and facial expressions.
D. Interaction is subjected to mutual influence - participants often leave the interaction in a changed situation than the situation in which they joined it.
E. Interaction is governed by its own rules - rules can be unique to a particular interaction or an entire society, but usually interaction does not occur in chaos, and all participants are aware of the behaviors associated with it.
F. Interaction is influenced by environmental factors - whether they are physical or social factors.
G. Interaction is measurable - the assumption that leads Bar -Tal and Bar-Tal [10] to the conclusion that it is possible to measure the levels of interaction is the assumption that the interaction in the classroom is determined by the teachers. Therefore, they claim that it is possible to measure the interaction that occurs between teacher and student, but ignore the interactions among the students themselves. Mevarech and Hativa [62] emphasize that during the constructivist learning process, learners need interaction for two main reasons: cognitive necessity and social sensitivity.

Cognitive Necessity- Intellectual development is influenced by interactions that occur during the learning process. Salomon & Almog [76], refer to interaction as a source of mutual intellectual stimulation. Mevarech and Lite [61] add that interaction stimulates and improves the mutual thinking, and Lavie [51] considers interaction as the source for increased ability of critical and analytic thinking. He warns that the absence of interaction will lead to a situation where the student will be required to provide correct answers during programmed learning, without an expression of curiosity, or the possibility of independent, original, and creative thinking.

Social sensitivity - Interpersonal learning contributes to social sensitivity since the need for social acceptance, is stronger than prohibition of interaction with friends [62].

Social development is expressed in several ways:

A. Interaction develops a better communication abilities and positive social relations [57;62] with tolerance to different opinions and conflicting positions [57] in view of different perspectives that help create networks of knowledge with plentiful connections [77;51]. Lavie [51] emphasizes that the more the learner understands other's perspectives, the more he will progress in viewing the surrounding reality, objectively. Moreover, Lavie [51] believes that openness to others and understanding of others, help the learner reach a deep understanding about himself.
B. Interaction provides real experience of social behavior rules by the authority of peers and not by exclusive obedience to external compulsion represented by the teacher [51].
C. Interaction allows for mutual support, encouragement and social acceptance [62]. Social sharing helps to reduce negative competitiveness while creating a positive learning atmosphere in groups [Slavin, 1980 in 62].
D. Interaction provides feedback and reflection [51;76] while deepening ties of identification and emulation, which gives the learner a sense of belonging and self-confidence and encourages him to work in cooperation with others [51].
E. Interaction encourages behaviors and values of accountability for the group and the duty [57].
F. Group experiences in an online environment, fosters creativity, originality and flexibility of thought [57;62].

Constructivist learning as a social interest- Mevarech and Hativa [62], Salomon & Perkins [77], and Salomon & Almog [76], agree that there are two versions to learning as a social interest:

A. Socially assisted learning, which is considered the weak version where group interaction supports the individual learning activity, and thus the strong learners in a particular subject, can contribute to the new and struggling learners. In this version the emphasis is on individual student achievement in a group context. Lavie [51] sees this version as the only version for learning as a social interest, and points out the advantage of peer teaching, in the option granted to the individual to organize his thoughts.
B. Social Distributed Learning, which is considered the strong version where what is learned, exists not only in the minds of individuals, but also in the group as a society as well as in aids such as lists and books. Pea [67] extends the definition by claiming that distributed learning, beyond the individual zone, occurs in three ways: involving

other people, relying on the media, and environmental exploitation. Perkins [69] calls it "person plus" [69, p. 88] meaning a person plus his environment, in other words the physical and social surrounding, and the remaining left by the activity of thinking. Social distributed learning focuses on what was learned by shared learning out of social interaction, and is expressed in aids such as lists and models [77]. Perkins [69] argues that learning and thinking are not processes that occur only in the mind of the individual, but also spread 'on the surface' and 'between' individuals, he concludes that achievements are built out of social sharing by social tools, and that intelligence is a quality that grows socially in the context of joint activities.

The learning process: between constructivist views and interpersonal views According to Piaget, who was one of the founders of the constructivism idea that initially included only the cognitive personal aspect, the process of construction of knowledge is made outside the social context [78], Vygotsky [1989 in 78]:

"Suggested the social-cultural context as a vital source of absorbing interpersonal processes and turning them into mental processes" [78, p. 66]

Vgotsky's [86] basic assumption was that the learning process of the child begins long before he gets to school. He does not question the fact that the child learns to speak by an adult, or investigates a variety of information through asking questions and getting answers. Therefore, Vgotsky [86] concludes, that learning and development are connected since the child is born. It is known that learning should be adjusted in a way with the child's developmental level; as a result, there are two levels of development [86]:

A. Actual developmental level - the level of mental functioning development that has been established as a result of completed developmental cycles.
B. Level of potential development – the developmental level a child can reach with the help of others.

Vygotsky [86], calls the gap between these levels –" zone of proximal development" and defines it as:

"... The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. "[86, p. 86]

Knowledge, which is today in proximity to the development, is tomorrow's actual knowledge, therefore the obvious conclusion, claims Vgotsky [86], is that 'good learning' is learning that precedes the actual development or in other words, learning that involves interaction. The developmental law determined by Vgotsky [86], is that an essential feature of learning is the

creation of zone of proximal development. The explanation lies in the fact that learning stimulates a variety of internal developmental processes acting only when the child interacts with people in his environment and in cooperation with his peers. Once these processes are internalized, they become part of the achievements of the independent development of the child.

Ostensibly, it seems that there is a contradiction between constructive views and personal views regarding the learning process [76]. While the assumption according to the constructivist approach is that activity is subjected to thought, and that transferable cognitions inside one' mind are dominant, the interpersonal view assumes that cognitions are located in certain activities since they are socially distributed [67; 69; 77; Hewitt & Scardamalia, 1996 in 76]. Salomon & Almog [76] claim that the contradiction is not real; they explain it in two ways:

A. Solo cognitions (of a single individual) and distributed cognition are interdependent and mutually develop in spiral shape;

"On one hand the contribution of the individual and what he takes with him from the group process, and on the other hand the contribution of the group and what it produces from the process, are interrelated in developing spiral" [78, p. 70]

This can be described clearly in a graphic form, as seen in the following image [78, p. 71], the individual contributes to the group's learning process, and the contribution of the group to the learning process of the individual interrelated in developing spiral.

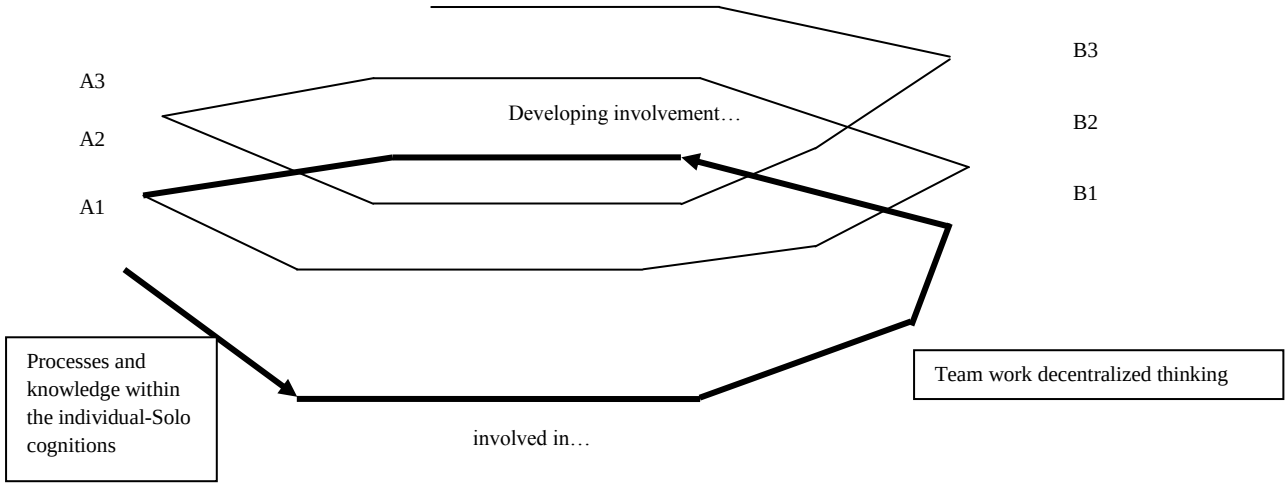


Figure 1.6: Mutual Spiral Development of Solo Cognition and Distributed Cognitions

Salomon [78] emphasizes that the individual brings his solo baggage to the group such as knowledge and skills, but at the end of the interpersonal process he leaves with a different solo baggage.

The team, while developing minor theories out of the individual's understanding, constitutes the place to express the academic achievements obtained via interpersonal learning.

B. The idea of learning as an active construction of knowledge, and the idea of learning as a social process do not reject each other. Moreover, constructivist learning environments successfully combine the two ideas effectively [76].

Encouraging interpersonal learning-Levin [57], Salomon & Perkins [77], Lavie [51], and Mevarech and Hativa [62] all agree that there is room to encourage and increase the interaction in the classroom. Levin [55] sees the need to foster learning availability in groups, while Salomon & Perkins [77] recommend taking advantage of opportunities for interesting and powerful learning. They put this capability on teachers and students who are being required, in their opinion, to learn how to benefit from these opportunities. Lavie [51] agrees with Levin [55] that educational conditions should be created, these conditions encourage verbal social interaction between the learners themselves and between them and their teachers. Mevarech and Hativa [62] summarize the implications of computerized classroom interaction and encourage operation of computerized learning environments collectively opposed to individual operations, in order to improve social and cognitive variables.

- Three alternative schools of thought on how people learn have strongly influenced the design of instructional technologies: Behaviorism, Cognitivism and Constructivism.
- Behaviorists theories of learning assumes knowledge is an absolute, reflecting universal truth about reality. Cognitivist theories of learning assume reality is objective, but mediated through symbolic mental constructs, focusing on internal processes of information processing, mediate between stimuli and responses.
- Constructivist theories of learning assume that meaning is imposed by the individual rather than existing in the world independently, it represents a new relationship between learner and knowledge, where understanding exists in our interaction with the environment.
- Constructivism is not a theory of teaching, but a theory of learning and knowledge, where knowledge is defined as temporary, developmental and subjective, being a product of social-cultural mediation.
- Constructivist approach refers to three perspectives: philosophical perspective, technological perspective and psychological perspective.
- According to the technological perspective, effective use of technological tools enables the construction of personal knowledge and encourages the learner to the

process of decision making. Computer revolution enables the response to different learning styles, while keeping close intercourse not only among the learners themselves, but also between them and their guides and parents.

- The underlying psychological basis of the constructivist approach is learning as an interpersonal process in addition to its being an intrapersonal process.
- Researchers agree that there is room to encourage and increase the interaction in the classroom.

1.3. The Importance of Social Interaction in the Process of Learning (via an examination of the constructivist approach)

Wilson [91] defines a constructivist learning environment as:

"a place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-solving activities" [91, p.5].

Savery & Duffy [1996, in 91], have derived a number of instructional principles from constructivism:

- Learning should be relevant
- Instructional goals should be consistent with the learner's goals.
- Cognitive demands and tasks in the learning environment should be consistent with cognitive demands and tasks for the environment for which the learner is being prepared.
- Teachers' role is to challenge the students' thinking.
- Students' ideas should be tested against alternate views through social negotiation and collaborative learning groups.
- Encourage reflection on the learning process.

The social environment is essential to the development of our understanding, and the construction of knowledge. We check and confront our understandings against understandings of others in the group. Knowledge is constructed through the development of social dialogue. [Savery & Duffy ,1996, in 91] Shared learning in a group frame creates, inevitably, relationships and a sense of unity [Hiltz, 1995 in 25]. The social relations that are created inside a learning group comprise an important part of the learning, and eventually affect the results of the learning process. Good social relations enable effective learning dialogue, successful conflict management and increasing involvement of members of the group in the dialogue [Anderson & Kanuka, 1997 in 25].

Ernest [1998, in 1] also points out that, children partly construct their knowledge as a form of collaborative meaning-making based on their interaction with others. Ernst and Clark [32] identify a situation as collaborative in nature when three conditions are met:

"if peers are (i) more or less at the same level and can perform the same actions, (ii) have a common goal, and (iii) work together" [Dillenbourg, 1999 p. 9 in 32]

Multifaceted tasks that necessitate various proficiencies and abilities have been identified by Neilson [2002, in 32] as most efficiently performed by a group. He explains that the logic and associated evidenced-based findings identify that a group's problem-solving skills and knowledge exceed those of any single contributor.

Modern constructivist learning environments are technology-based in which learners are engaged in meaningful interactions. Emphasis is on learners who interpret and construct meaning based on their own experiences and interactions. Therefore, if educators are to adopt a constructivist approach, they are now challenged to adapt and change instructional design strategies to actively engage learners in meaningful projects and activities that promote exploration, experimentation, construction, collaboration, and reflection of what these learners are studying. Wilson and Lowry [92] suggest three principles of constructivist learning that are characteristic of learning on the Web:

1. Access to rich sources of information.
2. Meaningful interactions with content.
3. Bringing people together to challenge, support, or respond to each other.

Design of constructivist learning environments is important in enabling the effective use of collaboration. Learners share information to collaboratively construct socially shared knowledge [47]. Applications such as computer conferencing, chat lines, newsgroups, and bulletin boards promote conversation and collaboration and assist meaningful learning. The use of these tools helps facilitate discussion and sharing of ideas amongst learners when they are addressing the same goals. Successful interaction between learners in the constructivist sense results in peers being identified as resources rather than competitors [82].

Constructive learning sets up knowledge as tentative, in other words, knowledge is not absolute and there is a place for reflection that enables intelligent reference to information. Salomon [78] adds that the tentativeness of knowledge is a result of:

"Friction between different points of view, obtained during group learning, and therefore connects between the cognitive aspect of learning and the inter-personal aspect". [78, p.55]

The psychological approach focuses on the way in which meaning is created within the individual mind, and more recently, how shared meaning is developed within a group process.

According to this theory learners actively construct their knowledge. The process of construction depends in part on the learner previous knowledge and background. More important, the development of meaning may take place within a social interaction that gives its individuals the opportunity to share and provide warrant for these meanings [75].

Richardson [75] claims that the psychological constructivism has been an important contribution, particularly for pedagogical processes:

"It acknowledges the social nature of formal knowledge development within an expert community and of knowledge creation that can take place within a social grouping such as a classroom" [75, p. 1625]. This can be summed up in the following flow chart, where one constructive theory of learning, deals with the instructor as the learning supporter that encourages reflection and seeks alternative views, while providing:

a. Collaborative situations which are essential to the construction of knowledge.
b. Learning environments which are recently technology-based, therefore challenges instructors to change pedagogy in order to use technology effectively.

The connection between interaction and student achievements

The central assumption of social learning theories is that people learn in social contexts. Vygotsky [87] examined how social environments influence the learning process. He suggested that learning occurs through the interactions learners have with their peers, teachers, and other experts. The ability to ask a question, to share an opinion with another student, or to disagree with the point of view in a reading assignment are all fundamental learning activities [71]. Through discourse and conversations situated in meaningful contexts, students construct new knowledge through negotiation of their ideas [Collins, Brown, & Newman, 1989 in 22]. Two studies [2; 88] carried out with a difference of 36 years, both concluded that cooperation and affiliation (both discussed later), or in other words relationships created by social interactions are a significant factor to academic success [also 18]. Hadar-Peker [40] explains that daily coping with the demands of school occurs in a social context, which has a decisive influence on student performance and achievements. It seems that cooperative learning allows students live-training in social skills, which their acquisition also promotes academic achievement. Watkins [90] considers learning as constructing knowledge with others, as opposed to "learning=being taught" [90, p.2] as well as "Learning=individual sense-making" [90, p. 3]. Scardamalia and Bereiter [80] claim that "learning is not asymptotic because what one person does in adapting changes the environment so that others must readapt… … Because this very activity increases the collective knowledge,

continued adaptation requires contributions beyond what is already known, thus producing non-asymptotic learning" [80, p. 266]. They point out to what they believe as schooling problem with regard to interaction: it focuses on the individual student failing to grasp the social structures and dynamics required for ongoing knowledge building. In a learning community, they add, the aim is to advance the collective knowledge and while doing so, to support the growth of individual knowledge. It views the individual learning as rooted in the culture within which the individual learns [Prawat and Peterson, 1999 in 90], and knowledge, both shared and individual, as the product of the social processes [90]. Although Watkins states that there are fewer studies on the issue than one might expect, he believes that focusing on social relations in the learning process will lead to better learning, therefore better performance, and better behavior. Wang & colleagues [89] confirms, claiming that developing a positive climate can lead to the development of the classroom as a learning community which will ultimately lead to better student performance and behavior. Watkins [90], in his research, also uses the term "classrooms as communities" [90, p. 7]. He describes the different communities of the classroom, emphasizing that in classrooms where a sense of community is built, students are more engaged in the learning and an increased sense of classroom belonging develops which leads to greater relatedness, participation and motivation. Moreover, in classrooms which operate as a community of learners, participants come to learn from each other and to help each other learn. In such classrooms, students are more likely to be motivated toward learning for the sake of learning and are more likely to make choices and feel responsible for what happens to them. Watkins [90] adds that learning programs which aim to foster communities of learners have encouraged pupils to:

a. Engage in self-reflective learning.
b. Act as researchers who are responsible to some extent for defining their own knowledge and expertise.

Crawford, Krakcil & Marx [22] agree, however, they warn that definitions of a community of learners are varied, vogue, and not well developed. Nevertheless, they claim that when a collaborative learning atmosphere develops, students are more likely to become responsible for their own learning and more motivated toward learning for its own sake. In their research, Crawford & colleagues identified six components of a community of learners:

1. Instruction is situated in authentic tasks.
2. Students develop interdependency in small group work.
3. Students and teacher debate ideas and negotiate understanding.
4. Students and teacher publicly share ideas with members of the classroom community.
5. Students collaborate with experts outside the classroom.

Responsibility for learning and teaching is shared. [22, p. 703]

On the less positive side, Crawford and colleagues [22] question the likelihood of beginner teachers to have the tools necessary to successfully build this kind of learning community. I believe that this question should be directed to even more experienced teachers, especially those who teach in the education system for many years and are accustomed to their familiar methodology. The goal is to help students advance each other's' understanding in small groups, through processes of mutual teaching [Palincsar and Brown, 1984 in 90]. According to Scardamalia [79] small group work is the answer to breaking all patterns of communication mediated by the teacher. Such work can be more productive [Barnes, 1977; Wells, Chang & Maher, 1990 in 79], and it involves substantial transfer of responsibility to the students.

"It is through the medium of this interaction and communication process within small groups cooperating on academic tasks that these team-learning methods strive to influence pupils' cognitive learning" [Sharan, 1980 p. 242 in 88].

Webb suggests that different group interaction patterns may lead to a variety of achievement results. The most common interaction variable used to predict achievement in small groups is, according to Webb [88], helping behavior. In other words, giving and receiving help are beneficial for achievements. Moreover, Webb [88] also found that off-task and passive behavior are "negatively related to achievements" [88, p. 427].

Hadar-Peker recommends, under the research-based premise, that promoting students in the social-emotional field may promote them in their studies and more importantly, contribute to their success and overall development. Martin & Dowson [2009, in 40] in a comprehensive review that examined the importance of interpersonal relationships to learning and achievement in various studies and among different age groups, demonstrated the ways in which different structures of motivation and achievement are influenced by relationships with others, and being constructed within their framework. Hadar-Peker continues that as much as students believe that they are encouraged to interact with others in the classroom and as much as they feel safe and respect among peers, so they will find higher levels of motivation and engagement in learning. In the past, student motivation was often conceived as a purely personal student feature [65]. It is recognized now that motivation is affected by external influences as well [Pintrich & De Groot, 1990 in 65]. Therefore, motivation and motivated behavior are nowadays more often studied while considering the student in interaction with the learning environment [Anderson, Hamilton, & Hattie, 2004 in 65]. According to Fraser [1998, in 65], the learning environment refers to as "the social, psychological and pedagogical contexts in which learning occurs and which affect student achievement and attitudes" [Fraser, 1998, p. 3 in 65]. Classroom environment research as well as

research and theories on motivation and self-determination focus on the importance of students' perception of their learning environment [Connell & Wellborn, 1991; Skinner & Belmont, 1993; Fraser, 1998c; Church, Elliot, & Gable, 2001; Deci & Ryan, 2002; den Brok, Bergen, Stahl, & Brekelmans, 2004; Fraser, 2007; Kowalski, 2007 in 65], since it is the primary source of information on the quality of learning environments [Fraser, 1998; Levy, den Brok, Wubbels, & Brekelmans, 2003 in 65]. More important, there is some evidence that the way students perceive their learning environment and their interaction with their teachers has an influence on their motivation and engagement in school [Ryan & Patrick, 2001 in 65], therefore it influences their achievements as well.

Hadar-Peker [40] concludes that schools need to build their environment in a way that allows students to achieve educational goals, but also the realization of their social-emotional needs and goals, including: social acceptance, social support and creating a good relationship in their peer group [Boekaerts, 2002 in 40]. Opdenakker and Minnaert [65] explain that "feeling related refers to a sense of belonging and connection with others. Students feeling related experience emotional security, which is required to actively explore and deal effectively with the

world. Students with a strong sense of relatedness respond more positively to challenges and set positive goals, and are more willing to internalize social regulations and to adapt to interpersonal circumstances" [La Guardia & Ryan, 2002 in 65]. Hanushek and colleagues [41] support this claim adding that peers constitute sources of motivation, aspiration and direct interactions in learning. Delgado-Gaitan [1986, in 89] found that in addition to affecting motivation, peer influences may also be related to adolescents' different achievements levels in school.

Slavin [113] talks about four major theoretical perspectives on cooperative learning and achievements:

Motivational Perspectives: encouraging cooperative learning structures create a situation in which the only way group members can achieve their own personal goals is if the group is successful. Therefore, to reach their personal goals, group members must, on the one hand, help their group mates to do whatever helps the group to succeed, and, on the other hand, even more importantly, to encourage their group mates to apply their best efforts.

Social Cohesion Perspectives: the effects of cooperative learning on achievement are strongly connected to the unity of the group, meaning, students will help one another learn because they care about one another and want one another to succeed. "This perspective is similar to the motivational perspective in that it emphasizes primarily motivational rather than cognitive explanations for the instructional effectiveness of cooperative learning" [113, p. 3].

Cognitive Perspectives (Developmental Perspectives & Cognitive Elaboration Perspectives): "interactions among students will in themselves increase student achievement for reasons which have to do with mental processing of information rather than with motivations" [113, p. 4]. **Developmental Perspectives:** interaction among children around appropriate tasks increases their mastery of critical concepts. The explanation according to Vygotsky [86] lies in the fact that children of similar ages are likely to be operating within one another's proximal zones of development, formulating ideas in the collaborative group which are more advanced than those they could perform as individuals. Similarly, Piaget [1926, in 113] claims that social-arbitrary knowledge such as: language, values, rules, morality, and symbol systems can only be learned in interactions with others. Therefore, according to Slavin [113], many Piagetians [e.g., Damon, 1984; Murray, 1982; Wadsworth, 1984 in 113] have called for an increased use of cooperative activities in schools, since they believe that interaction among students on learning tasks will lead in itself to improved student achievement.

In other words, students will learn from one another "because in their discussions of the content, cognitive conflicts will arise, inadequate reasoning will be exposed, disequilibration will occur, and higher-quality understandings will emerge" [113, p. 5]. **Cognitive Elaboration Perspectives:** the learner must be engaged in cognitive restructuring, or elaboration, of the material, if information is to be retained in memory and related to information already there [Wittrock, 1986 in 113]. One of the most effective means of elaboration is peer tutoring, that is, explaining the material to someone else. Research on peer tutoring has long found achievement benefits for the tutor as well as the tutee [Devin-Sheehan, Feldman, & Allen, 1976 in 113].

In summary, motivational theorists hold that students help their group mates learn because it is in their own interests to do so. Social cohesion theorists, in contrast, emphasize the idea that students help their group mates learn because they care about the group. Cognitive theorists involve neither the group goals nor the emphasis on building group cohesiveness characteristic; they hold that interaction among children around appropriate tasks increases their mastery of critical concepts.

Slavin [113] points out that "research on cooperative learning has moved beyond the question of whether cooperative learning is effective in accelerating student achievement to focus on the conditions under which it is optimally effective" [113 p. 8].

Watkins [90] claims that results from community learning classrooms show that both literacy skills and subject knowledge improve. He calls to support the idea that the development of learning communities should be a key feature of 21st century schools, focusing on the importance of the connectedness of all outcomes – social, moral, behavioral, intellectual and performance. He

explains that the fixation on achievements test gains should be drawn away to the vision of a superior kind of outcome [Bereiter, 2002 in 90]. Scardamalia [79] adds that students in a knowledge-building classroom carry with them the ability and willingness to take responsibility for the collective solution of knowledge problems, into the knowledge society they live in. Teachers, and their teaching, are also important to students' academic outcomes [Brophy & Good, 1986; Fraser, Walberg, Welch, & Hattie, 1987; Nye, Konstantopoulos, & Hedges, 2004; Hamre & Pianta, 2005 in 65], especially teachers' support of students, teacher involvement, and classroom management and organization [89; Alton-Lee, 2003; Opdenakker & Van Damme, 2009 in 65] Wang [89] also notes the importance of constructive, academic and social teacher-student interaction. With regard to technology, Scardamalia and Bereiter [80] clarify that the technology by itself cannot bring about the transformation of a school into a knowledge-building community. There is evidence that teacher strategies can make a major difference in the extent to which students engage in collaborative knowledge building [80], yet, they warn that unless schools will be reorganized into communities that actually work to build their own knowledge, the technology may be largely wasted. Watkins concludes: "I have been unable to find a UK example where school classrooms are using the available technology for building learning communities. In this field, London is not leading the way" [90, p. 20].

Crawford and colleagues believe that a productive line of research should involve examining the difficulties beginner teachers face while trying to create communities of learners in their own classrooms. Picciano [71] also urges to further study what he calls a complex pedagogical phenomenon: the relationship between interaction and learning outcomes.

Developing advanced pedagogy in order to integrate technology seamlessly into the curriculum

With view that using technology will not be indefinite, we must use an advanced pedagogy that is suitable for the 21 century. This pedagogy uses technology in order to create a more profound understanding by means of transferring the responsibility to the learner [84]. Vadmani [84] says that this pedagogy consists of researching issues, team work, informative complex tasks which are interdisciplinary and multidisciplinary and relevant to the reality of life.

Dede [27] points out the historic controversies about technology and pedagogy, they illustrate:

"an apparently endless search for a universal method of teaching/learning that is best for all types of content, students, and instructional objectives. Parallel to this is a perennial belief that each new interactive medium is a 'silver bullet' for solving education's problems, despite massive

evidence from both research and experience that old content/pedagogy in new instructional containers does not produce major gains in effectiveness" [27, p. 28].

Dede [27] urges the field of instructional design to recognize that learning is a human activity diverse in its manifestations from learner to learner and even from day to day. He Suggests that

The emphasis should shift to:

"developing a pedagogical media that provide many alternative ways of teaching, which learners select as they engage in their educational experiences" [27, p.28]

Brithaupt, Fisher, Gardner, Raffo & Woodard [16] distinguish between 'pedagogy-driven' approach, where desired and essential learning objectives guide the lesson design and choice of instructional and technological tools and approaches. And 'technology-driven' approach, where teachers try to determine how a specific technology can be integrated into a lesson with little attention to how that tool helps them meet their teaching and learning goals. In other words, teachers give in to the temptation to use instructional technology for its own sake [Clark-Ibanez & Scott, 2008; Fish & Wickersham, 2009; Hutchins,2003, in 16]

Technology should be integrated seamlessly into the curriculum. Pitler, Hubbell, Kuhn & Malenoski [73] reference Schacter & Fagnano (1999) to state that:

"applied effectively, technology implementation not only increases student learning, understanding, and achievement but also augments motivation to learn, encourages collaborative learning, and supports development of critical thinking and problem-solving skills" [73, p.3]

This explains the central essential role of an effective teacher in promoting social interaction in the computerized classroom and hence, student learning and understanding.

- The social environment is essential to the development of understanding, and the construction of knowledge.
- The social relations that are created inside a learning group comprise an important part of the learning, and eventually affect the results of the learning process.
- Modern constructivist learning environments are technology-based in which learners are engaged in meaningful interactions.
- Design of constructivist learning environments is important in enabling the effective use of collaboration.
- Learning occurs through the interactions learners have with their peers, teachers, and other experts. These relationships, created by social interactions are a significant factor to academic success.

- In a learning community, the aim is to advance the collective knowledge and while doing so, to support the growth of individual knowledge.
- Developing a positive climate can lead to the development of the classroom as a learning community which will ultimately lead to better student performance and behavior.
- There are four major theoretical perspectives on cooperative learning and achievements:

Motivational Perspectives**,** Social Cohesion Perspectives**,** Cognitive Perspectives (developmental perspectives & cognitive elaboration Perspectives).

- An advanced pedagogy uses technology in order to create a more profound understanding by means of transferring the responsibility to the learner.

1.4 The Role of the Teacher in Effective Use of Technology

Teachers are essential to support learners as they interact [Yackel, 2002 in 1]. Moreover, ICT loses its advantages when lacking the correct guidance [25]. Since it is often hard for teachers to give up old habits in favor of new, they need support and guidance [Borko, Davinory, Bleim & Cumbo, 2000 in 1]. In their research, Akkus, Seymour & Hand [1], developed a framework for teachers to combine different aspects of mathematics teaching and learning which includes "embedded writing-to-learn strategies (MRA)" [1, p. 53]. They found out that teachers who used this framework improved their ability to support dialogue interaction across time along with other pedagogical skills important for promoting dialogic interaction.

Vadmani [84] agrees, she claims that when integrating technologies the teacher cannot simply teach. Training must be provided both to teachers and to teacher students.

Moreover, since the new technologies of today, are the old technologies of tomorrow, it is important for teacher-collages to conduct a continuous monitoring after new technologies and collaborate these technologies to appropriate pedagogies. These pedagogies should be taught both to teachers in schools and teacher students.

Forkush Baruch [34] urges to take into consideration that as far as technology, it is a whole system to learn, including characteristics and the way it works. Whereas pedagogically, this is actually a new specialization, of matching the technology and best use it to empower teaching and learning. Flow chart 1.7 shows that the success of integration of computers depends on optimal combination between technology and pedagogy, in order to promote collaboration and peer-learning.

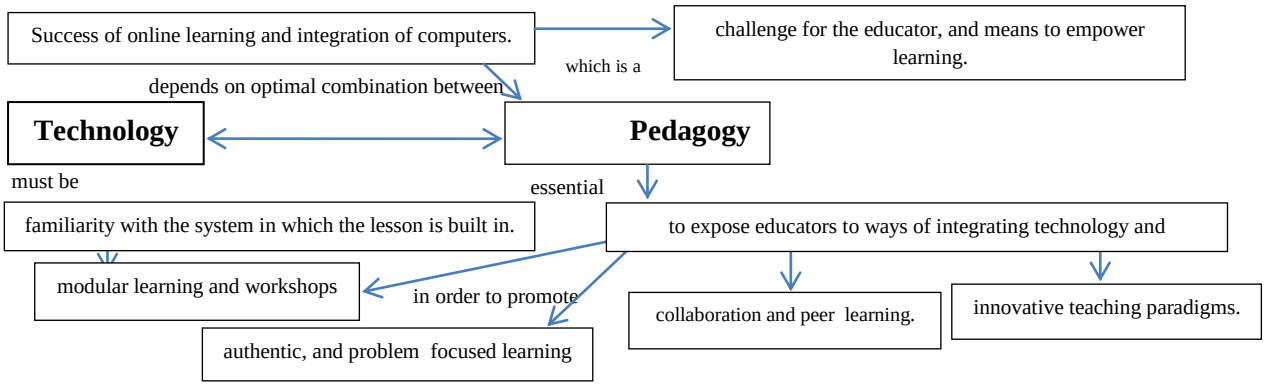


Figure 1.7: Training for Successful Teaching.

In its 2009 report "Creating Effective Teaching and Learning Environments-first results from TALIS", the OECD [110] found out that across the 23 participating countries, the aspect of teachers' work frequently rated by teachers (25%) as an area of high development need was "Information and communication technology (ICT) teaching skills" [110, p. 61]. The report concludes that in light of the 2001 OECD Survey that highlighted the lack of use of ICT in classroom instruction but noted the substantial amount of professional development that had taken place in this area [110], "that school teachers identify such a high level of need in the use of ICT for instruction almost 10 years later may be a reflection of the speed technological change which teachers must keep pace with. This may signal a continuing challenge for schools and teachers to keep up to speed in a fast-moving area and to fully exploit technology for the benefit of teaching and learning. But it may also confirm studies which indicate a lack of capacity building in terms of how best to use ICT in the classroom." [110, p. 61]

The report reveals that the reasons that had prevented the teachers from participating in more professional development (given by the teachers themselves) were mainly: conflict with work schedule, no suitable professional development and family responsibilities.

This report also provides a solution to this problem. It recommends compulsory professional development:

"Some professional development may be deemed compulsory because the skills and knowledge the development activities aim to enhance are considered important for teacher quality. In some cases participation in such activities may even be required for teacher certification." [110, p.64]

Ben Peretz [12] adds that both global external factors and local cultural social factors are perceived as having an impact on curriculum and teaching, and therefore directly affect teacher trainings. She thinks that the voice of local procedures must be heard alongside the attention to global changes and ways. One of the means suggested to navigate between the pressures, sometimes contrasted ones, is to build parts of the educational policy in the local

level, by professional educators who do not ignore the impact of socio-cultural ties over education.

The opponents claim, that the development efforts invested in ICT learning focus especially in the teachers and not the learners. These efforts consider lesson plans and presenting the material using new technologies, instead of focusing on the question how students learn using new technologies [Alexander & McKenzie, 1998; Bound & Prosser, 2002, in 25], flow chart 1.4.2 shows that since teachers are essential in integrating technology, they should be provided with support and guidance via continuous technology training collaborated with the appropriated pedagogies, three main reasons preventing teachers from participating in these professional developments include: conflict with work schedule, no suitable training, and family responsibilities. The solution is to declare the trainings compulsory.

Integrating technology to increase interaction

Rising information and communication technologies could considerably enhance interaction and collaboration [32].

Knight, Almeroth, Mayer & Chun [49] claim that collaboration is one area in which technology consistently appears to improve student learning experiences. The following image sums up their main conclusions:

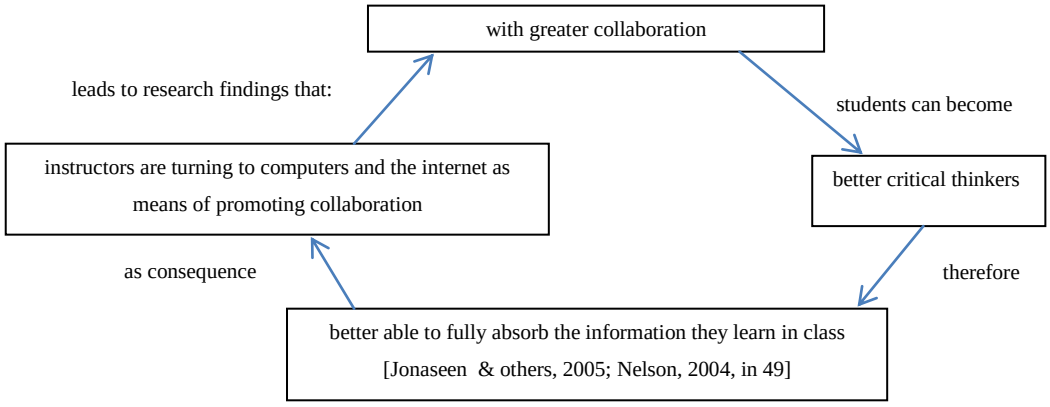


Figure 1.8: Collaboration & Technology

Knight & others [49] divide interaction into two main classes (as seen in image 1.9): asynchronous, when participants are not expecting an immediate reply, and synchronous, when participants can expect immediate response.

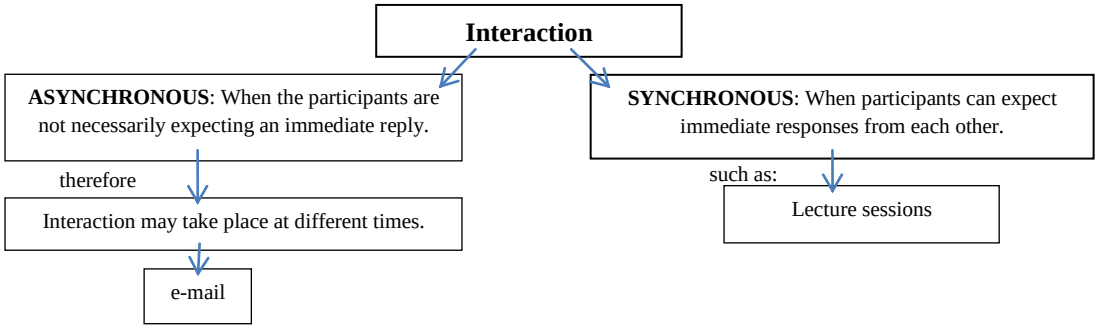


Figure 1.9: Two Main Classes of Interaction

Technology has not remained static over time, newer technologies are being developed that maysoon replace the old ones. Cuban [1986, in 49] has shown that educational technologies of the 20th century (e.g. motion pictures, radio and TV) generally have not lived up to their potential. In conclusion, Knight & others [49] recommend educators to continue to use technologies to their advantage, since it can help them extend interaction within and beyond the classroom, and thus to increase opportunities for collaborations.

Pineteh [72], supports the recommendation above. Since he rightfully believes that traditional methods of teaching are still valuable given the differences in the learning styles and technological experiences of the learners, he suggests that the most expedient teaching approach will be "complementarity" [72, p.85]. Pineteh's research [72] shows that using his approach can promote quality peer interactions and collaborative learning.

He also reminds us that this current generation of learners is more technologically conscious and brings to school and university "a wide range of life experiences and interests" [Lillis, 2003 in 72, p. 192]. For instance, learners spend hours interfacing with their peers on computer or mobile devices [Carter, Foulgar & Ewbank, 2008; Saeed, Yang & Sinnappan, 2009, in 72;117].

As a result of the increasing presence of technology, educators are forced to be more imaginative and it encourages them to use teaching methods that are more stimulating and appealing to learners [72].

Yang [95] thinks that blogging provides an unrestricted and more accessible space for learners and educators: "to exchange and localize new information based on their personal needs and living environments". [95, p. 12]

Pineteh [72] concludes Yang's research [95]:

"This paper lends itself to the Vygotsky-based theory that learning is a process of social constructivism, shaped today by the quality of virtual relationships and dialogue engagements with peers and educators inside and outside the conventional classroom". [72, p. 88]

Critics of technology in education contend, that overexposure to social networks (e.g. facebook), infantilizes learners, affects academic performance and sometimes creates misleading impressions about learning [Considine et al, 2009; Scharber, 2009 in 72;117].

Both Wintour [117] and Cross [2004, in 72] warn that virtual interactions, that include connecting with a wider population of peers, has had negative implications for the way learners socialize online and in the classroom.

- Teachers are essential to support learners as they interact.
- ICT loses its advantages when lacking the correct guidance**.**
- It is important for teacher-collages to conduct a continuous monitoring after new technologies and collaborate these technologies to appropriate pedagogies.
- Collaboration is one area in which technology consistently appears to improve student learning experiences. Educators should continue to use technologies to their advantage, and thus to increase opportunities for collaborations.

Conclusions For Chapter 1

In this chapter I described the new conditions for culture and social life especially recognizable in the education field. I also indicated the change and innovation educators are obliged to cope with in the globalization of the 21st century, with emphasize on constructive learning as a social matter. According to the psychological approach, learners actively construct their knowledge. Learning occurs through the interactions learners have with their peers, teachers, and other experts. These relationships, created by social interactions are a significant factor to academic success. The aim is to advance the collective knowledge and while doing so, to support the growth of individual knowledge. This can lead to the development of the classroom as a learning community which will ultimately lead to better student performance and behavior.

With view that using technology will not be indefinite, advanced pedagogy suitable for the 21st century, is recommended to be integrated seamlessly into the curriculum. This explains the central essential role of an effective teacher in promoting social interaction in the computerized classroom: the increasing presence of technology forces educators to be more imaginative and it encourages them to use teaching methods that are more appealing to learners. In light of all this, findings are not surprising. It seems that pedagogy was forgotten while technology invents itself daily. In the words of Salomon:

"The computer is indeed a lever for change, but the lever, as levers normally do, is not working on its own. It is inconceivable that a crane hoists objects and moves them here and there just because it has the power to do so? The crane has an operator and the operator has an executable program. Any program is due to a broader vision of what is intended to be achieved by operating the crane".

2. EFFECTIVE USE OF ICT FOR EDUCATION WITH REGARD TO THE TEACHING LEARNING PROCESS

2.1. The Penetration of ICT into Education and Social Aspects of its Learning Environments

Education is a socially intended activity. Quality education has traditionally been associated with teachers having high levels of personal contact with learners .In contrast, the use of ICT in education is a more student-centered process. Therefore, with the world of education currently undergoing a massive change as a result of the digital revolution, the role of ICT in education is becoming more and more important. These new technologies create learning opportunities that challenge traditional schools [21].

According to UNESCO [116] information and communication technology (ICT) may be regarded as a combination of 'informatics technology' with other related technology, specifically communication technology. ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for future workers, as well as strengthening teaching and helping schools change [100;54].

ICTs have been utilized in education ever since their beginning, but they have not always been massively present [45]. Computers have not been fully integrated in the learning of traditional subject matter, the commonly statement that education systems need to prepare the citizens for lifelong learning in an information society urged interest in ICTs [68].

The popularity and accessibility of internet-based services in the 1990s, brought the decade of computer communications and information access. Consequently, educators focused on using technology to improve student learning. The predominant conception at the time was that computers would "take over" the teacher's job. Namely, students would be taught by computers [61].

Technology has transformed the society all over the world. It has become central to people's basic schooling skills such as reading, writing, calculating, and thinking. And yet, technology has been kept in the "periphery of schools, used for the most part only in specialized courses." [21, p. 2]

Collins & Halverson [21] claim that the central challenge is whether current schools will be able to adapt and integrate the new power of technology-driven learning, for the next generation of public schooling. They call educators and policy makers to rethink education apart from schooling, warning that schools which are unsuccessful in integrating new technologies will

eventually dissolve the long identification of schooling with education into a world where wealthier students pursue their learning outside of the public school.

Educators therefore have a choice, says Dellit [28, p. 57]:

"We can push the boundaries of information and communications technology in education, seeking to exploit its capacities to improve our outcomes by extending us beyond the limits and paradigms we currently experience or we can limit it to the boundaries that we currently know, challenging only our technical skills"

Oliver [64] adds that teachers need to be involved in collaborative projects and development of intervention change strategies, which would include teaching partnerships with ICT as a tool. Zhao and Cziko [96] specify three conditions which are necessary for teachers to introduce ICT in their classrooms: teachers should believe in the effectiveness of technology, they also should believe that the use of technology will not cause any disturbances, and finally they should believe that they have control over technology.

Few educational researchers criticize the non-connected learning to the complex reality, and the reality of teaching the facts of life, as something closed and defined which cannot be appealed and re-investigated [69]. You cannot fulfill the challenges of the future, say educators [55; 56; 50], by acquiring control of the knowledge of yesterday, and it is impossible to learn and teach in ways that force stability on a dynamic environment. The gap between the dynamic reality and the static school not only raises the necessity for change, but can also be the doorway to change [Koren, 2012 in 37]. Recognition of this gap and the need to bridge it raised different pedagogical and didactical ideas. These approaches actually signify a revolution in school and its working habits, because they perceive the teacher and student as crew members who are partners in learning. [Koren, 2012 in 37]

Koren [2012 in 37] thinks that this reality faces schools and teacher training colleges with another challenge - the ability to connect not only to the reality but also to people and their shared goals. Bringing reality into the teacher's work also includes teamwork and building learning communities. Intelligent integration of ICT can help teachers enter the reality into their classrooms while promoting collaborative working and learning with their students and colleagues.

Moreover, Koren [2012 in 37] believes that opening the door to innovation ICT and technology, still requires face to face dialogue. This is not an educational revolution that occurs, but an evolutionary process of continuity between the old and the new pedagogies carried out by a tool named ICT.

Koren [2012 in 37] concludes claiming that the critical factor for success in school is the teachers and the human relationships they build at school, while the computer is only a means to

achieve pedagogical goals. The recognition of the school in the use of ICT to help pedagogical purposes is its guarantee to success.

Social aspects of learning environments using ICT Pernsky [70] coined the term "digital natives" in 2001, distinguishing them from "digital immigrants". The first born or behave as if they were born into the age of the Internet, and the other came to the Internet and the digital world only after they acquired habits and customs that characterized the culture prior to the digital age [Davidson, 2012 in 37]. Davidson indicates the fact that in a few years the young reader of his article will be a "digital native" and will live in a different reality, yet, one thing that will not change is the need of human beings for communication with each other, the desire of people to be listened to, and the importance of social and emotional aspects of meaningful learning. Creating connections between students and their acquaintance through dialogue in a social informal context seems important and contributes to improve collaborative learning.

'Social presence' has been defined recently by Garrison [36] as:

“the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities” [36, p. 352].

Social presence is an important antecedent to collaboration and critical discourse because it facilitates achieving cognitive objectives by instigating, sustaining, and supporting critical thinking in a community of learners [35]. Garrison & archer [2007 in Davidson, 2012 in 37] in their model 'Community of Inquiry' which they developed based on their research, attribute 'social presence' great value to the satisfaction of distance learners, and to its contribution to their academic achievements.

Neal [63] notes, that in a constructivist environment, the use of ICT promotes student autonomy whilst also providing opportunities to work collaboratively with others. Shears [1995 in 63] explains that the relationships between teachers and students are more interactive and guiding, rather than a relationship where information is transferred from teacher to student. The critical factor in supporting effective learning with ICT according to Neal [63] is to focus on the way it is integrated into the classroom. He identifies learning culture, social wellbeing, motivation & engagement, and thinking & learning, as key factors that influence and shape effective learning.

Raw (2002) and Kinderman [1996 in 63] report that student who are supported by their teachers are more likely to be engaged in learning. "Regardless of the teaching methodologies, what remains critical to good learning is the quality of the relationship between student and teacher [Pomeroy, 1999 in 63] and student support of one another." [63, p. 9]

Schools and teachers often deliberately set up computers so as to support peer-learning situations. Such learning opportunities have a central role in constructing a student-centred learning environment [Sandholtz, Ringstaff, & Dwyer, 1997 in 63]. Neal [63] explains: "The idea is to have at least two students purposefully sharing one computer. The shared arrangements, according to one teacher, are deliberately implemented to encourage students to scaffold learning, share ideas and assist each other when using ICT. Students provided evidence about the impact of having to work with a partner. There are those who appreciate the support and those that prefer their independence" [63, p. 10]. Working with partners requires negotiation and collaboration. Some students feel inconvenience sharing their computer, and their sense of autonomous and decision-making is affected. However, a key finding in Neal's research [63] was that according to all of the students the use of shared arrangements with the computer, is dependent on the particular task at the time.

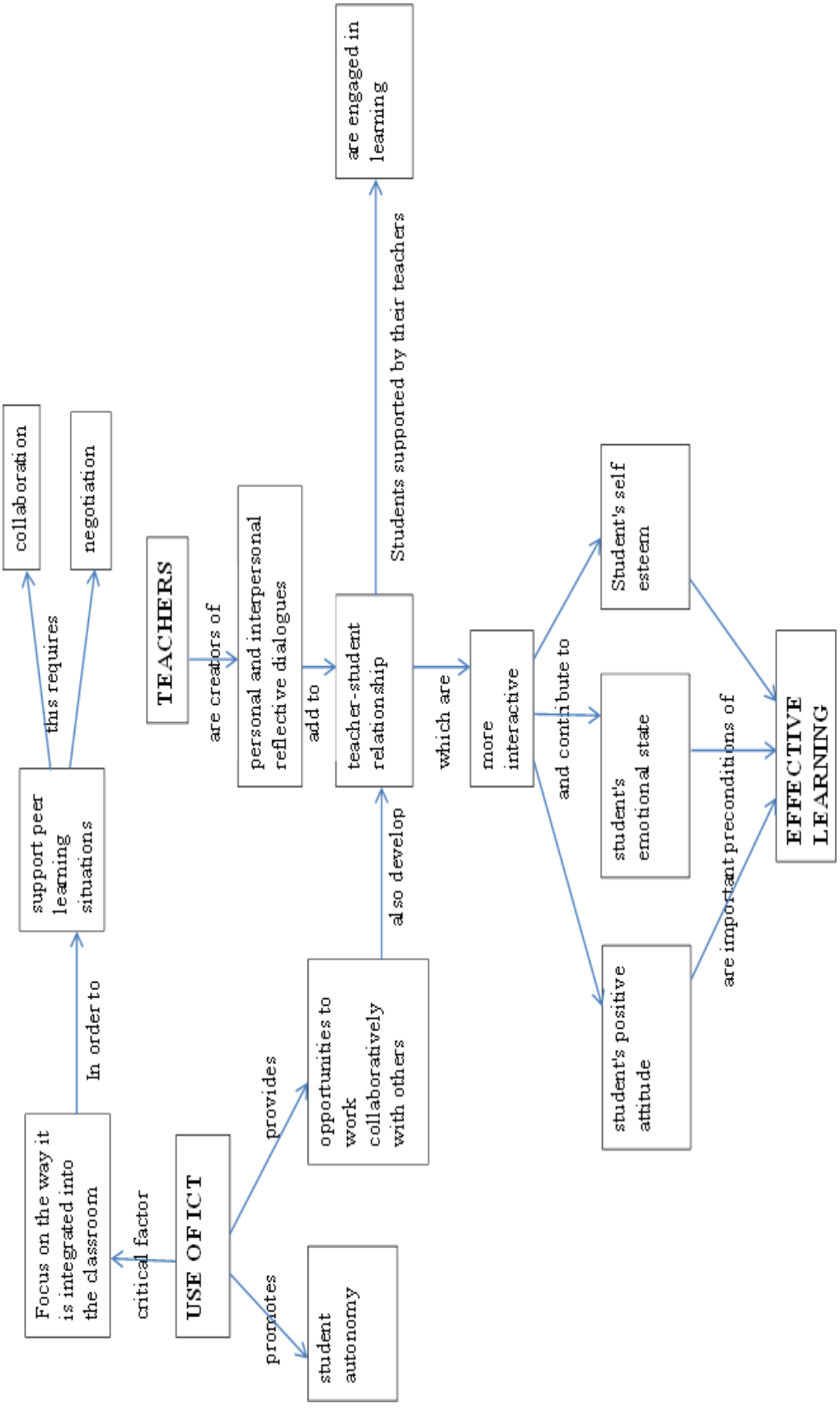
Neal [63] concludes that it is the relationships students develop that contribute to their emotional state, and positive attitudes and self-esteem, which are important preconditions of effective learning. The need for healthy relationships with peers and adults remains important to most of middle-years students and contributes to their self-esteem and positive attitude toward learning.

Davidson [2012 in 37] reveals two conclusions he reached during his researches:

a. Students got used to the idea that learning is a process where the learners have an obligation for each other and mutual responsibility, and the role of the teacher is to enable the learners' community to learn together and not be the main troubleshooter.
b. The combination of the structural- organizational design of the learning environment and the pedagogical design is an important part of the role of the online teacher as an 'instructional designer'

Davidson [2012 in 37] regards the teacher as the creator of personal and interpersonal reflective dialogues. Levin [2012 in 37] adds that the computer networking discourse can help the pedagogical guide, but cannot replace the human teacher whose presence is essential to the learning process and cannot be a substitute for face to face dialogue. Flow chart 2.1 shows the connection between using ICT to promote student autonomy and provide opportunities to work collaboratively with others, and teachers who are the creators of personal and interpersonal reflective dialogues which add to teacher-student relationship that are more interactive and contribute to students' positive attitude, emotional state, and self-esteem. These are important preconditions of effective learning.

Figure 2.1: The Penetration of ICT into Education and Social Aspects of its learning Environments



The contribution of ICT to quality in teaching and learning Dellit [28] presents six aspects of improvement in which ICT can contribute to quality in teaching and learning:

Cognition- ICTs can be used to qualitatively improve cognition by conceptualizing more creatively, improving teachers' knowledge and by applying learning resources to meet the particular needs of a child at every stage of his or her education. ICTs provide more opportunities for learners to engage as creators and manipulators in the learning process.

Pedagogies- Information technology can only contribute substantially to the improvement of schooling if it is appropriately embedded in powerful and interactive learning environments [established within] the broader context of [supportive] pedagogy, curriculum and school organization [DEETYA 1996:14 in 28].

Gropper [39] agrees claiming that pedagogy is the heart of the learning-teaching process, and there is no argument that it is possible to teach and learn wonderfully without technology. Nevertheless ICT is a powerful tool that can contribute enormously to the learning-teaching process. The challenge educators are facing, Gropper warns, is to get familiar with the technological tools provided and find a way to integrate them effectively in the learning-teaching process. Gropper [39] emphasizes that technology does not create a new educational theory, but allows significantly enhancing the learning experience and the effectiveness of learning.

Dresler & Colleagues [29] explain that since programs for implementing ICT in schools lean mostly on pedagogical approaches that are expressed in the curriculum, the question is which pedagogical approach is best suitable for optimal implementation of ICT in the curriculum in schools. The literature points out to three pedagogical approaches reflected in the 30 technological programs surveyed:

a. Innovative pedagogies- that set goals that aspire to provide students with 21st century skills and they were based on constructive teaching approaches.
b. Conservative pedagogies- that set goals that aspire to streamline and improve the traditional teaching through a combination of ICT tools and were based on behaviorist teaching approaches.
c. Instrumental pedagogies- that set goals that are targeted in technological tools and ICT means. The basic premise was that the technological tools will bring about the change.

Review of the literature shows that in most countries where innovative pedagogical goals were set, the ICT program succeeded. However, it is important to indicate that it is not enough to implement innovative teaching strategies; success of the program requires other additional elements that will be discussed later in this paper.

Convergence- Research indicates that some of the most interesting and innovative uses of technology take place in classrooms where multiple uses of technology are implemented [Dias and Atkinson, 2001:8 in 28]. If we are to achieve quality outcomes for the students of the future, we must use ICTs to assist us to manage the convergence. Further as Dellit [28] points out:

"Convergence is a significant opportunity and challenge for educators. We must meet the challenge and find ICT applications to assist us in managing convergence more effectively than we have in the past because the world itself is convergent as well as divergent; we need to educate for both." [28, p. 60]

Alignment- Schools can only be effective in enhancing teaching, learning and helping learners achieve well-defined educational objectives when the standards, objectives, teaching, curriculum, resources, technology use and assessment are all aligned. The quality of the alignment will determine the effectiveness of the teaching-learning process. Using ICTs in school can bring effective alignment within reach. [28]

Data- There is need for teachers who are attuned to data and its interpretation, and systems that aggregate the right things and that make it easy for teachers to record their observations. In order to ensure the quality of education improves with ICT application is the training and quality of teachers and related professionals in the creation, use and interpretation of data and applications generated from use of those ICTs [Oliver, 2001 in 28].

Culture- There is no doubt but that individuals' ability to access and process information is set to become the determining factor in their integration not only into the working environment but also into their social and cultural environment [Delores 1996:172 in 28].

By presenting the contribution of ICTs to qualitatively improve the teaching-learning process, Dellit [28] highlights an important entity mainly responsible for making it practicable: the educators, which she calls to

"…take up the challenge and hard work of adaptation and change required, if we are to develop both ICTs in education and the profession in its use of them." [28, p. 64]

Tondeur and colleagues [83] support this claim with their research findings about the impact of teacher characteristics on ICT use concerning 'innovativeness', 'attitudes regarding computers', 'intensity of ICT use' and 'gender'.

Scrimshaw [112] agrees, he thinks that the personal characteristics of teachers are important influence on the extent to which they take up innovation, such as the implementation of ICT. Therefore, he warns, this may result the need for different approaches to ICT implementation for different teachers. In other words, similarly to Dellit [28], Scrimshow [112] believes that

appropriate pedagogy has an important role in the contribution of ICT to the learning-teaching process.

Moreover, Scrimshow [112] claims that much of the reviewed literature appears to be concerned with evaluating the contribution of ICT to "student centered' teaching and learning, while Gibson [2001 in 112] observes that the majority of teachers tend to prefer to use a variety of "teacher centered" model. Ertmer et al. [1999 in 112] identified three levels of teachers' computer use:

1. As a supplement to the curriculum.
2. As a reinforcement or enrichment to the curriculum.
3. As a facilitator for an emerging curriculum.

In suggesting strategies for supporting teacher development in the use of ICT, Scrimshow [112] divides them into two main areas: school-based and externally supported strategies, which will be discussed later. Flow chart 2.5 shows that ICT contribution in teaching and learning especially to pedagogy (using 3 different approaches), makes it practicable for educators to use it intensively and as a result, there is need for different approaches to ICT implementation.

Negative aspects of implementing ICT

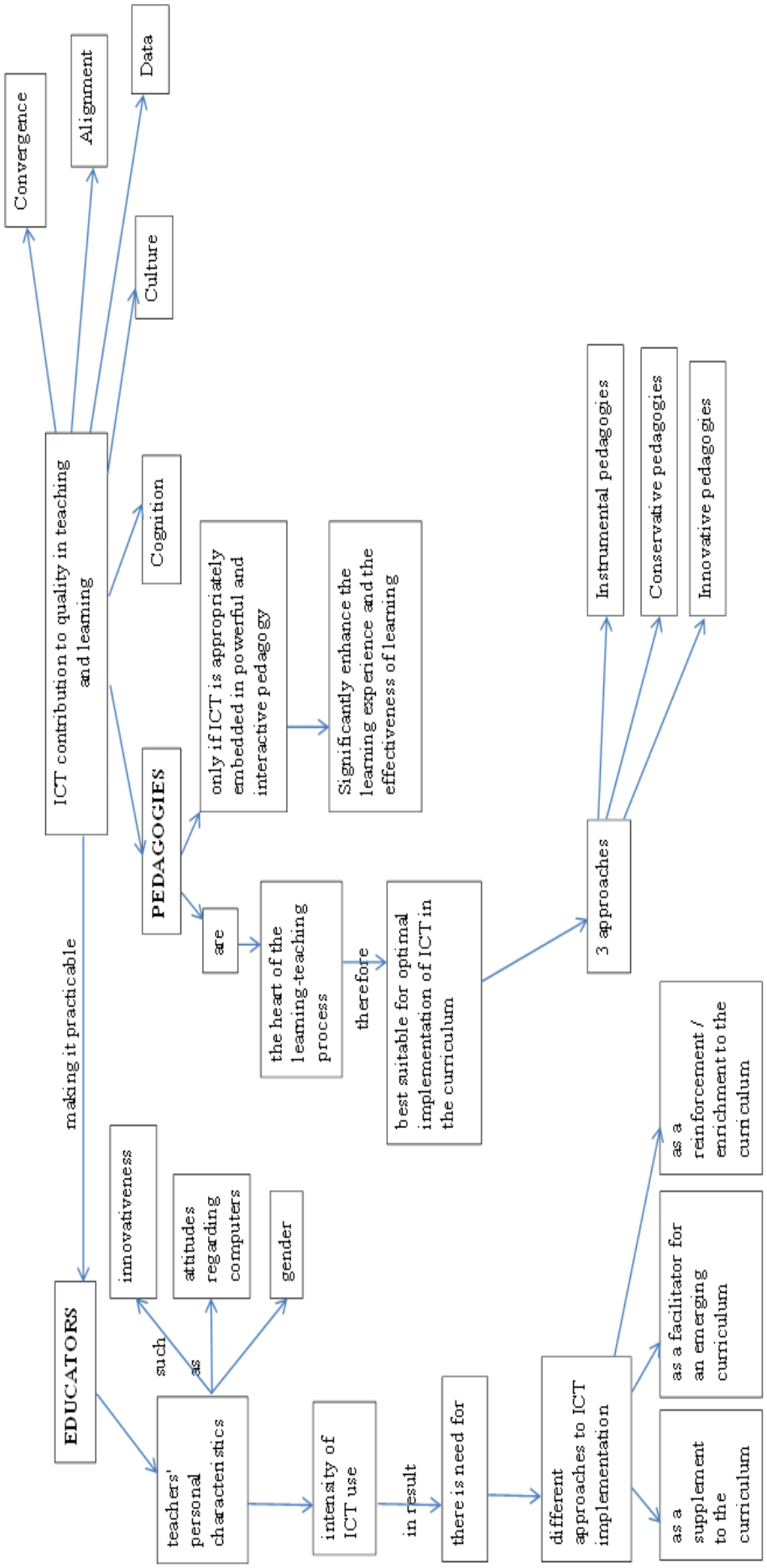
Although this research was able to prove the importance of implementing ICT into the teaching-learning process, there are some disadvantages of technology in the classroom:

- While technology can be a great addition to the classroom, it also can be a source of frustration for both the teacher and the student, unless the teacher is well trained in technology and can support the hardware in the classroom or alternatively, a technology expert is present to troubleshoot problems.
- Technology does not have a place in classrooms where teachers have not been adequately trained in its implementation. Transcending the passive use of technology and moving into active use is a skill that takes a lot of time and training
- Due to connection problems, downloading issues, and policing software teachers have to deal with time lost in the technology based classroom.
- Once technology is purchased for a school, the cost of upkeep and maintenance may be too expensive for school budgets.
- Many schools today have curricula and programs based on state or national assessments. The majority of these tests and measures are paper-and-pencil based in order to make them accessible for all students and schools. Because learning with technology involves typing input into a computer, there is incompatibility between the

assessments that determine government funding and the use of technology in the classroom. To adequately prepare for these tests, students need practice with authentic assessments most closely imitating those of the standardized test.

- As for the pupils, a few of them respondent that using technology in the classroom makes them feel tired. In other words, using ICT in the classroom cannot address all students' characteristics and therefore should be implemented to some extent.

Figure 2.2: The Contribution of ICT to Quality Teaching & Learning



- ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for future workers, as well as strengthening teaching and helping schools change.
- The central challenge is whether current schools will be able to adapt and integrate the new power of technology-driven learning, for the next generation of public schooling.
- Teachers need to be involved in collaborative projects and development of intervention change strategies, which would include teaching partnerships with ICT as a tool.
- Intelligent integration of ICT can help teachers enter the reality into their classrooms while promoting collaborative working and learning with their students and colleagues.
- The critical factor for success in school is the teachers and the human relationships they build at school, while the computer is only a means to achieve pedagogical goals.
- In a constructivist environment, the use of ICT promotes student autonomy whilst also providing opportunities to work collaboratively with others.
- The need for healthy relationships with peers and adults remains important to most of middle-years students and contributes to their self-esteem and positive attitude toward learning.
- Six aspects of improvement in which ICT can contribute to quality in teaching and learning: cognition, pedagogies, convergence, alignment, data and culture.
- The personal characteristics of teachers are important influence on the extent to which they take up innovation, such as the implementation of ICT.
- Appropriate pedagogy has an important role in the contribution of ICT to the learning-teaching process.

2.2. Enabling Successful Use of ICT

Most frequent **individual** factors which enable ICT use according to the survey conducted by Scrimshow [112], fall into three categories:

a. Ensuring awareness, capability and confidence in teachers in relation to using ICT.
b. Ways of ensuring access as required to reliable systems.
c. The educational benefits of using ICT, either through making teaching and learning more effective or by enabling kinds of learning that were not possible before.

What is required, Scrimshow [112] continues is an approach that makes a number of changes together:

a. Enough planning and preparation time are required to integrate ICT into day-to-day teaching.
b. The employment of an ICT teaching assistant to share the preparation and set up time.
c. An integrated approach to using ICT that recognizes it as a complex and wide ranging innovation.

The question arises according to Scrimshow [112] is "why an innovation that has been present in schools in some form for around 20 years has not yet reached critical mass." [112, p. 13] The literature presents four possible explanations [112]:

1. ICT does not fit with some teachers' wider educational beliefs.
2. There may be immovable social obstacles.
3. There may be powerful but removable obstacles in schools to expansion of use.
4. The obstacles may be to do with the personal characteristics of some teachers.

Groff & Mouza [38] believe the real question is "Why is it that so many teachers use computers to increase their own efficiency and productivity, yet do not strive to find effective applications for their use as instructional tools? What is it that keeps teachers from making this quantum leap?" [38, p. 22] Identifying potential obstacles can empower teachers to seek solutions early in the process, consequently increasing the probability of experiencing success while integrating technology [38].

Scrimshow [112] points out to approaches that support successful use of ICT in **school level**, these approaches include:

1. **Leadership and decision making**- The role of school leadership is clearly central, the leadership should be collaborative, supporting innovation and risk taking, and include others in decision-making.
2. **Whole school planning and implementation of the change**- Bryderup & Kowalski [2002 in 112] warns that a plan is a guide to action not a substitute for it. This means that it is not just a matter of having a whole school approach to ICT, but setting it within the wider pattern of changes needed. Bryderup & Kowalski [2002 in 83] add that developing an ICT school plan, setting up clear goals and defining the means to realize these goals, is a crucial step towards ICT integration. Kennewell et al. [2000 in 83] adds that a good ICT plan should also include an assessment and evaluation approach to reflect a clear view of ICT use.
3. **Whole school use and development of resources**- The move to viewing curriculum resources as something to be jointly developed by the staff of the school, linked closely to

what teachers actually want and need. However, this creates a need for teacher training in their production and classroom use.

4. **Knowledge sharing and training**- professional development as well as the willingness to learn from, and support, each other, Feeling comfortable asking each other questions, no matter how simplistic these seem. Groff & Mouza [38] agree, they also speak of administrative support (or the lack of it) that can either make or break a teacher's attempt to integrate technology into the classroom. Cohen and Hill [2001 in 83] add that the most effective teacher training experiences are school subject specific practices, directly relevant for classroom instruction and connected to school policy. They emphasize the fact that there is also need for continuous support, which can be expressed as cooperation between schools [Triggs & john, 2004 in 83]. The last can be seen as either contact with colleagues who share similar interest, interaction which involves knowledge exchange, or encouragement to take risks [Triggs & john, 2004 in 83]. According to Tondeur and colleagues [83] professional development should stay at the center of an ICT policy.
5. **Roles of technical support staff**- It is clear that the technical support for teachers and students should be a reliable and accessible service, and requires cooperation between all parties concerned. Tondeur and colleagues [83] strengthen this point with their research findings that: "teachers reporting a high degree of ICT-related support, incorporate more often these technologies in their practice." Yet, AsSomekh [1996 in 83] warns that needs for technical support tend to take priority over curriculum support.

Groff & Mouza [38] agree that there are factors at school level and also factors associated with teachers, which are critical to the successful integration of ICT in the classroom. However, they note the following four additional factors:

1. **Legislative factors**- "The lack of research on the efficacy of technology-based instruction and legislative policy that shifts frequently or is innately designed to facilitate the introduction of technology in the classroom." [38, p.26]

Tondeur and colleagues [83] agree, emphasizing that policy plan is important but only when teachers are aware of its content. They also claim that previous research ignores the complex systemic nature of ICT integration, including the role of national policies (macro level) and local school policies (meso-level). They indicate the gap between the proposed ICT curriculum (macro level) and the actual use of ICT in the classroom. They blame research focusing on 'individual blame' rather than 'system blame'. Olson [2000, in 83] suggests establishing a dialogue based on equality between principals and teachers. Engaging teachers in the development of an ICT plan, allows them to reflect on their educational use of ICT.

2. **The technology-based project/innovation**- a project/innovation can become an obstacle to the success of integrating technology, if it exhibits distance from the school context and dependence on resources outside of the teacher's control. Neal [63] adds that when the learning tasks provide little opportunity for students to explore their thinking and understanding, most of them will become passive learners. Levin and Wadmany [58] agree, the effectiveness of ICT depends in using Information-rich projects, which according to students are significant both in terms of interest and in terms of benefits for the short and long range.
3. **The Students**- Student characteristics must be taken into consideration when trying to identify potential obstacles. Their prior experiences with technology-based projects, attitudes and beliefs, and technology skills that they bring to a proposed project can substantially influence its success. Neal [63] adds that the teacher's awareness of the way a student will benefit from different learning experiences, contributes to increasing the learning process. The effects of the teacher and the teaching styles have a strong impact on students as they consciously and unconsciously obtain new skills and knowledge.

Similarly, Levin and Wadmany [58] reached the conclusion that the voice of the students as to the process of learning in technology-rich classrooms provides deep and rich information, which is important to use. Moreover, they found that using ICTs in the learning process increases the responsibility of the student for his learning and helps him become a self-oriented student. Furthermore, Levin and Wadmany [58] report that unique connections develop between the teachers and the students, they become active partners in a mutual-sharing relationship.

4. **Technology**- There is almost an infinite list of potential problems that the technology itself can present, such as: hard drive failures, insufficient memory, software problems, files problems and network connection problems. In order to avoid such challenges, Groff & Mouza [38] recommend working with up-to-date technologies, building a strong infrastructure and as Scrimshow [112] suggests, have a coherent technology team.

Groff & Mouza [38] focus primarily on four factors that can be directly addressed by teachers, while presenting their solution called $\mathbf{i^5}$: Context, the Innovator, the Innovation, and the Operators. The $\mathbf{i^5}$ is essentially designed as a means of surveying. There are a total of 12 variables presented that could potentially facilitate or hinder the effective implementation of technology. Groff & Mouza [38] believe that the $\mathbf{i^5}$ can help individual teachers to successfully integrate technology, by identifying potential obstacles upfront and seek solutions early in the process.

Byrom and Bingham [19], in their attempt to find the factors influencing the effective use of technology for teaching and learning, created eight lessons:

 # 1 Leadership is the key ingredient-Leadership at all levels (state, district and school) is the most important factor affecting the successful integration of technology. Byrom & Bingham [20] emphasize the fact that it is especially important at the school level for the principal to have a vision of what is possible through the use of technology and to be able to work with others to achieve the vision. They draw guidelines for the effective principals: An effective principal leads by example. In addition to modeling the use of technology, supportive school principals highlight the efforts of teachers who attempt to use technology to improve teaching and learning.

Effective school leaders focus on reform initiatives that offer the most promise for improving teaching and learning, and they ensure that their school has the resources, skills, and time necessary for turning the promise into reality. They also show both interest and trust in decisions made by the school technology committees. Finally, professional development is necessary as school teams strive to reach their vision for technology, an effective principal uses evaluation to further professional growth. Several studies [Anderson &Dexter, 2000; Dawson & Rakes, 2003 in 83] support the claim that leadership promoting change, is a key factor, and a crucial predictor of ICT integration since it focuses on promoting the use of ICT at a strategic and action level [Baylor & Ritchie, 2002 in 83].

 # 2 A comprehensive plan-"Each organization, whether it is a district or an individual school, needs to spend time developing and updating a comprehensive plan: starting with its vision, mission, and goals. The degree of success that a school has in implementing technology will depend, in part, on the quality and maturity of its technology plan. A useful plan reflects the ideas of an entire school community and is connected to overall school goals. It focuses on the use of technology to support teaching and learning." [19, p. 6]

 # 3 Technology integration is a slow process- Truly integrating technology into teaching and learning is a slow, time-consuming process that requires substantial levels of support and encouragement for educators. Byrom & Bingham [19] estimate this process from three to five years.

 # 4 Teacher adoption of technology use- Although it is still surprising to see how many teachers do not use technology at all, the solution according to Byrom & Bingham [19] may be found in professional development that can easily be applied to experiences leading to technology use, a direct linkage with the curriculum, teaching strategies, or improvements in achievement. And finally, the use of teachers as mentors and coaches: teachers-teaching-teachers is usually more effective than technology specialists teaching teachers.

 # 5 Changes in the way teachers teach-This means that teachers embrace strategies for student-focused learning." It is the combined effect of pedagogically sound teaching practices and appropriate technologies that lead to improvements in learning."[19, p. 14]

 # 6 Technical and pedagogical experts-Teachers need on-site and on-demand technical assistance with both the technology and the integration of technology into teaching and learning (pedagogy)

 # 7 Additional obstacles for students in economically disadvantaged areas – These obstacles include basic electricity that is not sufficient, difficulty in establishing an infrastructure and staff turnover which is often high.

 # 8 Lack of evaluation of technology programs- Most schools, have technology plans, but many of these plans still lack strategies or tools for determining whether the efforts have had any impact. "Educators want tools to track progress, they need tools and processes to track and document their technology progress—tools that help them reflect on where they are and where they need to go with their technology initiatives." [19, p.20]

In order to enable effective use of ICT in the classroom there is need for external support strategies [112;19] alongside school level strategies [38;112;19]. These must be in correlation with legislative factors [38;83] that have to take in account additional obstacles for economically disadvantaged areas [19]. The supporting strategies need to be given time for preparation and planning [38;83;112;19]. There is also need for an ICT assistant in school [38;83;112;19], in order to support technology itself [38] and a pedagogy specialist to help integrate ICTs into the curriculum [112;19]. Students' characteristics should be taken into consideration, as well as the technology-based project [38;58;63]. The whole process should then be evaluated in order to reflect the effectiveness (or lack of it) of the technology programs [83;19]. The central factor, all researchers agree upon, is teachers characteristic-such as leadership [112;19], and their acquaintance with technological tools [39;38;83;112;19;28].

- Identifying potential obstacles can empower teachers to seek solutions early in the process, consequently increasing the probability of experiencing success while integrating technology.
- Frequent **individual** factors which enable ICT use: ensuring awareness and confidence in teachers in relation to using ICT, reliable systems, enabling kinds of learning that were not possible before.
- Approaches that support successful use of ICT in **school level** include:

1. Leadership and decision making.
2. Whole school planning and implementation of the change.

3. Whole school use and development of resources.
4. Knowledge sharing and training.
5. Roles of technical support staff.
6. Legislative factors.
7. The technology-based project/innovation.
8. The Students.
9. Technology.

- Eight lessons to find the factors influencing the effective use of technology for teaching and learning: leadership, a comprehensive plan, a slow process, teacher adoption of technology use, changes in the way teachers teach, technical and pedagogical experts, additional obstacles for students in economically disadvantaged areas, lack of evaluation of technology programs.

2.3. The Role of Teachers in Integrating ICTs Into the Learning-Teaching Process

Many researchers discussed the question "Who is a good teacher?" and although it is difficult to reach agreement, three categories are recognized [Hinchey, 2010 in 43]: 'Teacher quality', which is namely teacher's characteristics. 'Teacher performance', what he does inside and outside the classroom (such as interaction with learners), and 'teacher effectiveness', his influence on learning among his students (such as their achievements and motivation).

Studies have shown that the main factor for creating significant contribution of technology to the learning process in school is the number of teachers who use technology wisely [39]. Therefore, she recommends, it is very important that investment in technology, will also include as integral part-teacher training: Teachers that will use technology wisely as a contributor tool to pedagogy. But technical training is not enough, in order to effectively integrate technology into teaching, training should emphasize how and when technology is integrated effectively for the achieving of specific pedagogical goals. A variety of methods for effective integration should be presented, so that the application will be pedagogical and not technical. Training should also emphasize simple tools, those that the teachers can integrate without the need for complex preparations [39].

Leading technology teachers should be allowed to serve as a model and advice their colleagues. It is also important to understand that a single training is not enough to make the necessary change. It takes an ongoing annual process, accompanied with technological and pedagogical support.

The greater time invested in the experience of teachers' use of technology, the more their self-confidence will increase and the more possibilities of technology and appropriate ways to incorporate it will be open for them [39].

Dresler & colleagues [29], while trying to answer the question "what is the behavioral profile that is characteristic for teachers that are implementing the ICT pedagogy at its best?" Found the answer in Ames' [1992 in 29] six elements called TARGET:

- **T**ask- The value of a task is assessed by its importance, interest to the student, usefulness or utility, authenticity, and the cost in terms of effort and time to achieve it.
- **A**uthority- Learning can be based on the authority of the teacher that dictates its pace and frames. Authority that constitutes a significant figure for the students, in mediation processes of the learning. The educator is not just a teacher he is also a learner.
- **R**ecognition-Adapting the curriculum to the learning style, the social emotional needs, the cognitive abilities, desires and other personality variables.
- **G**rouping- Strategies for teaching - learning - assessment based on the cooperative of teacher - learning - Group provide the learners opportunities for social interaction while experiencing many different dialogues. Learning outcomes reflect the thinking processes and actions of the entire group (shared cognition), and not just the individual learner.
- **E**valuation- Using a variety of alternative assessment methods - corresponding to the objectives of the assessment and evaluation subjects. Intelligent use of evaluation findings to improve teaching and learning processes
- **T**ime- Reference to time in designing the curriculum, such as: time allotted number of lessons per week, time management according to the assigned tasks.

Helping educators to change, is the key to fostering ICT integration, and some researchers have identified educational technology as a catalyst for bringing educational change [107]. The problem according to Newhouse, Trinidad and Clarkson is that despite new cognitive approaches to learning such as constructivism, the education system is stuck in the behavioral paradigm of the industrial age. While some teachers cope well with change

and enjoy risk taking opportunities, many teachers are reluctant to change. Therefore, Rogers [2000 in 107] states, it is necessary to understand where teachers are in terms of their level of ICT adaption, to understand the obstacles they are confronting. These obstacles include the lack of funding, teacher training, limited time for teacher planning, lack of support or infrastructure, and lack of vision as to what can technology contribute. For ICT to be effectively adopted into school, Newhouse, Trinidad and Clarkson [107] continue, planning is vital. The vision, goals and objectives of the technology program must be imbedded in that of the school [Cole, 1999 in 107].

Beauchamp [11] claims that teachers are facing challenges and opportunities while introducing a new ICT (such as the interactive whiteboard) in the classroom. Despite the benefits to be gained from exploring the new technology [Harris, 2002 in 11], there is necessary investment in time, effort, new learning and willingness to change existing teaching strategies [Keeler, 1996 in 11]. Therefore, it is not surprising that although teachers may start from the same starting point when using a new technology, it is possible to identify a range of competencies and pedagogic practice. In his findings, Beauchamp [11] distinguishes five stages, as seen in image 2.3, which delineate the transition from beginner to synergistic operator of new ICT using the interactive white board (IWA) as a demonstration.

Blackboard Substitute

The new technological tool is 'assimilated to existing pedagogic assumptions' [Eraut, 1991, in 11,p. 3].

Although this situation allows the teacher to continue to teach in a familiar teaching style, it does not necessarily allows the basic change in their pedagogy which is needed for the integration of new technologies. Technology is being used as a 'neutral tool' [Lim & Barnes, 2002, in 11, p. 37].

Apprentice User

This stage is characterized by the use of a wider range of existing computer skills in a teaching context, although lessons still proceed in a largely linear direction.

There is still need for both pedagogic imagination and specific ICT skills. As teachers' confidence in the new technology grows, then existing computer skills are transferred to the use with the new technology.

At this basic transition level, teachers are beginning to reassess their own practice in the light of greater technical ability. Since it is not just teachers' ICT skills that need to be developed, but also teachers need to "accept changes in their role and in the interactions they [have] with students and they also [have] to support children as their roles [change] too" [Harris, 2002, in 11 p. 457]. Bork [2000, in 11 p. 78] summarizes this as a situation where learning "is fully active, focusing on the student as learner rather than on authority figures".

Initiate User

Having achieved a level of technical competence, the key development in this stage is an awareness of the potential of the new technological tool, to change and enhance practice.

Teachers begin to combine their own skills as pedagogues with those of their pupils, and the new technology tool, to set in motion a classroom practice which produces a new pedagogy.

Advanced User

As teachers see possibilities in the new tool, they move towards the genuine excitement of discovering their impact on teaching and learning.

This in turn opens up new possibilities which begin a move away from a linear direction in lessons to a more creative use of the new technological tool.

The growing confidences of teachers, and the increased technical competence of the learners, also allow more unplanned opportunities for learners to use the new technological tool without damaging teacher confidence, presumably because these teachers are less concerned about knowing how to sort out any problems which may arise from learners pressing something they should not. [11]

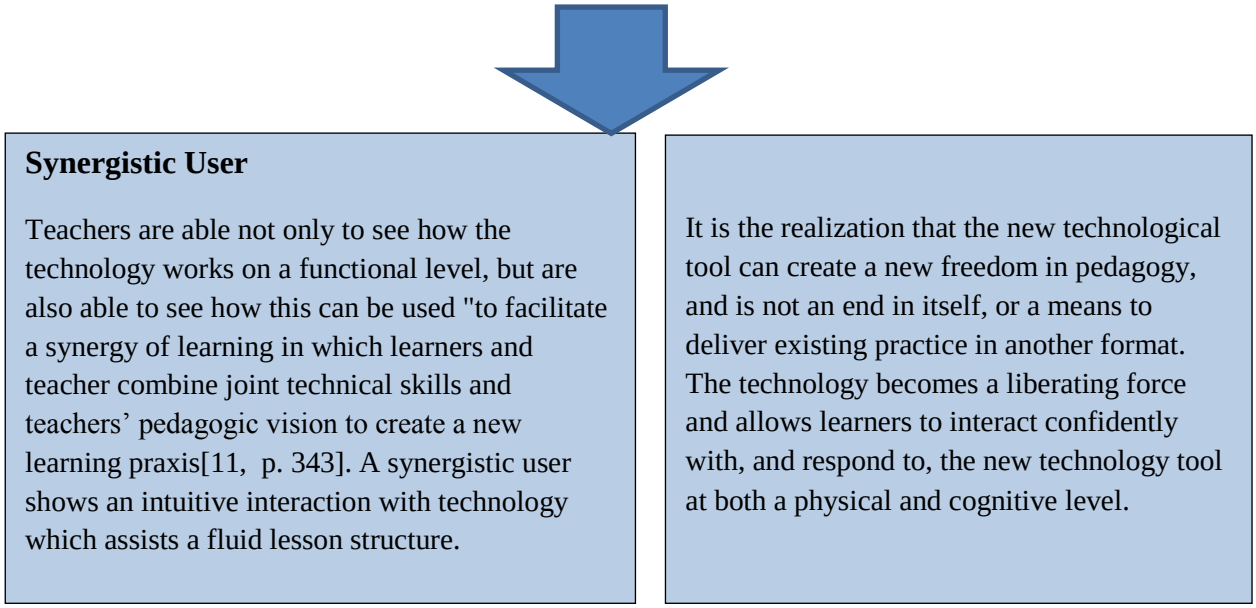


Figure 2.3: Stages delineate the transition from beginner to synergistic operator of new ICT

Beauchamp [11] reinforces the claim that if schools are to invest in new technological tools, they should also be aware to the investment needed in preparing teachers for their new role, both in terms of technical competence and classroom pedagogy. He also points out the element of time, time to assimilate the lessons learned by teachers into their practice, "until they feel confident in being able to cope with most facets of a program and other features of the technology" [11, p. 346]. However, he mentions, teachers will progress at their own speed and their training requirements will need to be met in a flexible and supportive environment [also Davis, Preston, & Sahin, 2009 in 44].

"It does take time for an educator to complete this journey and to develop a vision of what can be done with ICT" [107, p. 43]. Very often this vision is developed first with the personal use of ICT, and later with appropriate professional development providing good models of best practice [107].

The implementation of technology in schools occurs in one of the two following models [Avidov-Unger and Eshet- Alkalai, 2011 in 14]: 'Islands of Innovation', which encompasses only part of the educational organization, and 'Comprehensive Innovation'.

Rogers [2003 in 14] in his 'diffusion of innovation' model describes 5 groups of innovation adapters: innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%), and laggards (16%). Blau and Peled [14] found similar results in the field of education in a research conducted in Israel, 2011. They claim that the literature emphasizes the great importance of personal characteristics of teachers, in high levels of technology adaption [Becker, 2000 in 14], but there is no proper appreciation as to their viewpoints regarding technology [McCormick & Scrimshow, 2001 in 14], since changes in these viewpoints can help overcoming obstacles in implementing technology in schools [Hew & Brush, 2007 in 14]. Blau and Peled [14], also indicate the importance of holding in school, an

ongoing training program to support the teachers in effective use of their computers as a tool to create meaningful learning. Finally, Blau and Peled's research [14] raises the issue teachers complain about, of time consuming preparing digital materials for the technology based lessons. These findings emphasize the importance of preparing digital materials by content developers.

Hennessy and Colleagues [44] also indicate that there is substantial evidence that if used appropriately, ICT can be an effective tool in supporting teaching and learning. They agree with other researchers mentioned here that since ICT's introduction into schools does not by itself improve the quality of education, the pedagogical and technical expertise of the teacher is absolutely critical. They too, believe that teacher development is the key to effectively implementing policy and curricula, to using ICT to enhance teaching and learning, and to produce qualified teachers, therefore:

"Teachers who lack the chance to develop professionally in the use of modern ICT feel under threat. The relevance of a teacher in the 21st century is determined by their willingness to develop in this way." [44, p. 42]

Similarly to Newhouse, Trinidad and Clarkson [107], Hennessy and Colleagues [44] claim that ICT is most effectively used as a learner centered tool, instead of within a more traditional pedagogy.

Although they agree that it is teachers' attitudes, expertise, lack of autonomy and lack of knowledge to evaluate the use and role of ICT in teaching that are important factors delaying teachers' readiness and confidence in using ICT support. Hennessy and Colleagues [44] think that there is also a general inadequacy of learning resources, course curricula and other learning materials that involve ICT use.

The biggest obstacles according to Hennessy and Colleagues [44], identified by teachers participating in the 1998-1999 survey, were the lack of time available in classes, and their own schedules for planning; in addition to the lack of national policy on the use of computers in schools [Kozma, McGhee, Quellmalz, & Zalles, 2004 in 44]. Therefore, they recommend, national policies need to make more commitment to helping teachers effectively integrate ICTs into the classrooms "by aligning curricula, exams, and incentives with educational outcomes that they hope to gain" [44, p. 43]. They also believe that teachers can take time to discover that ICT does not mean extra work rather it makes their work easier and suggests that more competent learners can be a useful resource for their peers.

Hennessy & Colleagues' conclusion of the research that focused on the Sub-Sahara Africa, is presented in the following image 2.4: ICTs revolutionize the quality of learning when carefully integrated into the classroom, where teachers' primary barrier to ICT is the lack of relevant preparation, which results in low proficiency in using ICT and a general lack of knowledge about technology in teaching and learning. This eventually leads to lack of subject teachers trained to integrate technology into learning in their areas.

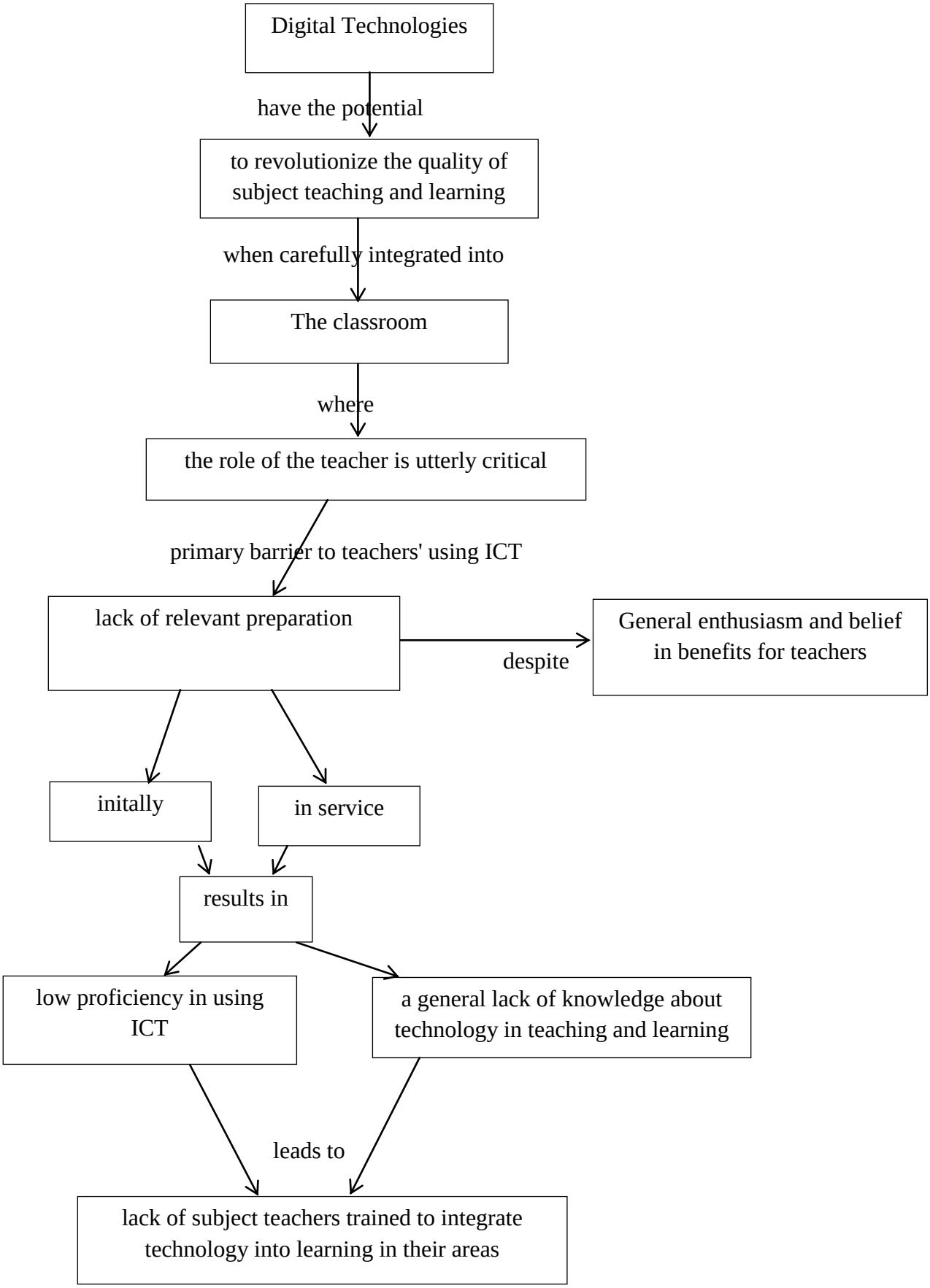


Figure 2.4: Problems in Implementing ICT in Schools

Mellar& Collegues [60] continue the idea, claiming that in order for teachers to be effective in supporting the development of ICT skills and confidence, they should encourage collaborative learning, learner autonomy-so that they will have time to get to know their learners better and adapt their teaching to their learners' need, in addition to using a wide variety of technologies to construct (usually shared) outcomes.

- Three categories are recognized in searching for the "good teacher": 'teacher quality', 'teacher performance', 'teacher effectiveness'.
- The main factor for creating significant contribution of technology to the learning process in school is the number of teachers who use technology wisely, therefore it is very important that investment in technology will also include as integral part- teacher training.
- Leading technology teachers should be allowed to serve as a model and advice their colleagues.
- Implementing the ICT pedagogy at its best includes: **T**ask, **A**uthority, **R**ecognition, **G**rouping, **E**valuation, **T**ime.
- Helping educators to change, is the key to fostering ICT integration, therefore, it is necessary to understand where teachers are in terms of their level of ICT adaption, to understand the obstacles they are confronting: Blackboard Substitute, Apprentice user, Initiate user, Advanced user, or Synergetic user.
- If schools are to invest in new technological tools, they should also be aware to the investment needed in preparing teachers for their new role, both in terms of technical competence and classroom pedagogy.
- The implementation of technology in schools occurs in one of the two following models: 'Islands of Innovation', which encompasses only part of the educational organization, and 'Comprehensive Innovation'.
- ICT is most effectively used as a learner centered tool, instead of within a more traditional pedagogy.
- In order for teachers to be effective in supporting the development of ICT skills and confidence, they should encourage collaborative learning.

2.4. How to Evaluate the Effectiveness of ICT in Teaching

Paiano [66] claims that since the use of ICT does not automatically improve the quality of teaching and learning, it is necessary to constantly evaluate how effective the use of ICT in the classroom really is. PISA have shown that evaluation creates a high level of responsibility among teachers and students which in turn produces better results. According to Paiano [66] Teaching and learning processes which use ICT should therefore be subject to evaluation.

BECTA (British Educational Communication and Technology Agency) presents five useful indicators which help decide whether ICT is of benefit to teaching and learning or not:

1. ICT Is of little effect if used in a traditional teaching environment.
2. The teacher plays a vital role in making ICT effective, and must be a facilitator who sets out clear didactic objectives.
3. ICT works best in a collaborative classroom where problem solving is involved.
4. ICT works when it is used regularly and in many subjects.
5. The users of ICT must believe in it, especially the teacher.

Paiano [66] describes five models for evaluating ICT integration in the teaching-learning process.

Model 1: Techno-constructivist- McKenzie [2006 in 66] says:

"the techno-constructivist class uses the Net, email, online projects, virtual field days, WebQuest, multimedia presentations, virtual classrooms, interactive simulations …and consequently revolutionizes the learning process. The teacher becomes a facilitator who guides the student between the real and virtual worlds." [66, p. 43]

However, in this model, teachers are aware of the dangers of an over-reliance on ICT.

Model 2: Techno/subject-centered- the new technologies are only used by a small number of highly-motivated teachers and therefore, in a limited number of subjects.

Model 3: Proto-technological- includes lessons that are ICT integrated for the first time. Teachers are excited to try out new teaching methods but they know very little about ICT and their use of new technologies tends to be superficial. They don't encourage their students to use ICT at home, and very often, after an initial stage, ICT is abandoned.

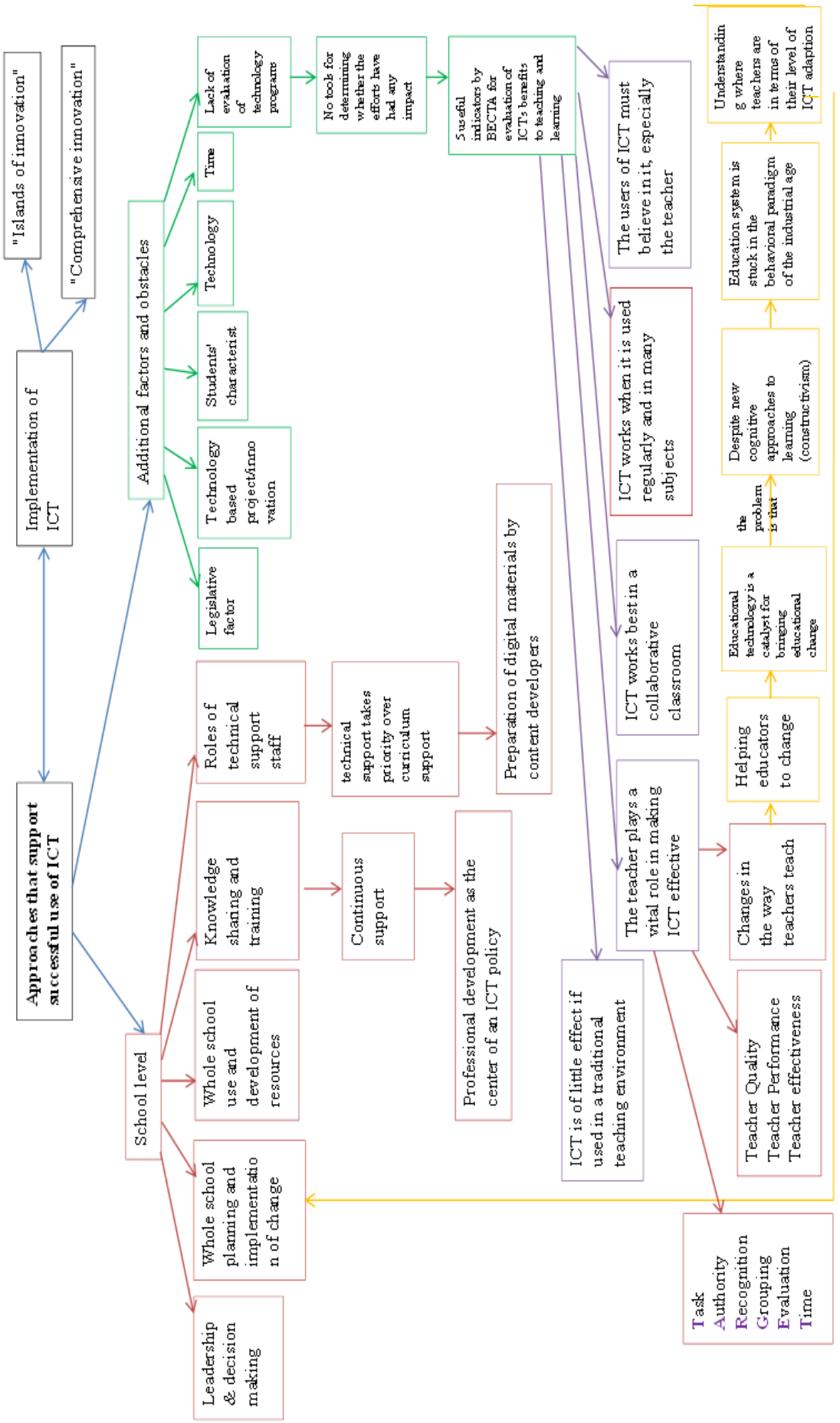
Model 4: Techno-traditional- Technology is used in tiny doses so as not to interfere the traditional teaching methods. There is little or no interest in change. Didactic programming remains traditional and any technology which is used must fit into existing

patterns. Lessons are teacher-centered and involve lecture-type transferring of information. Collaborative work is reduced to minimum or is non-existent.

Model 5: Technocratic- concentrates almost exclusively on developing new technology per se and helping students to be as proficient in the use of technological tools as possible. Teachers, who are experts in the field, focus on technological-skills acquisition and tend to ignore the wider didactic context. As in the techno-traditional model lessons are teacher-centered with little cooperative learning.

Flow Chart 2.5 shows the factors and obstacles discussed in this chapter, at school level as well as additional levels, to effectively use ICTs in teaching and learning. The solutions are to these obstacles are also presented.

Figure 2.5: Enabling Successful Use of ICT



- Since the use of ICT does not automatically improve the quality of teaching and learning, it is necessary to constantly evaluate how effective the use of ICT in the classroom really is.
- BECTA presents five useful indicators which help decide whether ICT is of benefit to teaching and learning or not.
- Five models for evaluating ICT integration in the teaching-learning process are presented: Model 1: Techno-constructivist, Model 2: Techno/subject-centered, Model 3: Proto-technological, Model 4: Techno-traditional and Model 5: Technocratic.

2.5. Integrating Technology Around the World

Integrating technology in teaching in Israel

A decade ago, the Israeli educational psychologist Prof. Salomon, who received the Israel Prize for Education in 2001, claimed technology constitute the platform on which all learning and training are conducted. He believed that the more technology tools involved in the learning process, the higher and useful the construction of knowledge will be. Salomom [78] added that effective use of these technology tools will enable the construction of knowledge and will encourage the learner to a process of making decisions.

After the first decade of the 21 century has past, Salomon (in "Haaretz" Newspaper interview, 2010) warns the education system of overloading computers in the classrooms. He urges the Israeli ministry of education to stop and think about the high hopes involved, in the past and in the future, in the power of computers to change the education system. Salomon agrees with most educators who claim that there is no advantage to the use of computers and technology as long as there is no change in the traditional role of the teacher.

Unfortunately, in 2010 policy document 'Education in the 21 century', handed both to the prime minister and the minister of education, the conclusion is that the affective and fast way to promote the education system and meet the requirements of the 21st century is to provide more computers, via an implementation model called 'Digital Schoolbag'. [46, p. 22]

It is surprising, since the document presents the data that 52% of school children in Israel think that school does not prepare them to the future and does not provide them the necessary skills to integrate in the job world of the 21st century. It also acknowledges the fact that the education system in Israel is not prepared to cope with the challenges of the current century and with globalization processes.

Moreover, In light of the recommendations of this document:

"Adjusting the curriculum, and the learning environment in accordance, includes investing in technology infrastructure, changing teaching methods and promoting teachers." [46, p. 19]

It is very disappointing that while reaching a conclusion, teachers and teaching methods were again neglected.

Davidovich and Suan [25] explain that the enormous increase in the numbers of online courses in academic institutes in Israel since 1999, is ascribed especially to the national strategy of the Council for Higher Education and its executive branch MEITAL (the inter-university knowledge center to assist in ICT) . The appeal of the Council for Higher Education to a new pedagogy for new technological tools, remained largely unanswered [Tel Aviv University, 2003, in 25]. They conclude that technology surged forward, leaving pedagogy far behind.

Forkosh Baruch [34] adds that even today, many teacher training college lecturers are still not ICT literate [Goldstein 2009, in 34] hence are not familiar with effective use of ICT environments and adapting them to innovative pedagogical paradigms [Reeves, 2003 in 25]

Many teachers struggle with pedagogical approaches and using the technology [25] and as a result, still use ICT only for course management reasons, higher accessibility for students to the material and for sending massages. Learning stays mainly traditional: learners are mostly inactive, and are not involved in social interaction and collaborative learning [13].

Vadmani [84] advises, in light of observing a beginning of awareness and doing in some schools, to keep using technology effectively in order to create a significant contribution that is relevant to life in school, and to form a growth lever for teaching and learning processes.

The main difficulty revealed in the previous stage of the Israel "Strategic Plan for integrating e-learning to the educational system stage 4 draft 4.1" (2005) was lack of training hours, hours not fully exploit, and inability to help schools with problems to integrate ICT in teaching. Since it is hard to assimilate innovations and prepare educators with no training hours, the digital gap increased.

In the 2005,Israel "Strategic Plan for integrating e-learning to the educational system stage 4 draft 4.1", the writers acknowledge the growth of schools in which e-learning has become a natural everyday part of teaching and learning. Therefore they recommend on one hand to organize and distribute e-learning pedagogies and ICT teaching models, that were developed in these schools by the school staff and by individual teachers, and on the other hand to keep encouraging the entrepreneurs and developers to enlarge the teacher circles that take part in these processes.

Decision makers and school policies regarding ICT in education In the "Management Planning and Assessments Folder for the academic year 2013-2014" [103] distributed to the counties managers, the staff of supervisors of districts and headquarters and to the managers of the educational institutions, three objectives are presented in the annual plan[44], and each objective is divided into two goals. The third objective is presented as follows:

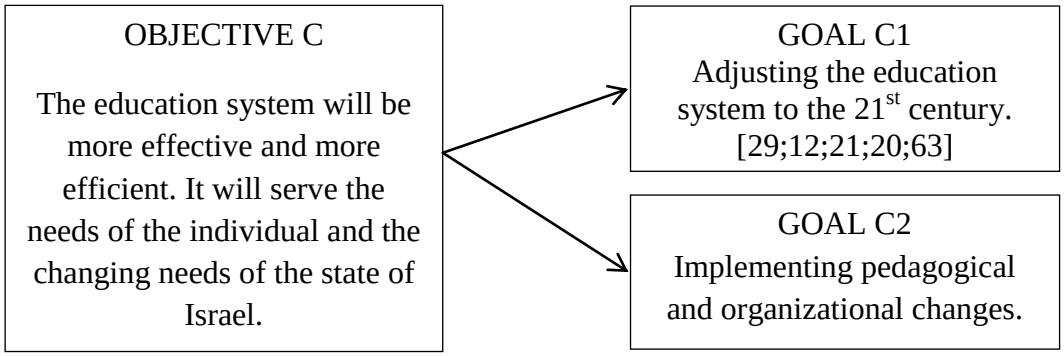


Figure 2.6: Objective C-Israel's Annual Plan in Education [103]

This objective is engaged in adapting the education system to the 21st century [29;12;21;20;63] and refers to a number of influencing key elements on the quality of the teaching- learning-assessing processes in the system. Components that complement each other, contribute each other, and require adjustment to the 21st century. These components include learning in a digital environment, the professional development process [99;77;38; Davis, Preston & Sahin (09) in 44] and the training of the education staff [37;42;98;114;63;76;104;17], the evaluation processes [66; Ames' (92) in 29;19; Kennewell et al (2000) in 83; Savery & Duffy (96) in 91] and leading reforms and programs while empowering the leading teams [19]. In addition to the objectives and the goals, the plan publishes a list of tasks which are the activities to be carried out by the schools in order to achieve the defined objectives. Actions are measured by output indices. In each task, there is a description of the actions required and the possible directions for the educational institute management and its team. **Promotion of ICT in primary schools** is the name of task listed under goal C1 that regards the implementation of ICT into the schools. This task contains the following main components [103]:

- Implementation and application of a computerized environment for teaching and learning supported by ICT technologies for the advancement of optimal pedagogy and 21st century literacy for teachers and students. [29;12;21;20;63]
- Implementation of the program is based on five key elements:

1. Comprehensive work plan that combines organizational and educational approach of the school.[19]

2. Learning and practicing in a digital environment - providing ICT skills [60; Rogers (2000) in 107] and integrating them in the learning-teaching-assessing processes.
3. Use of ICT technologies as an information management tool.
4. The existence of a school portal as part of an online environment to implement frameworks for collaborative learning and networking with school community (parents, teachers, students), and colleagues from different schools in the country and abroad. [39;112]
5. Implementation of a school plan [Cole (99) in 107;107] to promote students' awareness of ethical behavior and protected network.

The task includes professional development [14;84;39; Davis, Preston & Sahin (09) in 44] for managers, instructors, ICT coordinators, school staff, and teachers. The professional development of teachers and disciplines officials in Schools should be technology integrated.
According to this policy paper, the schools' managers, the ICT coordinators and the instructors are responsible for:

- Being familiar with the ministry policies for adjusting the education system to the 21st century, and imbed it into the school's vision.[115;19]
- Developing a school multiyear curriculum that integrates ICT technologies.[19]
- Promoting innovative environment activities including teaching ICT skills [60; Rogers (2000) in 107], ethics and protected network.
- Providing an educational response to ethical issues in conducting network and ensuring children are protected in this environment.
- Implementation of the CEO notice regarding social networks. (for example teachers and pupils cannot be friends on Facebook)
- Developing a quality and activist school site that includes and operates online learning environments and communication with students and parents while maintaining ethical rules.
- Choosing different types of databases, offering them to the teachers and students.
- Promoting collaborative learning among students in the country in their own language and students abroad in a foreign language.

The Science and Technology Administration, in the Ministry of Education, is responsible for the following steps in order to promote these tasks:

- Professional development of staff members, supervisors, counselors, administrators, field coordinators, school ICT coordinators, and teachers and teacher educators in academic institutions. [39;44;12;83;109;112;107;19]
- Professional development and support for school managers, and school staff according to the professional development outline. [14;84;39; Davis, Preston & Sahin (09) in 44]
- Installation of infrastructure for implementing ICT technologies to activate learning environment in educational institutions.
- Design, construction and operation of computerized learning environment and digital learning content repositories.
- Feedback, monitoring and reflection. [66; Ames' (92) in 29;19; Kennewell et al (2000) in 83; Savery & Duffy (96) in 91]

The Primary Education Division activities for promoting the pedagogical management of e-learning environments include:

- Developing pedagogical managing tools for e-learning environments and their implementation.
- The processes are accompanied by the supervisors and include development and operation of school systematic educational program for children functioning in the technological environment, while emphasizing pedagogical aspects. [39;44;73;11;112;DEETYA (96:14) in 28;19]
- Publishing suited regulations for school functioning in the technological reality of the 21st century. [29;12;21;20;63]

As for the allocation of time [38;83;112;19] for implementing the schools' plan for integrating ICTs and activating the educational processes and ethical protected conducting on the network, this is left for each school to decide. Furthermore, each school has to operate supervision as well as evaluation of the main outputs of the program [66; Ames' (92) in 29;19; Kennewell et al (2000) in 83; Savery & Duffy (96) in 91] . Productivity indices suggested are the number of disciplines that implement the program in each school, and the number of teachers, integrating ICTs into the teaching process in the various subjects. Reflection conducted between the school managers and their inspector, should include questions such as: To what extent has the program contributed to advancing pedagogy in general, and literacy in the 21st century in particular? And to what extant did the integration of ICT in different fields of knowledge contribute to the increase in pupils' achievement in those areas of knowledge?

The uniqueness of the ICT plan for the 2014 academic year presented here, in relation to the previous plans, is reflected in its emphasis on collaborative work at both school staff level and between the students themselves, using a variety of collaborative ICT tools.

Integrating technology in teaching in Moldova

The Higher Education (HE) institutions from Moldova are characterized by a limited use of digital services, limited ICT integration in their on-campus teaching, and a very low proportion of e-learning courses. Moreover, the provision of formal retraining for teachers from HE Institutions from Moldova for ICT implementation in the curricula is seldom and uncoordinated [48].

The WETEN (western-eastern teacher education network) Project, a network of university teachers from European HE Institutions, is built to share expertise on effective learning and teaching in universities. This network of pedagogical innovation in HE, aims:

"to share good practice, materials and new teaching methods with teachers from five HE Institutions in two eastern countries, Moldova and Ukraine". [48, p. 37]

The courses for Moldova and Ukraine educators include also ICT enhanced learning and Technologies of e-learning. These courses imply activities such as mastering and use of e-Learning environments and new educational technologies, for sharing content, promoting action learning, and management of learning activities [48].

It is disappointing that promoting social interaction, which is a very important aspect of learning, as shown in this paper, was left out of the training objectives. Fortunately, the conclusions of the trainings were not surprising:

"Besides the knowledge on the proposed topics, the trainings have given the participants knowledge and experience:

- In online communication and collaboration.
- In collaboratively using of Web2.0 technologies and applications.
- In creating Personal Learning Environments.
- In participating in communities of practice." [48, p. 37]

This also reinforces my claim that interaction and collaboration are necessary for effective e-Learning.

Following a case study about the training of trainers organized in the WETEN Karlsson & others [48] state that to assure quality learning process in Higher Education, continuous training of teachers is a priority:

"A quality education requires teachers, who are better and continuously trained, who assume the responsibility of improving continuously their own knowledge and skills, who are

motivated….who collaborate…who innovate, improving support for learners through new educational technologies" [Holotescu, 2007 in 48, p. 36]

According to Karlsson & others [48] this education paradigm implies reform in trainings for educators in order to prepare them to their new responsibilities. Institutions should have ways of verifying that educators are qualified and competent for these tasks [Huet & others, 2009, in 48].

The aim of 2011-2013 Project, "Modernization of education in Moldova-preparation of pedagogues and students for e-learning methodology enhances the access to flexible education", is to support reforms in the educational sector and to improve access to education as an instrument of social development through mediation of e-learning methodology as a form of flexible learning. The purpose of the project is to train Moldavian teachers and future teachers, in e-learning, and thus to contribute to modernization of learning of ICT skills.

This project could be inspiring unless pedagogy was not forgotten behind. Although "preparation of pedagogy" appears in this project's title, there is no evidence for actual preparation of pedagogy alongside e-learning training in the specifications.

The SunSchools Project, which started in Moldova, in September 2005, is supported by The Ministry of Education, youth and Sports, SunCommunications and North Carolina National Guard. Its aim is to support Moldova's learners' development by facilitating their access to the most modern instruments of education and self-development. Since 1999 the state of North Carolina has been sustaining partnership relationship with the Republic of Moldova.

The project brought Moldova only 275 computers and unfortunately only the city of Chisinau gained computers with high speed free Internet access.

In the 2005 national report issued in the Republic of Moldova [23], The authors conclude that while conducting their surveys among higher education institutions and teaching staff, it revealed that using ICTs in teacher education are among the factors contributing to enhancing the quality of pre-service teacher education. Moreover, their research points out the need for a comprehensive curriculum reform by the means of modernizing the national system of teacher lifelong training and approximating it to European systems. Therefore it is not surprising that they recommend to motivate teachers to take part in lifelong learning courses, develop performance based tools for advancement, promotion and financial stimulation.

Interviewed on February 2011, Dr. Besliu, admitted Moldova has only two universities with curriculum focusing on ICT. He thinks that young children should have access to ICT tools, since they are able to absorb the technology very quickly. Dr. Besliu points out that Moldova currently has no legal framework for e-Learning, therefore formal credits towards degree programs are not available through online education. He also acknowledges that "some face-to-face interaction in

the education process is important. Dr. Besliu explains that many instructors are already working part time in the private sector, for salary reasons but more important, it enables them to keep on top of new emerging technologies. He urges the politicians to understand the role of communications, computers and ICT education in the future of Moldova, and to enlarge its exposure into the education system from primary schools. Dr. Besliu concludes saying that it will help learners become computer/internet literate in their future workplace, and more important, in normal society of the 21st century.

'Education 2020': Main strategic policy of the Moldovan Ministry of Education

Education is a national priority in Moldova [106]. Project 'Education 2020' of the Moldovan Ministry of Education was built on the assumption that education is the basic factor in the transmission and creation of new universal and cultural values, human capital development, and guidance of national identity and consciousness, in order to promote European integration aspirations. Education has a primary role in creating the prerequisites for human development and the building of a sustainable knowledge society. Although in the last two decades several thematic strategies in education have been developed and implemented, there was no comprehensive strategy on the development of the entire sector. The quality of education largely determines the quality of life and creates opportunities for every citizen, to put into action his full capabilities.

The Moldovan Ministry of Education proposed to change the emphasis in education to quality in education, claiming that individual's success depends on its ability to adapt to change and to learn. Therefore the educational system must provide the appropriate environment for the development of these capacities. In the context of global change and population decline increased, lifelong learning becomes an important concern of the educational system.[106]

Education Development Strategy for the years 2013-2020: 'Education 2020' is the main policy document in education. It establishes the objectives and tasks, proposes a vision, and provides direction and development priorities for the short and long term in the education system in Moldova. In order to coordinate integrated strategic planning in the education sector, the strategy was correlated with relevant policy documents, it initiated reforms in the education system, and with other reforms, it represents a continuity of actions designed to develop the national strategy 'Moldova – 2020'. This strategy is organized in three pillars: access, relevance and quality. The strategy is results-oriented and addresses the problems and solutions both at education level, as well as the cross-cutting themes.

The strategy implementation processes will be organized on the basis of an action plan that will include operational components of the educational policies of the state. Funding of the strategy implementation processes will be carried out from the state budget, local budgets (withdrawing grants), sponsorship and other legal sources, with a special emphasis on project-based budgeting methods, programs and performance.

The 'Education 2020' strategy provides a diagnosis of the current state of the education system in Moldova, identifies the main problems of the system, and selects the most appropriate solutions to overcome them, so that the education system becomes the main factor of economic and social progress of the country.

According to the draft [106], education is a complex sector with numerous standards and active stakeholders and at the same time, reforms in education can be visible only after consistent tracking over a period of many years. Therefore, in order to be implemented effectively, the strategy should represent a consensus of society regarding the long-term vision of education, such as strategic directions to transcend political and group interests, and be implemented consistently throughout the period of implementation.

The objectives of the 'Education 2020' strategy are:

- Developing priority for education in the Republic of Moldova and establishing the mechanisms for achieving them.
- Increasing the efficiency of public-spending invested in education, so that the resources are made available to be diverted for better salaries for the education staff and for quality educational infrastructure.
- Increasing the efficiency of the educational system: the expansion and diversification of educational opportunities offered by ICTs.
- Ensuring sustainable development of the educational system in order to form an integral, active, social and creative individual which are all key factors of human development, as well as economic and social progress of the country.
- The expansion and diversification of the adult lifetime education system in terms of general training and continuing vocational training, in line with the needs of the person in relation to socio-economic needs.
- Structural compatibility and quality of both national and European education.

Principles of the strategy include: efficiency, strictness, piloting and reproduction, reconsideration, adaptation and institutional viability.

Moldova has been through a difficult transition period. The last two decades have been marked by economic recession, demographic decline, emigration and the financial crisis of

2008-2009. Demographic decline leads to a continuous decrease of the population included in the educational process. Given that younger generations are proving reduction, and the increasing share of elderly population, the reduction of the school population becomes more pronounced. Investment in education does not ensure the competitiveness of the national economy. Investments in recent years have failed to meet the needs of an industry that aims to educate the workforce for an increasingly competitive global economy. In the current circumstances, it is necessary to have comprehensive and innovative education policies.

'Education 2020' points out to Moldova's current situation and the general problems facing its education system in four aspects:

1. **Access** problems caused by a number of social and institutional factors, being more pronounced for disadvantaged groups, and include the gap remaining between urban and rural areas. At the same time, the network of schools is oversized and outdated, which leads to inefficient use of resources. About half of the graduates continue their studies in secondary education schools. The 12.8 % of graduates who remain out of school have a low degree of employability. Secondary vocational education is not sufficiently attractive to students, but it is costly for the state, and the number of students in higher education institutions is decreasing. Collaboration between educational institutions of this type and the economic environment is weak.
2. **Relevance**- analysis of fields of employment and unemployment structure indicates that the education system is not sufficiently connected to labor market requirements and provides no relevant qualifications. Curricular contents are congested and do not provide relevance to the development of personal, social and professional recipients of the educational process. Training at all levels of education do not provide the required skill- set of the labor market.
3. **Quality**- Standards and curriculum have been developed, but the teachers do not have the skills necessary to efficiently implement these policy documents in the design of educational activities. The monitoring, evaluation and quality assurance of academic results is not linked to the provisions of the curriculum. Quality training is below expectations and the quality assurance system does not work at all levels of the education system. Professional competencies of teachers and their development are not connected to changes in the educational system. The lack of a fair system of remuneration in education, and training programs which are not focused on the needs of teachers, and the lack of interest in the teaching profession

results in low quality candidates for teaching. The mechanism of selection and accountability of managers of educational institutions is deficient. Lack of internal and external mechanisms for quality assurance converging with European standards causes low reliability studies, and bottlenecks in the academic and professional mobility.

4. **ICT in education**- Introducing students to ICT is limited by the low coverage of computers and their late use. More than half of the computers are old-aged and they wear out rapidly. Moreover, students are familiar with ICT only since seventh grade while in the majority of EU member states, ICT teaching in one form or another begins in elementary school. ICT interactive methods and devices are not widely used in teaching subjects: only 140 schools have been equipped with specialized software for basic disciplines, but they are used in different proportions due to low motivation and inadequate training of teachers in the field. Of the 1,400 teachers who teach Computer Science in general education, only 36 % are specialists in this field. Most teachers do not participate in training activities and often do not have access to the adapted curriculum in computer science. Communication management at school is dominated by classical methods (such as: letters), therefore the use of ICT in schools would allow more efficient management of time and reducing costs. It would also allow transparency in education and disciplining of teachers by creating electronic books, digital content development and placement of homework electronically for viewing by students and parents in the community. This would serve as an example of effective use of ICT resources.

Since the long-term strategic objectives of educational policy at the European level include the following 4 aspects: implementation of lifelong learning and mobility in learning; increasing the quality and efficiency of education and learning; promoting equity, social cohesion and active citizenship; and fostering creativity and innovation, including entrepreneurship, at all levels of the education system. Moldova has developed its strategic vision respectively. The first priority in the education sector regards "Aligning the education system to labor market needs in order to increase labor productivity and increase employment in the economy" [106, p.30]. Correlation between labor market demand and education supply will have a significant impact on economic development. Modernizing vocational training and mechanisms of labor training will allow citizens to adapt to the new conditions of the labor market. Partnership between education and the labor market will lead

to the generation of educational offerings that meet the quantitative, qualitative and structural labor demand. This in turn will help reduce the unemployment rate, migration, and the proportion of people at risk of poverty or social exclusion. According to the strategy [106], the education system of the Republic of Moldova in 2020 will be accessible to all citizens, and will provide quality education relevant to society and the economy in terms of economic efficiency. Therefore the strategic vision includes the following components of the education system:

- An educational system that demonstrates skills necessary for growth and personal, social and professional development.
- An educational process focused on the educational needs of learners and the relevant curriculum, connected to labor market demand.
- Fair evaluation system focused on measuring individual and life skills relevant to the labor market.
- Teachers rewarded according to job performance, able to design learning activities focused on the individual educational needs of the learners.
- Teaching professional management, able to effectively manage educational institutions.
- A network of educational institutions efficiently dimensioned according to demographic and social trends as well as appropriate quality standards.
- Infrastructure and friendly educational environment of the learners.
- A modern institutional framework, flexible and functional that contributes to the quality of education.
- Development of academic and social partnerships, focusing on long-term mutual benefits.

In order to implement the vision, seven strategic directions are worded:

1. Increasing access and degree of participation in education and lifelong training.
2. Ensuring relevance studies for life, active citizenship and career success.
3. Developing, providing support for teachers and motivating them for didactic quality education.
4. Design and institutionalize an efficient evaluation, monitoring and ensuring the quality of education.
5. Improving resources for education management.
6. Effective integration of ICT in education.
7. Social cohesion to provide quality education.

'Education 2020' with regard to ICT integration Policies should support education preparing young people for active participation in the construction and development of the knowledge society, which is the engine of socio-economic development of globally competitive society [106]. Information and communication technologies have enabled the development of a wide range of tools for education and training so that the use of ICT in education has become a common feature of developed countries with strong economies. [106]

Analysis of the situation in the Republic of Moldova has shown that a student's familiarity with ICT is limited due to low coverage of computers and their late use. Limited application of ICT interactive methods and limited devices for management and teaching does not enable quality objectives, inclusion and efficiency that will prepare young people for the demands of the labor market and satisfying socio-economic life. Therefore, in order to effectively integrate ICT in education, the following priority actions were set according to the objectives described above [106]:

1. Increasing access to quality education by providing educational institutions with modern equipment which is useful for the educational process.
2. Pilot project 'A computer for every student' in 15 schools, starting in 2013 (for 3 years).
3. Developing a medium-term plan to equip educational institutions with computers, internet access, and infrastructure necessary to successfully implement ICTs in education.
4. Ensuring access to quality education for students in small schools by implementing distance education models.
5. Facilitating the creation of networks of communication and the exchanging of good practice between teachers.
6. Developing digital literacy through the development and application of digital educational content in the educational process.
7. Developing and implementing training programs, as well as motivating teachers to use ICT in education, including creating and publishing their own digital content .
8. Offering a variety of optional courses in primary and general by introducing courses that use or promote information technologies.
9. Developing standards for digital textbooks and their application.
10. Creating a unique educational platform to combine digital educational content that can be accessed by students, teachers and parents.

11. Promoting the use of existing digital educational content (eg: Discovery School, Khan Academy).
12. Enhancing the quality of higher education by promoting the integration of online courses in university curricula.
13. Increasing the effectiveness and efficiency of school management at system level, school level and class level, through information technologies.
14. Implementing an Educational Management Information System, based on school census, which will include schools, students and teachers, providing regular and accurate data collection.
15. Improving school management using the management team and the implementing of management software (eg: for accounting, budgeting).
16. Enhancing the quality of teaching and learning, the recording of student performance and the communication between students, teachers and parents in schools, by the progressive introduction of classroom management software.

The strategy policy paper acknowledges that achieving the objectives of the strategy depends on the ability of the Ministry of Education, as well as those of the institutions responsible for implementing the action plan. Therefore, it claims, the strategy is exposed to risks such as [106]: political instability and lack of political consensus among the groups targeted by the strategy proposed policies, weak implementation ability at the central government, both at local and institutional levels, resistance (institutional and human factors) to the proposed changes in strategy, insufficient financial resources to cover the costs associated with implementing the strategy actions and finally, inability to coordinate and monitor the implementation of the actions set out in the strategy.

The Moldovan Ministry of Education commits to all the necessary steps to reduce these risks, and to avoid the emergence of unexpected risks. It also undertakes to conduct a comprehensive communication and consultation process to reach consensus among a wider part of society and political forces, in order to ensure sustainability in the implementation of the strategy.

Integrating technology in teaching in Britain and USA

In June 2009, the government of Britain launched a national ambitious program, called 'Digital Britain' in order to turn Britain to a digital country that leads the knowledge economy in the world.

This program's vision puts the education system as center axis, carrying out this vision, therefore it has been decided to provide technological infrastructure not only to schools, but also to parents' houses, in order to develop digital literacy, which is an essential skill for learning, working and living in this age. (Britain Department for Culture, Media and Sport, 2009)

As a result, ICT must be a central inseparable part of the curricula.

The resources needed to build the education system should be provided, in order for this system to improve and develop itself constantly and with no need for central intervention. The goal is to create an education system that can absorb the technological innovations and turn them to an integral part of the ongoing learning process [24].

'Beyond Current Horizons' [33], is a breakthrough program of the British "Future Lab" organization. The program examines and attempts to predict the technological developments expected by the year 2025 and their influences on society and education. The stated purpose of the program is to redefine and to redesign the education system to suit the needs of the next generation. According to Facer [33] the key challenges that UK will have to deal with in future education, focus on the following areas:

- Redesign of the educational framework of communication and virtual networks in the world.
- Development of a systematic strategy to support complex learning processes, which are not limited in space and time.
- Re-examination of educational goals in the context of changes and uncertainty in the global economic system.

President Obama initiated a law, which was approved in congress on May 2009, to ensure that the citizens of USA will be able to integrate successfully in the future job market. According to this law, the existing curricula will be adjusted to the skills of the 21st century. This 500 million budget law, focuses on the development of new learning subjects, such as global awareness as well as civic and business literacy, the development of critical thinking skills and problem solving skills, creativity and innovation, communication, cooperation and information and media literacy.

This law also indicates the importance of preparing the educators and teachers to intelligently integrate these skills in the pedagogical process, with an emphasis on leadership, ethics, accountability, adaptability, and personal and social responsibility.

The education reform leaders in the USA, view technology as a major strategic tool, and in its implementation- providing a quality learning opportunity for all students, creating of conditions for teaching in new and varied ways, and effective evaluation of the processes at all levels.

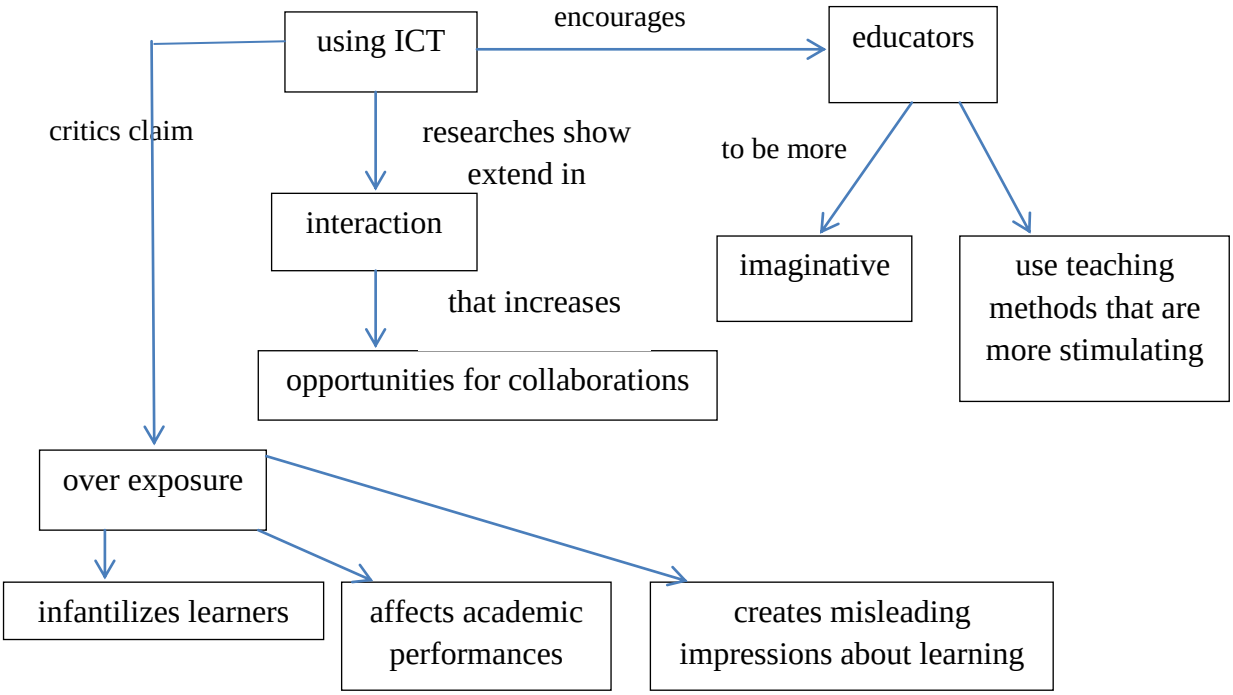


Figure 2.7: The Importance of Promoting Social dynamics in the Classroom

Flow chart 2.7 shows that using ICT extends interaction that increases opportunities for collaborations. It also encourages educators to be more imaginative and use teaching methods that are more stimulating. However critics claim that over exposure may affect academic performances, create misleading impressions about learning, and infantilizes learners.

Israel

- Writers of the strategic plan acknowledge the growth of schools in which e-learning has become a natural everyday part of teaching and learning.
- Recommendations are on one hand to organize and distribute e-learning pedagogies and ICT teaching models, that were developed in these schools by the school staff and by individual teachers, and on the other hand to keep encouraging the entrepreneurs and developers to enlarge the teacher circles that take part in these processes.
- The uniqueness of the ICT plan for the 2014 academic year in relation to the previous plans is reflected in its emphasis on collaborative work at both school staff level and between the students themselves, using a variety of collaborative ICT tools.

Moldova

- Project 'Education 2020' of the Moldovan Ministry of Education was built on the assumption that education is the basic factor in the transmission and creation of new universal and cultural values, human capital development, and guidance of national identity and consciousness, in order to promote European integration aspirations

- The Moldovan Ministry of Education proposed to change the emphasis in education to quality in education, claiming that individual's success depends on its ability to adapt to change and to learn
- Principles of the strategy include: efficiency, strictness, piloting and reproduction, reconsideration, adaptation and institutional viability.

Britain

- The government of Britain launched a national ambitious program, called 'Digital Britain' in order to turn Britain to a digital country that leads the knowledge economy in the world.
- 'Beyond Current Horizons' is a breakthrough program that examines and attempts to predict the technological developments expected by the year 2025 and their influences on society and education.

USA

- According to the low initiated by president Obama, the existing curricula will be adjusted to the skills of the 21st century.
- This law also indicates the importance of preparing the educators and teachers to intelligently integrate these skills in the pedagogical process.
- The education reform leaders in the USA, view technology as a major strategic tool, and in its implementation- providing a quality learning opportunity for all students.

2.6. With View to the Future

In the 2012 NMC Horizon Report [108], technological trends were listed and then ranked according to how significant each was likely to be for higher education in the next five years. The highest ranked are considered to be key drivers of educational technology adoptions for the period 2012 through 2017. The following are the top five:

Mobile Applications (Apps)- "Smartphones including the iPhone and Android have redefined what we mean by mobile computing, and in the past three to four years, the small, often simple, low cost software extensions to these devices have become a hotbed of development".[108, p.10]

Tablet Computing- "in the past year, advances in tablet computers have captured the imagination of educators around the world. In the process, tablets have come to be viewed as not just a new category of mobile devices, but indeed a new technology in its own right – one that blends features of laptops, smartphones, and earlier tablet computers with always-connected Internet, and thousands of applications with which to personalize the experience". [108 p.14]

Game-Based Learning- "has gained considerable traction since 2003, when James Gee began to describe the impact of game play on cognitive development. Since then, research, and interest in, the potential of gaming on learning has exploded, as has the diversity of games themselves, with the emergence of serious games as a genre, the proliferation of gaming platforms, and the evolution of games on mobile devices". [108 p.18]

Learning Analytics-" refers to the interpretation of a wide range of data produced by and gathered on behalf of students in order to assess academic progress, predict future performance, and spot potential issues. Data are collected from explicit student actions, such as completing assignments and taking exams, and from tacit actions, including online social interactions, extracurricular activities, posts on discussion forums, and other activities that are not directly assessed as part of the student's educational progress. The goal of learning analytics is to enable teachers and schools to tailor educational opportunities to each student's level of need and ability in close-to real time".[108 p.22]

Gesture-Based Computing- "It's already common to interact with a new class of devices entirely by using natural movements and gestures. The Microsoft Surface, Apple's iOS devices (iPad, iPhone and iPod Touch), and other gesture-based systems accept input in the form of taps, swipes, and other ways of touching… These are the first in a growing array of alternative input devices that allow computers to recognize and interpret natural physical gestures as a means of control". [108 p.26]

"School fosters just-in-case learning while technology fosters just-in-time learning" [21, p. 3]. There are many reasons why schools are uncomfortable with new technology. But technology is becoming central to all of life. Collins & Halverson [21] think this means that school will become less important as a venue for education. They already see the seeds of a new system emerging in the form of home schooling, workplace learning, distance education, learning centers, adult education, and lifelong learning generally.

The future of ICT in education in Israel Koren [2012 in 37] on the other hand, thinks that in Israel today, implementing ICT is considered important; therefore districts and schools are taking many good actions to promote ICT. There are many active school sites, ICT coordinators have become leading figures, teams work via e-mail, and working communities initiate ICT projects. Recognition of the school that the use of ICT can help reach pedagogical goals is its guarantee for success.

Glasner & Davidson [2012 in 37] claim that today the education system is going through changes following the radical processes occurring in society, in part due to the ubiquity of online social networks. The Ministry of Education is planning, drafting and

distributing documents on the issue of adapting the education system to the 21st century. In the school year 2011-2012 a comprehensive training system began in 200 schools in the southern and northern of Israel. The purpose of the training is to prepare educators and teachers to learn and teach the skills required in the 21st century, [Melamed and Sealant, 2010 in 37] and integrate them into the teaching and learning programs. This is the beginning of a process that will apply to the entire education system in Israel. The intention is to change pedagogical perceptions prevailing in the education system in correlation to the reality of the current age [Glasner & Davidson, 2012 in 37].

Glasner & Davidson [2012 in 37] also expect that in the coming years communication over the Internet will be one of the main ways by which human beings will maintain interpersonal relationships. They ask whether education systems are properly prepared for such a society. The use of voice and visual communications for teaching and learning is expected to expand, and this situation also requires appropriate preparation. Approaches to teaching and learning based on social constructivism and its connection to ICT environment [Salomon & Perkins, 1998 in 37] and the latest approach of collectivism [Downes, 2006; Siemens, 2004 in 37], which considers the Internet an essential part of meaningful learning, can be the foundation for changes in the teaching and learning methods.

The Israeli educational system recognizes the importance of implementation and use of advanced teaching technologies in schools.

In the last thirty years the Ministry of Education announced a dozen different programs all of which have one goal: to combine Information Technology in Education. The fact that every few years the education system announces a new ICT program shows not only the difficulty that lies in implementing technologies in such a huge system and its enormous budgets, but also how this issue troubles the heads of the system [30].

In addition to the complexity involved in acquiring new technologies, implementing tens of thousands of classrooms, and training teachers, the education system has to deal with problematic starting point relative to the OECD countries: Not only the percentage of schools connected to the Internet is low, only less than half allow students to actually connect [30].

Dror and Gerhson [30] come up with four suggestions:

1. Students now studying in the school system (2012-2013) were born into the age of the Internet and digital technologies. Students believe that technological aids help them in terms of the learning process and in terms of the interest they bring into class, however at this stage there is a gap between the potential of technologies to

enhance the apparent teaching and learning process and their availability and actual use in post - primary schools.

2. Israel declares that it has economic and cultural interests to combine the Arab sector in Israeli society and in the labor market in particular. To reduce the digital gap between the Jewish and Arab sectors, there's need for a systematic action to be made by policy and decision makers. Through the allocation of appropriate resources, it will be possible to invest in advanced technologies, use them wisely pedagogically, and eventually help to reduce the gaps between the sectors.
3. Access to a computer and a broadband internet connection are necessary tickets to the digital world but they are not enough. The education system has to provide basic tools for effective and meaningful action in digital space by teaching searching skills and evaluation of the quality of information, while encouraging students to experience not only the consumption of content but also creating it.
4. Relationship between teachers and students in social networks is disputed; however, the ban imposed by the Ministry of Education on communicating in social networks between students and teachers is consistent with the lack of enthusiasm most students express with the possibility of the existence of such a relationship. However, over a third of the students that add their teachers to their friends feel that it improves the atmosphere in class.

The future of ICT in education in Moldova National Association of Private ICT Companies and USAID CEED II Project have presented the Agenda for Action "ICT Education in Moldova: meeting the industry needs" on June 2012. The Agenda for Action was developed by a group of local and international experts in collaboration with ATIC, Ministry of Information Technology and Communications, with the support of USAID CEED II Project and broad participation of the educational institutions. The document articulates the solutions and measures that would allow eliminating the deficit of qualified professionals that ICT industry is currently facing and which represents a major impediment to the sustainable development of the sector. The recommendations aim to increase the efficiency of collaboration between stakeholders in the preparation of teachers for ICT, and provide necessary support from the state and will be taken into consideration when finalizing the study and the action agenda. ”We have recognized we have a problem and now it's the time to combine efforts and work together to solve it” mentioned Mr. Nicolae Godiac, Delivery Unit Manager Endava Moldova, ATIC Board member. The experts presented their recommendations for the adjustment of the educational system to the market

demands and for the further strengthening of the cooperation between ICT companies and educational institutions. Mr. Gil Taran, chief executive officer Icamegie, explained (2011): "…We have to provide better quality education so people can practically do what they need to do on the job when they graduate. So that means changing the kinds of program we teach so they're more practical and they meet what industries need. A lot of time you see gaps between what industries want and what universities provide and that gap is growing. We want to eliminate it, we want to make sure that when we build a curriculum and programs we have industries involved in building these curriculums so they can in some way insure that when students graduate from these programs they are able to do the things we need them to do…we have to start education in Moldova around Science, technology and Engineering at a very young age…. I think the plans [for Moldova] center around working with the government to understand what's the vision, where the government wants to be going in terms of changing education and how education plays a role in increasing and developing the ICT sector, what's the priority and when and where is the funding that could be provided to do any one of these things."

- Top five future technological trends, ranked according to how significant each is likely to be for higher education in the next five years are: Mobile Applications (Apps), Tablet Computing, Game-Based Learning, Learning Analytics, and Gesture-Based Computing.

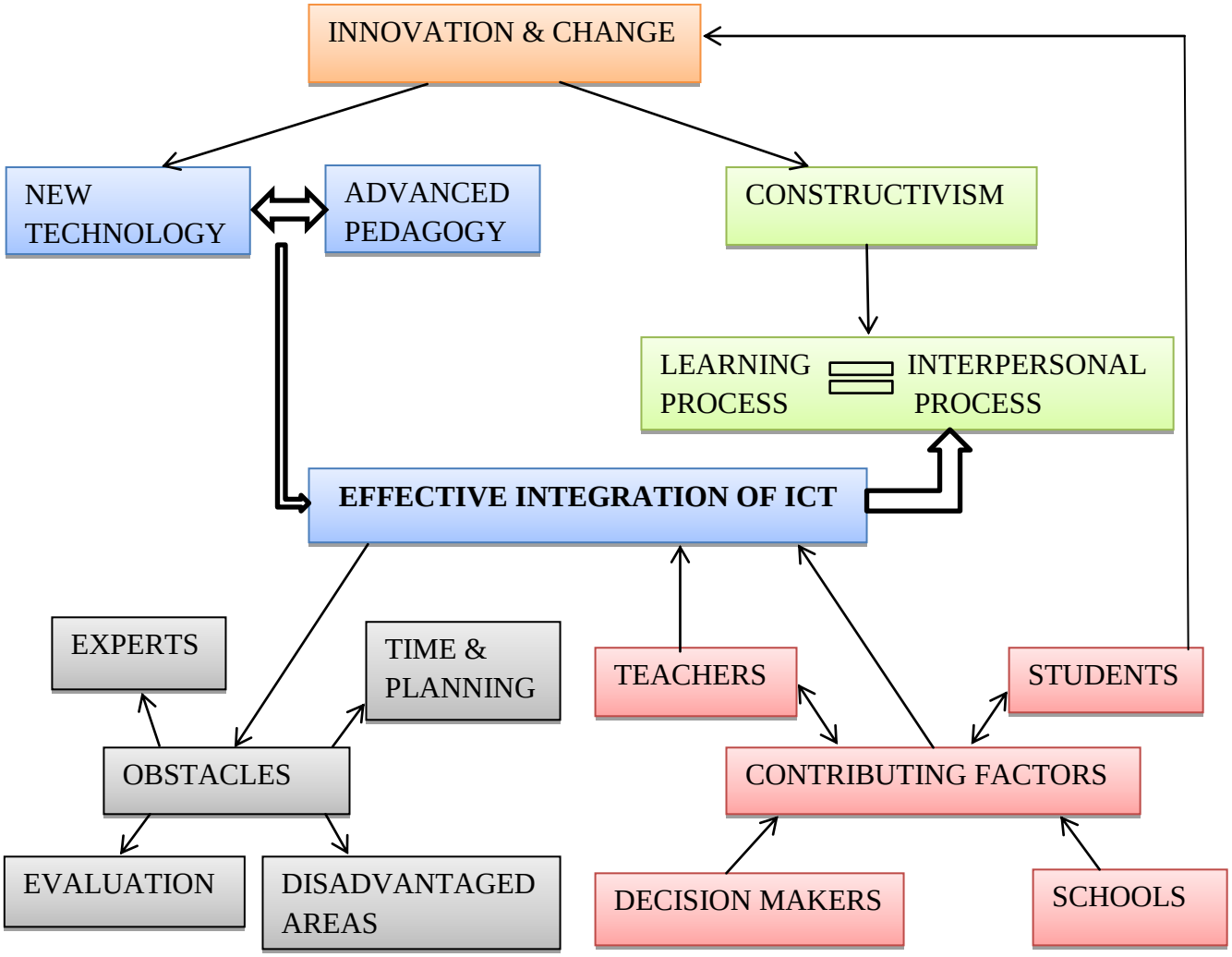
Israel:

- Implementing ICT is considered important; therefore districts and schools are taking many good actions to promote ICT.
- The Ministry of Education is planning, drafting and distributing documents on the issue of adapting the education system to the 21st century.
- The use of voice and visual communications for teaching and learning is expected to expand, and this situation also requires appropriate preparation.
- Approaches to teaching and learning based on social constructivism and its connection to ICT environment and the latest approach of collectivism can be the foundation for changes in the teaching and learning methods.

Moldova:

The experts presented their recommendations for the adjustment of the educational system to the market demands and for the further strengthening of the cooperation between ICT companies and educational institutions.

Figure 2.8: Promotion of social interaction in the classroom by effective utilization of technological tools



Innovation & change component involves the new conditions for culture and social life that are created rapidly with the development of new markets, new technologies and new communication systems. As a result, the skills and qualifications requires to the job market are changing. Education systems aspire to assimilate innovation and generate a change in schools and thus to give learners the essential tools for life in the society of knowledge. As a result a lot of time and resources are allotted for educational programs integrating ICT.

Constructivism component represents constructivist theories of learning that assume meaning is imposed by the individual rather than existing in the world independently. People construct knowledge and understandings based on what they already know and believe, which is shaped by their developmental level, their prior experiences, and their sociocultural background and context.

Learning process as an interpersonal process component is the basic assumption of constructivism, that is, understanding exists in our interaction with the environment, therefore, the learning content and the learning process cannot be separated. Learning stimulates a variety of internal developmental processes acting only when the child interacts with people in his environment and in cooperation with his peers [86]. Once these processes are internalized, they become part of the achievements of the independent development of the child.

New technology alongside advanced pedagogy component arises by the view that using technology will not be indefinite, therefore, an advanced pedagogy that is suitable for the 21 century, must be used. This pedagogy uses technology in order to create a more profound understanding by means of transferring the responsibility to the learner [86], ICTs can only contribute substantially to the improvement of schooling if it is appropriately embedded in powerful and interactive learning environments [established within] the broader context of [supportive] pedagogy [DEETYA 1996:14 in 28].

Effective integration of ICT component enables the construction of personal knowledge and encourages the learner to the process of decision making. "applied effectively, technology implementation not only increases student learning, understanding, and achievement but also augments motivation to learn, encourages collaborative learning, and supports development of critical thinking and problem-solving skills" [73, p.3].

Obstacles: experts component involves the lack of technical support for teachers and students that must be a reliable and accessible service, and requires cooperation between all parties concerned. Teachers need on-site and on-demand technical assistance with both the technology and the integration of technology into teaching and learning (pedagogy).

Obstacles: time & planning component focuses on developing an ICT school plan, setting up clear goals and defining the means to realize these goals, as a crucial step towards ICT integration. Truly integrating technology into teaching and learning is a slow, time-consuming process that requires substantial levels of support and encouragement for educators.

Obstacles: disadvantaged areas component includes mainly economically disadvantages such as basic electricity that is not sufficient, difficulty in establishing an infrastructure and staff turnover which is often high.

Obstacles: evaluation component refers to the fact that most schools, have technology plans, but many of these plans still lack strategies or tools for determining whether the efforts have had any impact, Tools that will help them reflect on where they are and where they heading with their technology initiatives. [19]

Contributing factors: teachers are an essential **component** in effective use of ICT in order to encourage interaction and turn the learning process into an interpersonal process. ICT loses its advantages when lacking the correct guidance [25]. This is actually a new specialization for the teachers: matching the technology and best use it to empower teaching and learning. Teachers can use the behavioral profile **TARGET**, which presents the characteristic for teachers that are implementing the ICT pedagogy at its best [29]: **T**ask, **A**uthority, **R**ecognition, **G**rouping, **E**valuation and **T**ime.

Contributing factors: decision makers component emphasizes that the policy plan is important but only when teachers are aware of its content. The complex systemic nature of ICT integration, including the role of national policies (macro level) and local school policies (meso-level) should be considered, therefore, the proposed ICT curriculum (macro level) and the actual use of ICT in the classroom should be correlated in order to contribute to the effective integration of ICT.

Contributing factors: schools component include establishing a dialogue based on equality between principals and teachers, and engaging teachers in the development of an ICT plan, while allowing them to reflect on their educational use of ICT [Olson 2000, in 83]. It is especially important for the principal to have a vision of what is possible through the use of technology and to be able to work with others to achieve this vision.

Contributing factors: students' characteristics **component** must be taken into consideration when trying to identify potential obstacles. Teacher's awareness of the way a student will benefit from different learning experiences, contributes to increasing the learning process. Using ICTs in the learning process increases the responsibility of the student for his learning and helps him become a self-oriented student. It also develops unique connections between the teachers and the students as they become active partners in a mutual-sharing relationship. These students are the main benefiters of the effective integration of ICT to the learning process, and they are also the future innovators which are responsible for future changes.

Conclusions For Chapter 2

In this chapter, I presented the potential of ICT in education and the challenges to adapt and integrate it into the teaching-learning process. I also examined the implementation of ICT and its learning environments focusing on the social aspects. The contribution of ICT to quality in teaching and learning was viewed from six aspects: cognitive, pedagogy, convergence, alignment, data, and culture. In order to enable effective use of ICT in the classroom there is need for external support strategies alongside school level strategies. These must be in correlation with legislative factors that have to take in account additional obstacles for economically disadvantaged areas. The supporting strategies need to be given time for preparation and planning. There is also need for an ICT assistant in school, in order to support technology itself and a pedagogy specialist to help integrate ICTs into the curriculum. Students' characteristics should be taken into consideration, as well as the technology-based project. The whole process should then be evaluated in order to reflect the effectiveness (or lack of it) of the technology programs. The central factor, all researchers agree upon, is teachers characteristic-such as leadership, and their acquaintance with technological tools.

Six elements, called TARGET, are provided to describe the role of teachers in integrating ICT effectively, and five stages delineating the transition teachers go through while using new ICTs in the classroom are presented. Finally, two main solutions are given in order for teachers to use ICT effectively in the teaching-learning process: Teachers professional development in terms of both technical competence and classroom pedagogy, and time for adjustment. In order to evaluate the effectiveness of ICT use, the five indicators of BECTA are listed alongside Paiano's five models. Finally, integrating ICT in teaching is discussed while distinguishing Israel, Moldova, Britain and the USA, while Israel's and Moldova's education policies are examined closely.

With view for the future, new ICT tools are described: The 2012 NMC Horizon Project, and resolutions concerning ICT in education are discussed regarding Israel.

3. PROMOTED SOCIAL PROCESSES IN THE CLASSROOM: MAXIMIZING THE EFFECTIVENESS OF TECHNOLOGICAL TOOLS

3.1. Rationale and characterization of the scientific research

In order to verify the hypothesis that effective maximal utilization of technological tools promotes social dynamics in the computerized classroom, and to identify the aspects of the computer's unique potential contribution to promoting social processes in the classroom while developing a model engaging in maximizing the effectiveness of technological tools and their level of impact on social processes in the classroom, an adequate preparation of the experimental research was conducted.

The first step (2011-2012) involved theory analysis and critical review of the importance of promoting social dynamics in the computerized classroom, which is evident in the first chapter of this study:

- Identification of the challenges facing the education field in the 21st century, emphasizing innovation and clarifying the nature of the change.
- A presentation of the three approaches to learning: Behaviorism, Cognitivism, and Constructivism.
- A close examination of the Constructivist approach in three perspectives: the philosophical perspective, the technological perspective, and the psychological perspective.
- Analysis of the learning process as an interpersonal process.
- Explanation of the importance of social interaction in the process of learning via an examination of the constructivist approach.
- Description of the design of constructivist learning environments that enable the effective use of collaboration.
- Giving evidence that relationships learners have with their peers, teachers, and other experts, which are created by social interactions, are a significant factor to academic success.
- Familiarization with the relation between technology and pedagogy.
- Defining the role of the teacher in effectively integrating ICTs into the lesson.
- Establishing an understanding regarding the effective use of technology in order to increase interaction during the teaching-learning process.

- Current description of the situation in Israel, Moldova, Britain and USA, in terms of integrating technology.

Step two (2012-2013) verified and discussed the effective use of ICT for education with regard to the teaching-learning process, which is evident in the second chapter of this study:

- A survey of the penetration of ICT into the education field.
- Examination of the social aspects of learning environments using ICT.
- Clarification of the contribution of ICT to quality in teaching and learning, in six aspects of improvement: cognition, pedagogies, convergence, alignment, data, and culture [28].
- Identification of the factors enabling successful use of ICT in three levels: decision makers, schools, and individuals.
- Development of a profile for an effectively integrating ICT teacher, while examining the obstacles he/she faces.
- Presenting models for the evaluation of the effectiveness of ICT in teaching.
- Discussion regarding the future of ICT in education focusing on future plans both in Israel and in Moldova.

In step three (2013-2014) an experiment was carried out comparing reciprocal relations activities taking place within three different classrooms: the traditional classroom, the computerized classroom, and the "classroom maximizing the effectiveness of computers."

Applying the model for effective maximal utilization of technological tools in the classroom was carried out according to the methodology discussed by the researcher of this thesis in the second chapter. Measuring levels of socialization included adjusted calculation of the results produced by the "Interaction Level Indicator"[9] as recorded by the teacher on the one hand, and the processing of student responses from the questionnaires on the other. This has proven the pedagogical validity of the research.

Data was collected, while considering the different conceptions of all the participants in the computerized teaching-learning process: the decision makers, school policies and planning, the teachers, including the ICT coordinator, and the learners.

Seeking to examine the most effective use of the opportunities provided by integrating the computer into the classroom to promote social processes among the students, led the researcher to use the action research methodology, that enabled her to be involved directly in the activity being studied, analyzing existing practice and identifying elements for change and primarily, to improve it [31;81]. In seeking evidence for the effectiveness of the change, and the obligation to look at it from different perspectives, a triangulation of methods was employed [94]. These methods are

comprised of: class observations (of interactions, class organization, the given task and the teacher's activity in the classroom), monitoring of learners' achievements, analysis of learners' questionnaires, interviews with teachers, an interview with the ICT coordinator, and external documents containing education policies regarding ICT use in schools, published by formal bodies of decision makers.

A dialectical analysis [93] was formed on the final results of the experiment. These results were subject to inclusion and allowed final conclusions and further recommendations.

- In order to verify the hypothesis that effective maximal utilization of technological tools promotes social dynamics in the computerized classroom, and to identify the aspects of the computer's unique potential contribution to promoting social processes in the classroom while developing a model engaging in maximizing the effectiveness of technological tools and their level of impact on social processes in the classroom, a three steps research was conducted.
- The first step involved theory analysis and critical review of the importance of promoting social dynamics in the computerized classroom.
- Step two verified and discussed the effective use of ICT for education with regard to the teaching-learning process.
- In step three, an experiment was carried out comparing reciprocal relations activities taking place within three different classrooms: the traditional classroom, the computerized classroom, and the "classroom maximizing the effectiveness of computers".
- Data was collected, while considering the different conceptions of all the participants in the computerized teaching-learning process: the decision makers, school policies and planning, the teachers, including the ICT coordinator, and the learners.

3.2. A closer look at the research field: the school's plan for integrating ICT

There are 12 classes in the school that opened its gates to this research. In the academic year of 2013-2014, around 300 pupils, between the ages 6-12, study there. Teacher's staff includes 24 teachers, including an ICT coordinator. A district ICT instructor supports the teachers in their everyday integration of ICT into their teaching. There are 38 desktop computers in the school, including 15 new computers in the computer room. There are 2 old desktop computers in almost every classroom (including science, math and art classrooms), and almost every teacher has a laptop. There are 17 projectors in the school and one smart board. The school has a subscription to a professional content environment. Yet there are no portables or tablets to the use of the pupils.

According to the ICT coordinator, the school aspires to add about 50 portable computers for pupils' use, purchase extra 2 desktop computers for each classroom, add 5 more computers to the computer room, and replace projectors that are out of order. As for integrating ICT so far, the school:

- Makes use of projectors in teaching for activities such as: presentations, videos, digital books, and tasks from the software environment.
- All the pupils participate in computer lesson once a week. The teacher teaches computer literacy through pedagogical content taught in the lesson [39;44;73;11;112;DEETYA (96:14) in 28;19]. School has developed a spiral program that was written by the computer teacher and the homeroom teachers in collaboration. [Olson (2000), in 83]
- School web site that includes: the curriculum, weekly programs, pupils' learning outcomes, and the climate questionnaires. The school web site is also used for updating homework, and assigning computerized tasks.
- There is e-mail communication between school staff the management and the parents.
- An ICT pedagogical management tool, where teachers update discipline events, and rate their evaluations.

The desired changes in the school following the ICT implementation are:

- Use of collaboration tools among teachers, between teachers and parents, between teachers and pupils, and between the pupils themselves
- Improving communication with parents through the school website and the collaborative tools.
- The teachers will develop computerized teaching units, or use the existing ones.
- Teachers will enter the computer room and maintain ICT integrated lessons, or lessons involving computer literacy.
- Computerized tasks will be sent by the teachers to the students via the school site.

ICT skills mapping among the school teachers shows that most of the teachers are able to search the internet and communicate via e-mails, operate the projector and use WORD and POWER POINT software, but only some can use EXCELL. Therefore, the ICT coordinator claims, the school requires to reinforce in its teachers, the use of different software environment and acquire knowledge and assimilation in collaborative documents [39;38;28]. In order to meet these objectives, the school provides 14 hours for computer training every two weeks [39;44;12;83;109;112;107;19]. The training goals are recognition and assimilation of a software environment, continuity of computerized teaching at home, collaboration between staff members

and between teacher and pupils, and finally, combining computer classroom lessons: computer literacy integrated in various disciplines.

The school's plan in order to adapt itself to the 21st century [29;12;21;20;107] emphasizes six operational objectives:

- Safe Web – "Living Online" team was established [Olson (2000), in 83;19]. The team plans four learning activities for all ages during the school year, which will be taught by homeroom teachers and the computers teacher.
- ICT literacy- The school management aspires that teachers will enter the computer room and teach ICT integrated lessons alongside computer literacy while using different content environments and new tools.
- Collaborative learning – Pupils from 4th, 5th, and 6th grades will create shared files using Google tools, for collaborative learning between the pupils [Davidson (12)in 37; Ames' (92) in 29;63;35;75; Pomeroy (99) in 63;47; Ernest (98) in 1; Anderson & Kanuka (97) in 25;91; Savery & Duffy (96) in 91; Hiltz (95) in 25;86].
- Activating the ICT integrated teaching in the Teaching-Learning-Assessing (TLA) Program- All teachers will assign pupils new ICT integrated tasks [Neilson (02) in 32; Ames' (92) in 29;38;58;63;78;26;17] of different content environment, at least three times a year.
- School portal- Improving communication with parents through the website. All teachers will enter the classroom/professional web page and assign computerized tasks for their pupils.
- Pedagogical management tool- Teachers will produce students' reports for parents' day and certificates using the computerized management tool.

Although the school staff has developed an annual plan [Olson (2000) in 83], both technological and pedagogical [39;44;73;11;112;DEETYA (96:14) in 28;19], and wishes its teachers to integrate ICTs into their lessons and develop computerized units, this is an impossible task considering the poor ICT skills most teachers in this school have according to its mapping [60; Rogers (2000) in 107]. It is important to have professional training [39;44;12;83;109;112;107;19] especially in technology, as already exists in the school, but since there is no reflection on the process or evaluation of the plan [66; Ames' (92) in 29;19; Kennewell et al (2000) in 83; Savery & Duffy (96) in 91], it is hard to conclude what has been accomplished and what can be improved in the future. Drawing conclusions is an important part of the implementing technology process since it helps to determine whether the efforts have had any impact [19]. Since legislative factors are affecting the effective implementation of ICTs in schools [38], It is crucial not to have any gaps between the proposed curriculum at macro level [83] and

the use of ICT at micro level, namely in schools [83]. Reflection and evaluation are part of the policy plan of the ministry of education of Israel, but they are missing in the school annual plan and therefore create a gap [83]. The school is unable to determine in what stage its teachers are, in terms of ICT integration progress, and as consequence the implementation of technology in this school occurs in 'Islands of Innovation' pattern [Avidov-Unger and Eshet- Alkalai (2011) in 14] which encompasses only part of the educational organization.

A closer look at the research field: context of the study

This study focuses on two sixth grade English classes taught by the researcher in the 2013-2014 academic year. In this school teachers followed their fifth grade classes into sixth grade. Therefore, at the time of this study, the teacher had known most of the students for almost 2 years. Baranetz (referred to as "the teacher"), works also as a pedagogical instructor in teachers-training, specializing in ICT implementing for English teachers courses. At the time of the study she had taught in this elementary school for 6 years and in middle school and high school for 12 years. The 43 students (19 boys and 24 girls) in the classroom represented a wide range of academic achievement and classroom behavior. During the year in which this study took place, the teacher met every 6 months with the English teachers of the middle school, where the pupils were intended to continue their learning, to discuss the challenges related to English instructions. The researcher's role as a public school teacher involved the typical full range of challenging responsibilities: contacting parents; conducting after-school activities; teaching small groups; mediating disagreements and feuds between pupils; managing English staff meetings as part of a subject-coordinator duty; participating in English supervision meetings; and doing yard and hall duty.

- The school's plan, in order to adapt itself to the 21st century, emphasizes six operational objectives: Safe web, ICT literacy, Collaborative learning, Activating the ICT integrated teaching in the TLA program, the school portal, and the pedagogical management tool.
- The school wishes to improve communication, via collaborative tools and the website, between teachers, students and parents, to encourage teachers to use and develop computerized units that involve computer literacy, and to use the school's web site as a platform for sending computerized tasks.
- Reflection and evaluation are part of the policy plan of the ministry of education of Israel, but they are missing in the school annual plan and therefore create a gap, as consequence the implementation of technology in this school occurs in 'Islands of Innovation' pattern which encompasses only part of the educational organization.

3.3. The teacher's role: between capability and expectations

Out of the 20 teachers teaching in school- four language art teachers, referred to as teachers A, B, C and D in the following discussion, volunteered to reflect on their teaching characteristics, their use of computers in their classrooms, and the social processes undergoing by their students. All four participating teachers were female. One was under 40 years of age; the other three were 42, 46 and 49. They had 13, 7, 17 and 27 years of teaching experience respectively. Although they all used technology in their classrooms between two to three years, their self-assessed ICT competencies varied considerably as will be described later. All teachers were from the same elementary school which was very good equipped with ICT resources and provided a good technical support to its teachers [112]. Data were collected from these teachers through interviews.

Teacher A

Teacher A had taught language arts in elementary school for 13 years, and had been accustomed to a traditional teacher-centric style of teaching. She has limited ICT skills [60;Rogers (2000) in 107]. She has been integrating technology in her lessons for the past two years, and considers herself as innovative, creative, effective and updated [Becker (2000) in 14; Hinchey (10) in 43;98;38;112;19], but not a risk taker [107]. She admits she likes to be thorough and prepared, therefore gets stressed when things do not go as planned. She believes that as a teacher she is not the source of information in the classroom, and says she is open to hear her learners' opinions. Although she prefers to use technology in her lessons and acknowledges the importance and benefiters of ICT to the learning process [Hew & Brush (07) in 14;107;96;64], teacher A uses technology to a small amount in her lessons admitting not being an ICT expert, as she noted: "I admit that I am not an ICT expert in that field. I think that time should be dedicated to the togetherness of the children and not just sitting and staring at the screen". From the words of teacher A it is not hard to understand that technology is ineffectively integrated into her lessons, since there is much more to technology than just "staring at the screen" [Dias & Atkinson (01:8) in 28]. Teacher A claims that the pupils should be exposed to the new things technology offers but warns of its mesmerizing effect: "it has a tendency to pull you to other things when the situation is not always convenient". She points out that although computerized lessons' advantages cannot be ignored, the major obstacles [Hew & Brush (07) in 14;44;38;112;Rogers (2000) in 107] she experienced while integrating technology, apart from problems with the internet

connection during the lessons [38;112], were the big amount of work, time and preparation [14; Ames' (92) in 29;44;11; Keeler (96) in 11;107; Rogers (2000) in 107] she had to put into it at home. Moreover, she adds: "it also means that I have to be updated". Teacher A explains that there are many principles she uses to motivate her pupils to work together but none of them uses the advantages that technology provides. She thinks that the top 3 skills for a teacher integrating technology into the teaching process are: "computer proficiency, responsibility, and doing more than required". With regard to technology, teacher A says she is glad she was not forced to use it in class, and gradually learns to use it [38;83;112;19], as she notes: "integrating technology for me was a gradual process. I was exposed to it from other places and other teachers and I saw that it wasn't that bad, so I experienced it and it ended in a sequence of ICT based lessons that I built by myself and I am experiencing the integration of technology as a fun process". There is no question in her mind that she wants to improve her technological skills and to learn more about computers [39;38;28], therefore, she participates in training courses [39;44;12;83;109;112;107;19] both pedagogical and technological [39;44;73;11;112; DEETYA (96:14) in 28;19], and nevertheless she admits, there is still a lot of learning ahead of her [14;84;39; Davis, Preston & Sahin (09) in 44].

Teacher B

Teacher B had taught language arts in elementary school for 7 years. She has a partial background in ICT [61;Rogers 2000 in 107], and has been integrating technology in her lessons for the past three years, mainly digital books. She considers herself as innovative, effective, updated, and sometimes creative [Becker (2000) in 14; Hinchey (10) in 43;98;38;112;19], but she is not sure as for being a risk taker and explains that she does not think that using technology is taking a risk in teaching [39]. She is confident in the way she teaches, and admits that in some way her lessons are traditional, since there is no other way to teach the letters. Teacher B believes that integrating technology into the teaching learning process is a necessity [Hew & Brush (07) in 14;96] "because we are living in an age where we have to be updated for our students' benefit" [44;21;Borko & colleagues (2000) in 1;42;109;Keeler (96) in 11;107;19;28;92; 26]. She prefers to use technology during her lessons since it helps her to catch her pupils' attention and reach out to pupils with problems [99], as she explains: "Technology is very visual [28;26], when used correctly, it involves the whole class". Teacher B can defiantly tell that there is a difference between effective and ineffective use of ICT in the classroom, moreover, she can tell the difference just by noticing that an effective integration of technology into the lesson involves the whole class. She

points out that she is not afraid to update her lessons from time to time, and make the necessary changes if needed [44;21;Borko & colleagues (2000) in 1;42; 109;Keeler (96) in 11;107;19;28;92;26], even if it means 'going outside the book'. She recognizes the power of technology to grab the pupils' attention and to activate the class, but similarly to teacher A, teacher B complains about poor internet connection [38;112] and technical problems during the lessons. She recommends other teachers to follow her solution and always have a backup plan for the lesson, she even admits using her own smartphone in order to stay connected to the internet. She also warns that although technology has its advantages, it does not meet the needs of some of the pupils, and therefore teachers must be careful to use it wisely. She believes that a situation where every pupil has his own computer is ideal, since as a teacher it will enable her to a different kind of teaching, and will provide every pupil a chance to be a full participant in the lesson.

Teacher B explains that there are three principles she uses to motivate her pupils to work together [Hinchey (10) in 43;73;116]: The nature of the tasks [Neilson (02) in 32; Ames' (92) in 29;38;58;63;78;26;17], class organization [78;9;10], and the teacher's willingness to let the pupils socially interact[17;77;78]. Moreover, as opposed to Teacher A, she harness technology to help her in the process: "Using technology also allows more connections between the students, there is a natural tendency to work together [Davidson (12) in 37;63;62]…but still there are some students that working alone, is best for them" [63]. She thinks that a teacher integrating technology into the teaching process should be innovative, updated and a risk taker [107].

With regard to technology, teacher B sheds light on what she thinks is one of the main problems teachers are dealing with: "it really depends whether or not you have someone to talk to or consult with, some teachers don't like to share and some just can't" [39;112]. Teacher B hopes to deepen her knowledge regarding technology [39;38;28] and its use in the classroom, in order to do things she has not done before [Koren (12) in 37;109;112;64;50].

Teacher C

Teacher C had taught language arts in elementary school for 17 years. Similarly to teacher A, she had been accustomed to a traditional teacher-centric style of teaching, and has limited ICT skills[60;Rogers 2000 in 112]. She has been integrating technology in her lessons for the past two years. She considers herself as innovative, very creative, effective, and updated [Becker (2000) in 14; Hinchey (10) in 43;98;38;112;19], but she says she is definitely not a risk taker[107]. She is confident in the way she teaches, and just like

teachers A and B, admits that in some way her lessons are traditional, since "some of the lessons must be frontal". Teacher C acknowledges the importance of integrating technology into the teaching learning process [Hew & Brush (07) in 14;107;96;64]: "you must progress or you will be left behind" [44;21;Borko & colleagues (2000) in 1;42;109;Keeler (96) in 11;107;19;28;92;26]. She also points out the fact that integrating technology into the learning process helps pupils with different kind of disabilities to be engaged in the lesson [99].

Teacher C claims that at this point she cannot teach without the use of technology since she got used to it and understands that it is "a very effective tool that suits both the children and the teacher". Although she explains the many ways she uses technology to involve disabled pupils in the learning process, teacher C alluded to her ineffective use of technology; she interprets integrating technology into the lesson as watching videos, typing texts and projecting stories on the screen for the whole class [Dias & Atkinson (01:8) in 28]. There is no question regarding the attention these activities draw from pupils with learning disabilities, as teacher C noted, but there is so much more these pupils can gain, from an effective diverse use of computers, to their learning process as seen in the previous topic.

It is not surprising that similarly to teacher A and teacher B, teacher C also complains about poor internet connection [38;112] and technical problems during the lessons. She too recommends teachers to be prepared and always have a backup activity for the lesson, like teacher B, she also admits using her personal smartphone as a backup for poor internet connections. Teacher C feels that the technology she is using is not updated [20; Cuban (86) in 49;38;112;Harris (02) in 11], and wishes to work with new technological tools such as the smart board. It is surprising given that she admits that there are technologies she still does not know how to operate [60; Rogers (2000) in 107]. She reveals that one of the main advantages of technology is that instead of writing the lesson's highlights on the board, she writes everything on the word processor, which enables her to send it directly via mail to pupils who missed class. Unfortunately, teacher C does not see a connection between integrating technology into the lesson and promoting social interaction [Koren (12) in 37;72;84;32;73;98;60;49;63;92]. On the contrary, she believes that "working with computers leads to a more individual work and not group work". Clearly Teacher C, who describes herself as innovative, creative, confident and updated, all top four skills and characteristics she listed for being an effective integrating ICT teacher, is tied up to the old pedagogy [84;27;107;56;53], where she rarely uses peer learning and does little to encourage group activities [Neilson (02) in 32; Hiltz (95) in 25; Ames' (92) in 29;26;57;76;60;77;55; Bar Tal

& Bar Tal (85) in 10; Pea (93) in 67]. She is aware to the penetration of technology into the education field but unconscious to its benefit or to the great impact it has on students' learning. Therefore she is confident to use it only in specific situations which does not involve full utilization of ICT tools in the learning, or more important, avoids social interaction in class [Davidson (12)in 37; Ames' (92) in 29;63;35;75; Pomeroy (99) in 63;47; Ernest (98) in 1; Anderson & Kanuka (97) in 16;91; Savery 7 Duffy (96) in 91; Hiltz (95) in 25;86]. This approach is revealed even more deeply when teacher C is asked to describe an effective teaching technique she used to promote social interaction, and chooses to describe one "with no use of technology". It is disappointing that teacher C considers her pupils watching a video together as integrated technology group activity. Future progress is suggested in the form of two teacher training courses [39;44;12;83;109;112;107;19] that teacher C is going to take part in this year: "The online teacher" and "The interactive classroom". The fact that teacher C acknowledges her weaknesses, and is open to learn new things [Koren (12) in 37;109;112;64;50] in order to improve her teaching skills and to line up with the requests and progress of the education system into the 21st century [29;12;21;20;107] is satisfactory.

Teacher D

Teacher D had taught language arts in elementary school for 27 years, and is the oldest among the four participating teachers, but she has a relatively strong background in ICT [60; Rogers (2000) in 107], and has been integrating technology in her lessons for the past three years. She considers herself as innovative, effective, updated, and creative [Becker (2000) in 14; Hinchey (10) in 43;98;38;112;19], but claims she is not a risk taker [104]. She also admits that in some points, especially concerning preparation and discipline she is traditional too. She believes that her daily use of technology in "whole lesson level' and working differentially in class distinguishes her from other teachers. Teacher D, similarly to teacher B, believes that integrating technology into the teaching learning process is a necessity [Hew & Brush (07) in 14;107;96;64] because "schools cannot stay behind as an anachronistic institution" [21;107]. She prefers using technology in her lessons since "it is easier to explain, demonstrate and visualize [28;26]. It constructs a different kind of relationship between me and the pupils [Hinchey (10) in 43; Ames' (92) in 29;58], it demonstrates the kids a real use of technology". Clearly teacher D recognizes the importance of integrating technology into the learning process [Hew & Brush (07) in 14;107;96;64], and she also uses it effectively while describing how she uses computers in three levels: Whole class, group

activities [Neilson (02) in 32; Hiltz (95) in 25; Ames' (92) in 29;26;57;76;62;77;55; Bar Tal & Bar Tal (85) in 10; Pea (93) in 69] and individuals. Like the other teachers she also complains about technical difficulties during the lessons, when she has to continue teaching without using the technological tool that failed [Hew & Brush (07) in 14;44;38;112;Rogers (2000) in 107]. Having a lot of experience in integrating technology into her lessons, it is not surprising that she is an instructor in teacher training on integrating technology into language art lessons, and participates on a regular basis in instructors training [39;44;12;83;109;112;107;19]. She thinks that the three top skills a teacher integrating technology should have are: Striving for excellence, profound insight into the added value of technology and its use [Hew & Brush (07) in 14;107;96;64], and the ability to be updated all the time [44;21;Borko & colleagues (2000) in 1;42;109;Keeler (96) in 11;107;19;28;92;26].

Teacher D explains that in order to promote social interaction in class she gives a task that requires creative work, and summon dialogue between the pupils [Neilson (02) in 32; Ames' (92) in 29;38;58;63;78;26;17], she claims that while working in groups [Neilson (02) in 32; Hiltz (95) in 25; Ames' (92) in 29;26;57;76;62;77;55; Bar Tal & Bar Tal (85) in 10; Pea (93) in 70] she prefers to promote content and less interaction since one of the main obstacles of technology, in her opinion, is that media is making it easier to miss the content. She suggests taking the content one wants to pass and then think how to bind technology and the computers to do that [Koren (12) in 37;16;34; Ertmer et al. (99) in 112;78]. A good example she gives concerns a poet whose poems she introduced to the pupils via a slide show she prepared, dramatizing it using 'You Tube'. She said it helped the pupils become a public discourse community cooperating in groups and presenting their insight [Neilson (02) in 32; Ames' (92) in 29;38;58;63;78;26;17] .

With regard to the future, teacher D wishes to be familiar with all the important technological functions that will help her promote writing and reading [39;38;28]. She hopes to know how to combine between promoting the strategic she wants and integrate it effectively and correctly with the proper computer function [15]. The teachers' important sayings are summarized in Table 3.1:

Table 3.1: Teachers' Interview Summary

	Teacher A	**Teacher B**	**Teacher C**	**Teacher D**
ICT skills	Limited ICT skills	Partial background in ICT	Limited ICT skills	Strong background in ICT
Years integrating ICT	2 years	3 years	2 years	3 years
Self-characteristics	1. Innovative 2. Creative 3. Effective 4. Updated Not a risk taker	1. Innovative 2. Sometimes creative 3. Effective 4. Updated	1. Innovative 2. Very creative 3. Effective 4. Updated Not a risk taker	1. Innovative 2. Creative 3. Effective 4. Updated Not a risk taker
Acknowledges the importance of ICT integration	But uses ICT to a small amount during the lessons.	1. It helps to reach out pupils with problems. 2. It catches pupils' attention. 3. Updates her lessons.	Helps pupils with disabilities to be engaged in the lesson.	1. Easier to explain, demonstrate and visualize. 2. Constructs a different teacher- pupil relationship.
Uses ICT	Ineffectively	Effectively	Ineffectively	Effectively
The obstacles of using ICT	1. Internet connection 2. Work and time consuming-at home 3. teachers must be updated	1. Internet connection 2. Technical problems 3. Using technology doesn't suit **all** the pupils.	1. Internet connection 2. Technical problems 3. Technology used isn't up to date	1. Technical problems 2. Media is making it easier to miss content
Solutions	No suggestion	1. Have a backup plan 2. A computer for every pupil	Have a backup plan	Teachers should do the connection between pedagogy and technology

	Teacher A	**Teacher B**	**Teacher C**	**Teacher D**
Integrating technology and promoting social interaction	Motivates her pupils to work together but without using the advantages of technology	1. Motivates her pupils to work together while integrating technology with regard to the nature of the task and class organization. 2. Believes that it's her willingness as the teacher, to let the pupils socially interact.	Doesn't see a connection, and believes that working with computers leads to individual learning.	1. Uses technology for group activity, and whole class activity. 2. Gives task that requires creativity and summons dialogues between the pupils.
Skills an effective integrating ICT teacher needs	1. Computer proficiency 2. Responsibility 3. Doing more than required	1. Innovative 2. Updated 3. Risk taker	1. Innovative 2. Creative 3. Confident 4. Updated	1. Striving for excellence 2. profound insight into added value of technology and its use 3. The ability to be updated all the time.
In the future	Wants to improve her technological skills.	Wants to deepen her ICT knowledge.	Wants to learn more about the interactive classroom	Working as an instructor in teachers' training courses
Teachers' training	Participates in teachers' training courses.	Participates in teachers' training courses.	Participates in teachers' training courses.	Participates in instructors' training courses.
Special remarks	Gradually learns to use ICT	Shares information with other teachers		Aware to the problem of combining pedagogy and technology

- Four teachers were interviewed regarding their teaching characteristics, their use of computers in their classrooms, and the social processes undergoing by their students.
- All four teachers described themselves using the same personal characteristic: innovative, creative, effective and updated. Three even added that they are not a risk taker person.
- Two teachers had limited ICT skills therefore it is not surprising that they were the teachers that integrated technology ineffectively.
- The two remaining teachers that integrated technology into their lessons effectively had partial or strong background in ICT. It is interesting, considering the fact that all four teachers acknowledged the importance of integrating technology into the learning-teaching process, and also gave the reasons to support it, that only the effective teachers saw in the ICT integration a necessity.
- The two effective teachers harnessed technology to help them promote the dialogue between the pupils in class. Unfortunately, the two other teachers do not believe in the promotion of social interaction in the learning process in general or with the use of ICT.
- Although all four teachers agreed that being updated is an important characteristic, only two talked about being innovative.
- An interesting point Teacher B presents, is that although she does not believe that she should be a risk taker in order to integrate ICT in her lessons; She does believe it is an effective ICT teacher characteristic.
- All four teachers participate in teachers' training and hope to develop in the technology field.

3.4. Main didactical methodology applied for effective use of ICT in order to promote social interaction

In order to provide research evidence for the theoretical basis given, the methodology had two aspects. The first was the influence of ICT characteristics on the level of socialization and interpersonal interactions, and the second was estimating the socialization levels in the computerized classroom. These two aspects are discussed here while giving concrete examples from the research field.

The influence of ICT characteristics on the level of socialization and interpersonal interactions

ICT characteristics reflected in the classroom are divided into three categories: classroom organization [78;9;10], the learning task [Neilson (02) in 32; Ames' (92) in 29;38;58;63;78;26;17], and the teacher's activity. [17;77;78]

Classroom Organization- Coordinated groups: the structure of the computerized classroom allows interaction with all members of the class and does not limit it only to members who sit near the learner: Small groups working collaboratively [Neilson (02) in 32; Hiltz (95) in 25; Ames' (92) in 29;26;57;78;62;77;55; Bar Tal & Bar Tal (85) in 10; Pea (93) in 70], using means and outcomes, while linking and communicating between each other through an "organizational body" in the image of a coordination committee or a moderator. At some point, the class returns to function as one unite organization while dealing with the learning outcomes of the groups in cooperative social climate.

Observation 7a: The students are now divided into groups, each group has a task to read and gather information about an artist of their choice…(Once they have the necessary information) …each group in terns sends a member to fill up their part in a chart opened on the computer. The whole class sees the chart projected on the screen. Another representative of the group informs the class of their learning process and reflects on his groups' collaborative work. A third representative explains the group's findings on the screen…the class is now divided into 5 groups again, in a way that insures that every group has a member from each of the 5 "old groups". These groups are now given a follow up task to find more information on their own, regarding one of the artists that was mentioned earlier. They have to present an outcome of their choice using any ICT tool they like...Group A is invited to present her outcomes in front of the whole class…

Teacher b: "...Then there's the way students are sitting in class."

The Learning Task- Divided between group members and correlated with the other groups: each group is dealing with different aspects related to the class theme, that is, specialization in specific components of the overall theme. The completeness of the learning task is a process that takes place amongst learners and not within an individual. There is an attempt to create a group model while significantly utilizing time. Using artificial knowledge representations (such as hypermedia and databases) allows the learner to finish the learning task at the same context but the objectives are different between each learner. As a result the individual learner designs the quality of the knowledge he acquires and its implications via his own interpretation.

Task C 1

Choose an artist, read the information card, and complete the chart

	Group 1- Van Gogh	**Group 2- Guttman**	**Group 3-**
Was born			
lived			
His paintings characteristics			
Famous paintings			
Why he is famous			
When he became famous			
An interesting fact			
Still want to know			

Table 3.2: An Example of a Learning Task

Teacher B: "Firstly, the nature of the tasks, tasks are written in order to be solved together. I mix strong students with weak students in these group tasks…"

Working with computers is mainly visual, creative and colorful [28;26]. It involves less wording and creates more interest. The pupils invest in their work within desire to show their outcomes to their friends [Davidson (12) in 37;63;62]. The feedback strengthens their self-confidence and improves their social position in class [51].

Observation 8b: …5 pupils from Group 2 are standing in line in front of the class. One of them inserts a disk on key into the computer. The teacher turns on the projector attaching it to the smart board. After a few clicks a chart is opened on the board. Each pupil in turns explains a different raw in the chart, when they all finish, one of them invites the pupils to ask questions…another pupil raises his hands, he asks: "How did you make the painting rotate into its place?". The pupil answers: "I think it is best if pupil "z" will answer, he did it". The pupils move and make room for a short skinny boy. He smiles and explains… …The teacher addresses the pupils of the groups and asks: "Is that the end of your presentation?" They all say yes, the teacher says: "thank you all for a very interesting presentation". The pupils in class clap their hands as the pupils of group 2 go back to their sits…

Teacher D: "… I give tasks that require creative work, and summon dialogue between the children that are not far differentially…"

Working with computers also enables self-correction; therefore there is no sense of criticism on the part of the teacher or by other students. Using computers helps preserving the aesthetics of the outcomes and thus contributes, mainly to weak students [99], by reinforcing their self-confidence and as consequence, improves their involvement in the lesson and adds to their feeling as an equal part of the class [51].

Teacher C: " Advantages are that you can reach all the children: children with disabilities and even some short sited children say it is easier for them to read and copy from the computer via projector…"

Teacher B: "… it also gives the weak students a chance to be active and participate. Students that are less strong in their auditory channel but are very strong in their visual channel can also take part in the learning…"

The Teacher's Activity- Groups coordinator. The teacher takes part in the learning challenge while dealing with the learning process, without knowing the path and the target to which he is headed with his students. The teacher is a task leader rather than an authoritarian leader [18; Pitler & Yackel, (02) in 1; 73; Raw (02) and Kinderman (96) in 63; Pomeroy (99) in 63], and helps the groups reach a comprehensive conception of the subject by the exchange of information and opinions between groups [Neilson (02) in 32; Hiltz (95) in 25; Ames' (92) in 29;26;57;76;62;77;55; Bar Tal & Bar Tal (85) in 10; Pea (93) in 69]. Finally, the teacher is interconnected with organizational and content-related aspects in coordination between individuals [63], groups [Neilson (02) in 32; Hiltz (95) in 25; Ames' (92) in 29;26;57;76; 62;77;55; Bar Tal & Bar Tal (85) in 10; Pea (93) in 69] and the whole class.

Observation 8b: …The teacher sits on a chair near the pupils in group 2. The pupils are trying to decide which paintings of Guttman are the most famous one. The teacher tells them that group 4 decided to check it on the internet. One pupil says:" Hey we can find the paintings and copy and paste it into our part of the chart. That way we can show them to the class." The teacher says: "What a wonderful idea!" She stands up and calls the attention of the class. She speaks to the whole class when she says: "pupil "x" from group 2 had a wonderful idea, while looking for the most famous paintings of your artist, you can look for a picture of the actual painting and either link it to your part of the chart or use copy paste. That way when you introduce your artist to the whole class, you can also show his paintings visually"….Pupil "y" from group 1 raises his hands, the teacher addresses him and he says: "We can also write the name of the painting and

the year it was painted, that way we can put all the paintings of all the artists according to their chronological order"…The teacher sends the groups back to work to discuss the new ideas.

The teacher is responsible to encourage the social interaction in class while using the technological source. He must understand the need of the learners to see other outcomes and to show their own, therefore the teacher should allow the pupils to move freely inside the classroom while providing support to each other, and prevent physical and tasking restrictions.

Observation 8a: …Pupil "w" leaves his computer, he stands behind pupil "v" and they watch the screen together. Pupil "w" says: "you should put this information under this rubric (he points out to the screen) look at how I did it" They both go to the computer on the left side…

Observation 9a: …The teacher addresses the class and says: "Who used another site, not the one I showed you, to find information?" Pupils "o" "p" "q" and "r" raise their hands. The teacher continues: "each student chooses one of these pupils", she now turns to pupils "o" "p" "q" and "r" and says: "Each one of you explains to the pupils that gather around you about the site you found and what information you found useful" the class is now divided again into four groups around these pupils, the groups are not equal: 6 pupils, 4 pupils, 3 pupils, 9 pupils…

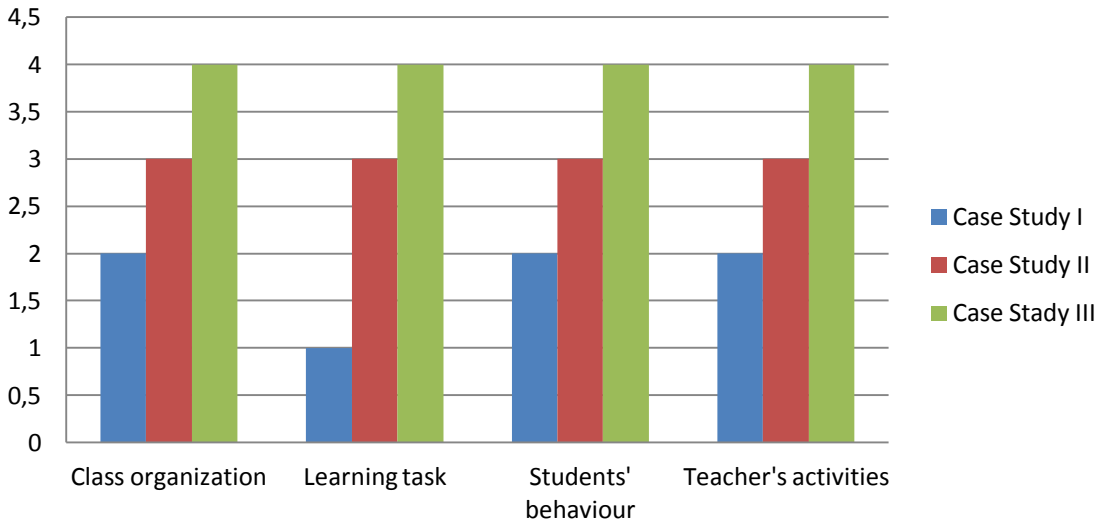
Teacher B: " …There is a natural tendency to work together and it is usually enough to have a teacher that permits it…"

Estimating the socialization levels in the computerized classroom

Interpersonal learning contributes to the social sensitivity since there is a strong need in students for social acceptance that is stronger than the prohibition to interact with friends during the lesson [Davidson (12) in 37;63;62]. In order to estimate the interaction levels in the classroom during an ICT integrated lesson, at both the student and teacher aspect, an "Interaction Level Indicator" was used [9]. This indicator detects the estimated levels of interaction in the classroom, and includes all factors affecting socialization processes under these four categories: classroom organization, learning task, pupils' behavior and teacher's activities. The indicator is designed this way, in order to facilitate the understanding of the separate influences of the computerized learning environment components, on the social dynamics in class. This indicator can assist teachers to get a social situation report, and a feedback to their actions in class [66; Ames' (92) in 29;19; Kennewell et al (2000) in 83; Savery & Duffy (96) in 91] from their students' point of view. Moreover, the indicator also enables monitoring and feedback for maximal utilization of all the components influencing the promotion of social dynamics in the computerized classroom.

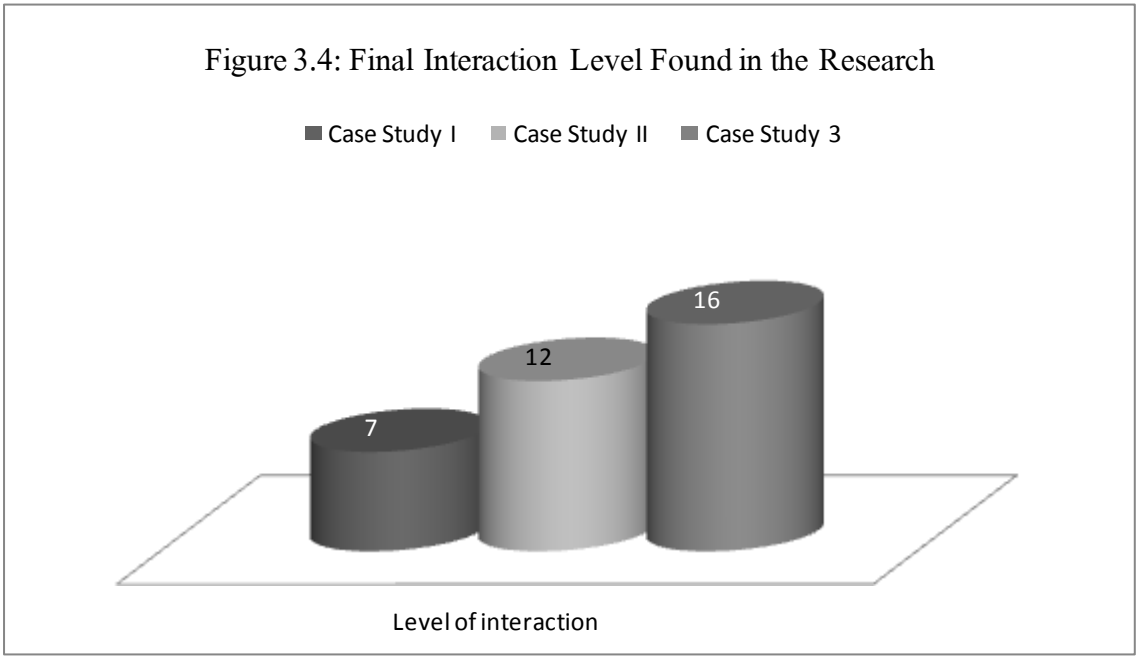
The socializations levels that were found in each case study of the research are best displayed in the following figure:

Figure 3.3: Estimation of Socialization Levels in Each Case Study According to the Four Categories



The final interaction levels which were found in each case study are displayed in the following figure:

Figure 3.4: Final Interaction Level Found in the Research



Both research tools: the "Interaction Level Indicator" and the questionnaires, show clearly that there is an increasing tendency between case study I and case study II as well as between case study II and case study III. While it is not surprising to see that there is between 71% to 100% increase in socialization processes when initially integrating ICT into the lesson; this research has achieved its purpose by presenting results of another 33% to 35% increase in pupils involved in social interaction while integrating ICT effectively into the teaching-learning process. In other words, the more effective the teacher is in integrating technology into the lesson, the more pupils are involved in social interactions. The quality of the "Interaction Level Indicator" is reflected while examining the final interaction levels found in each case study, versus the number of pupils that reported experiencing social interaction during the learning process via the questioners, as seen in figure 3.4.2. It is remarkable to see that the ratio of the increase in pupils' interaction involvement, between case study II and case study III was maintained: The questionnaires show an increase of 35% while similarly, the "Interaction Level Indicator" shows an increase of 33%. Proven as a reliable tool, the "Interaction Level Indicator" can help teachers reflect on their teaching and help them improve their use of ICT in their lessons.

A teacher can encourage or suppress social interactions in the classroom, but the ability to encourage interaction depends on the students as well [77]. Salomon and Perkins [77] suggests to both sides to take the opportunity for meaningful, interesting and powerful learning, while utilizing the opportunities that learning summons to promote social processes in the classroom.

- The main didactical methodology and techniques applied for effective use of ICT in order to promote social interaction were discussed in two aspects:

1. The influence of ICT characteristics on the level of socialization and interpersonal interactions divided into three categories: Classroom organization, the learning task, and the teacher's activity.
2. Estimating the socialization levels in the computerized classroom using the "Interaction Level Indicator" and the analysis of the pupils' questionnaires.

3.5. Integrating technology: learners' reflection on social processes

In order to validate the difficulties and obstacles facing teachers and learners, a research has been conducted divided into three case studies. Two classes of six graders were invited to participate in the research, involving 43 pupils: 19 boys and 24 girls. Data were collected from these three case studies through classrooms observations, questionnaires and quiz scores. In addition, four language art teachers volunteered to reflect on their teaching characteristics, their use of computers in their classrooms, and the social processes undergoing by their students, the findings will be discussed in the next section.

In all three case studies, pupils were taught English, according to the curriculum, for a period of eight lessons. All twenty four lessons were on the same topic. The lessons included reading and writing, new vocabulary introduction, and a grammar topic. At the end of each case study, the pupils were examined on the material they have just learned and their scores were divided into four groups according to the school procedure: low level (scores between 0-46); low-medium level (scores between 47-64); medium high level (scores between 65-83) and high level (scores between 84-100). Pupils were also asked to fill up a questionnaire reflecting on their learning process.

Case study I involved teaching in a conservative way only. There was no implementation of ICT of any kind. Lessons were based on books, and most of the practice was done in the workbook and on the board. The two classes were organized in a conservative way that is, pupils were sitting in pairs according to the following structure:

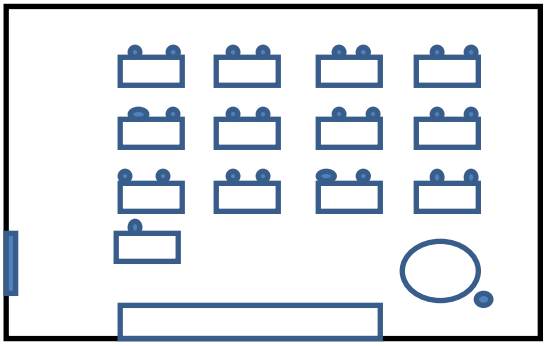


Figure 3.5: Classroom Organization Case Study I

Case study II involved teaching using ICT, with no effective maximal utilization of the technological tools: The smart board was used only as a projector board, in other words, the digital books were only projected on the board, and homework or class projects were assigned to word processors only. Each class was organized in groups of six according to the following structure:

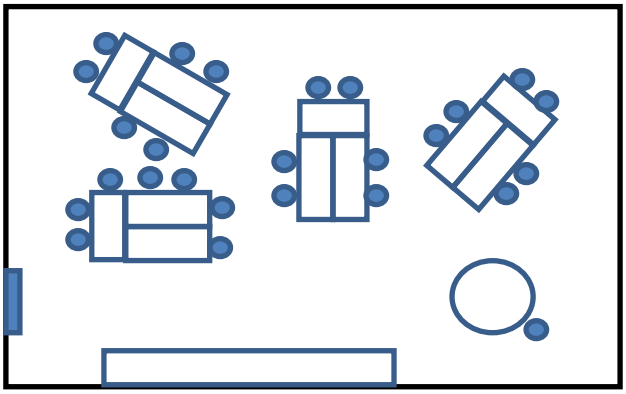


Figure 3.6: Classroom Organization Case Study II

Case study III involved teaching using a variety of technological tools effectively. The smart board characteristics were utilized to their full: The digital books were accessible to all the pupils and pupils were invited to the board to take part in the assignments and homework. Class projects were assigned to different technological tools including shooting self-videos, using smartphones. Each class was organized allowing multiple types of sitting arrangements, and pupils were allowed to change their position during the lesson as shown in the following structure:

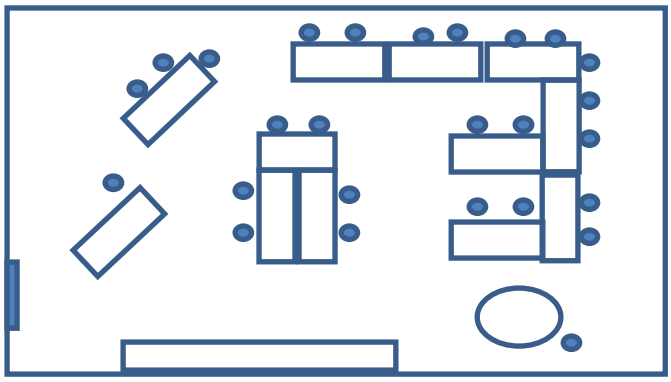


Figure 3.7: Classroom Organization Case Study III

In case study I, results were similar in both classes. Pupils stayed in their sit the whole lesson, they rarely spoke to each other and when they did, they were addressing the teacher after being given her permission. The scores in the final exam, given at the end of this case study, were divided as following: 39.5% of all pupils scored high level, 53.6% of all pupils scored med-high level and 6.9% of all pupils scored med-low or low level. It was surprising to find that half of the pupils enjoyed these lessons mainly because they like working with books or by themselves, but almost 35% didn't enjoy the lessons complaining it wasn't fun. More than half of the pupils defined the atmosphere in class as "calm" or "quiet", 18.6% defined it as "uncomfortable" and 14% defined it as "boring". 65% of the pupils agreed that there was no

communication between the pupils during these lessons and 16% indicated they wished to have been working in pairs or groups; therefore it is not surprising that 86% of the pupils think that social interaction in the classroom is important to promote learning. Pupils agreed that social processes were not promoted during the lessons (58%), and class organization affected the social interaction between the pupils (74.4%).

In case study II, results were similar in both classes, again. Pupils stayed in their sit the whole lesson but while working on class assignments they were able to speak with pupils who sat with them in the same group. The average percentage of time, spent on social interaction between the pupils during these lessons, was 40% of class time. Most of the conversations made by pupils were related to the topic of the lesson or the assignment given by the teacher. The scores in the final exam, given at the end of this case study, were divided as following: 65.1% of all pupils scored high level, 25.6% of all pupils scored med-high level and 9.3% of all pupils scored med-low or low level. When comparing these scores to the scores on the exams in case study I, it appears that although the percentage of pupils who scored med-low or low level went up by 2.4%, which means that with regarding to the exam in case study I, there are more pupils in this level, the percentage of pupils who scored high level grades went up by 11.6%, while the percentage of pupils who scored med-high level grades went down by 27.8%. This means that when teaching while integrating technology into the learning process, and allowing social interaction in the classroom, one cannot ignore the obvious result that more than 60 % of the pupils scored high level grades. The transition of most pupils was from med-high level to high level grades in the exam, as shown in the following figures:

Figure 3.8: Division of Students Into Levels According to Their Test Scores-Case Study I

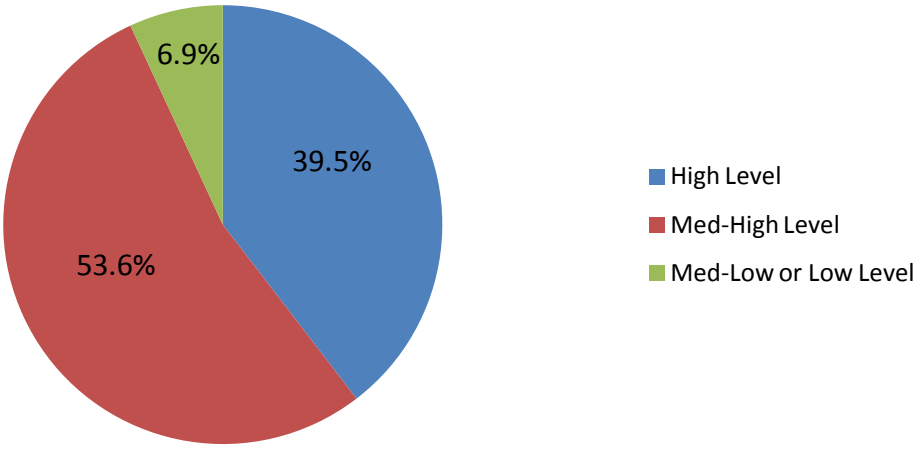
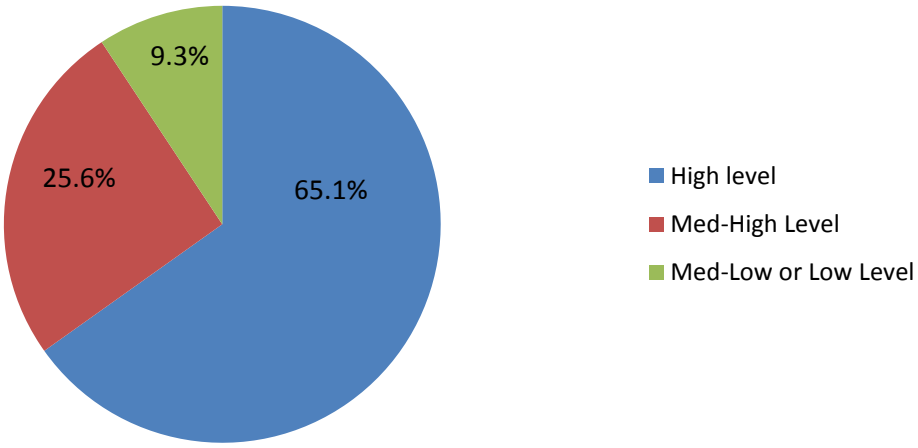


Figure 3.9: Division of Students Into Levels According to Their Test Scores-Case Study II



The problem, in case study II, remains the pupils, who are in the med-low or low level. These pupils' learning difficulties have not been addressed while using technology ineffectively.

Integrating technology into the lesson led 88% of the pupils to admit they enjoyed these lessons mainly because they "understand more" (23.2%), feel that "the atmosphere in class is more fun" (20.9%) or that learning is "more interesting" (18.6%). Only 7.6% of the pupils felt "not good" during these lessons. 69% of the pupils agreed that there was a lot of ongoing communication

between the pupils referring to the sitting arrangement that made it easier [78;9;10]. At the same time, it was unexpected to find that 9.5% of the pupils complained about "too much talking" as one of the pupils explained: "I like working with technology but sometimes it makes me feel like there is disorder in class". Most of the pupils would like to learn other subjects with the use of technology, since it helps them understand and contributes to the good atmosphere in class. Still, 6.9% of the pupils revealed the fact that they get very tired during these lessons. Considering the fact that all pupils agree that social interaction is important to promote learning, it is interesting to see that 67.4% of the pupils believe that technology has a great influence on social interaction in the lesson, but even more pupils believe that the classroom arrangement has that same effect (74.4%) [78;9;10].

With regard to the teacher, all pupils stated that, to some extent, the teacher demonstrated a good ability in controlling the technological tools in the lesson, but noted that she was helpless when there was no internet connection. Again, pupils reported that the teacher, while integrating

technology, is more understandable (44.73%), interesting (21%) and seems enjoying the lesson as well (23.6%).

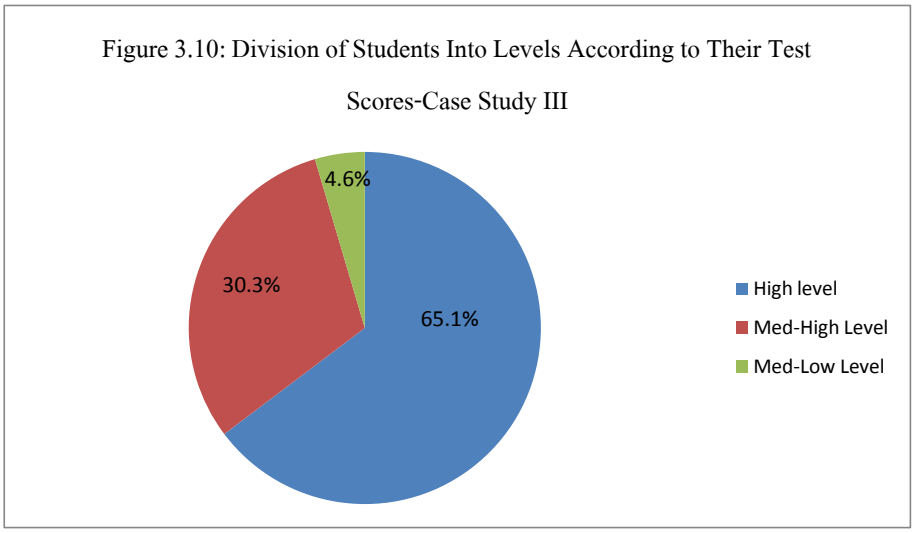
As for the technological activity, most of the pupils liked learning involving interesting internet links (34.8%), and using digital books (30.2%), but claimed that that technology is ineffective while answering questions in the workbook (20.9%) or checking homework (9.3%).

Introducing technology into the teaching process has changed the pupils' ideas about their learning. More pupils enjoyed the lessons and were aware to the fact that these lessons involved more social interaction as opposed to the lessons they experienced in case study I [Koren (12) in 37;72;84;32;73;98;60;49;63;92]. The involvement of technology in the learning process and the opportunities that were opened for social interactions in case study II, led 100% of the pupils to realize that interaction is important to the learning process [Davidson (12)in 37; Ames' (92) in 29;63;35;75; Pomeroy (99) in 63;47; Ernest (98) in 1; Anderson & Kanuka (97) in 25;91; Savery & Duffy (96) in 91; Hiltz (95) in 25;86], and that technology has great influence on the social interaction between the pupils [Koren (12) in 37;72;84;32;73;98;60;49;63;92], alongside with class arrangement [111;9;10].

In case study III, results were also similar in both classes. In the first part of the lesson, pupils sat in a plenum, and then they were free to sit where they wanted. They were also able to change their sit during the lesson. The class was organized in a variety of sitting arrangements. Pupils were free to speak and work with any pupil they chose, and there was no limit to the amount of pupils sitting in the same group. There were also two pupils who chose to work by themselves, in a period of time that was less than 11% of the total time of the lesson. The average percentage of time, spent on social interaction between the pupils during these lessons, was 83% of class time. Most of the conversations made by pupils were related to the topic of the lesson or the assignment given by the teacher (93% of talking). The scores in the final exam, given at the end of this case study, were divided as following: Similarly to the results in case study II, 65.1% of all pupils scored high level, 30.3% of all pupils scored med-high level and 4.6% of all pupils scored med-low level. **No pupil** scored low level.

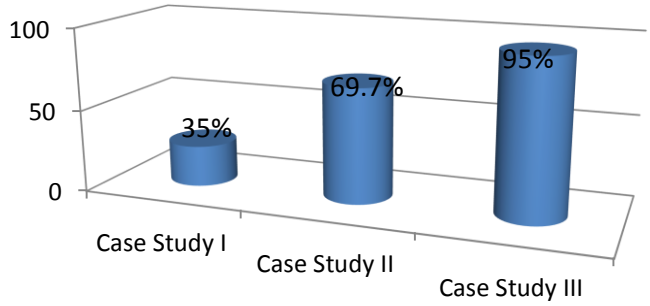
When comparing these scores to the scores on the exams in case study II, it appears that although the percentage of pupils who scored high level remained the same, the percentage of pupils who scored med-high level grades went up by 5.4%. Moreover, the percentage of pupils who scored med-low level grades went down by 4.7%, while no pupil scored the low level grades. This means that when teaching while effectively integrating technology into the learning process and allowing free social interaction in the classroom, the satisfactory result is that most of the pupils scored high level grades and no pupil scored low level grades. The transition of

most pupils was from low-med level to med-high level grades in the exam, as shown in the following figure:



Integrating technology effectively into the lesson led all the pupils to feel they are enjoying at least some parts of the computerized lessons. The reasons they gave varied: most of them claimed the atmosphere was more fun (37.2%), or the lesson was more interesting (30.2%), they understood more (20.9%), and felt learning was easy and up-to-date (16.2%). No pupil reported that he felt "not good" during these lessons, as opposed to case study I and II. 95% of the pupils described an atmosphere where they "learn more with friends, help each other and cooperate", they emphasized that social interaction during the lesson provides a fun environment for learning. However, there were still pupils who felt uncomfortable with the ongoing talking during the lesson (2.3%). This means that some children prefer working quietly by themselves, and are aware and comfortable with their learning style. Nevertheless, compared to case study II, there is a 25.3% increase in the number of pupils that experienced social interaction as a part of their learning process. This is shown clearly in the following figure:

Figure 3.11: The Number of Pupils That Experienced Social Interaction During the Learning Process



Similarly to case study II, most of the pupils would like to learn other subjects with the use of technology [98], since it helps them understand, it's enjoyable and makes their learning more interesting. Only 2.3% of the pupils admit they prefer learning without the integration of technology, therefore, compared to Case Study II, there is a drop of 4.6% in the number of pupils who don't like learning with the use of technology. Effectively integrating technology into the teaching-learning process highly motivated 86% of the pupils to engage in social interaction during their learning [Hinchey (10) in 43;73;116] as opposed to 67.4% of the pupils in case study II. Nonetheless, 86% of the pupils feel that class organization has also a great impact on the social interaction between the pupils [111;9;10].

With regard to the teacher, all pupils stated that the teacher demonstrated a good ability in controlling the technological tools during the lesson. They also added that she speaks less (9.7%), and makes them feel that learning is a game (19.5%). Moreover, the teacher was described as "more supportive" (56%) [25; Pitler & Yackel, (02) in 1; 73; Raw (02) and Kinderman (96) in 63; Pomeroy (99) in 63] and "relaxed" (26.8%), since, as one of the pupils explained it best: "there are no discipline problems because this way it is easy to keep the class in order".

As for the effective technological activity [Neilson (02) in 32; Ames' (92) in 29;38;58;63; 78;26;17], most of the pupils liked learning through the use of interactive computerized games and quizzes (60.9%). Using the digital books effectively was an interesting technological activity chosen by 26.8% of the pupils. Activities involving the effective use of interesting internet links were chosen by only 9.7% of the pupils, whereas in case study II, 34.8% of the pupil chose this activity as an interesting one. Since the

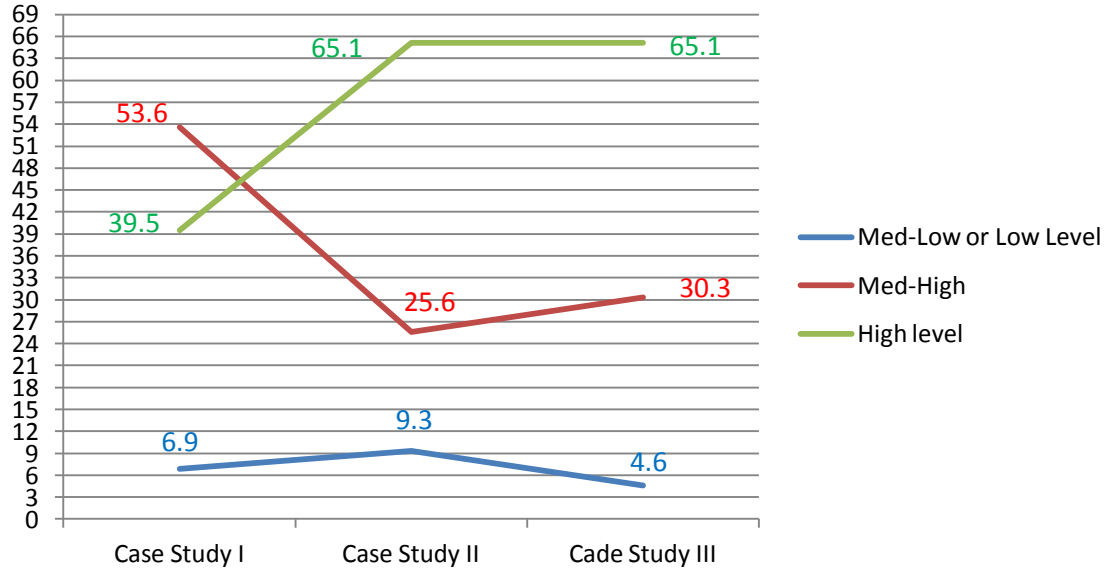
games and the quizzes were part of the digital books, the obvious conclusion is that while using the digital books effectively, more pupils enjoy an interesting lesson and regard the learning as a fun activity. Though most of the pupils stated that they did not experience an ineffective technological activity, unfortunately, doing homework and checking them in class, is still the only ineffective technological activity that 28.9% of the pupils complain about.

Integrating technology effectively into the teaching-learning process is reflected in the pupils reaction to the social processes promoted in class. According to the pupils, technology influences these social processes [Koren (12) in 37; 72; 84; 32; 73; 98; 60; 49; 63; 92] in three dimensions:

4. Technology "forces" pupils to work together. Pupils' working in collaboration is an enjoyable learning activity and hence more pupils take part in the learning process, as one of the pupils noted: "when it's more fun, kids want to participate more" [Davidson (12)in 37; Ames' (92) in 29;63;35;75; Pomeroy (99) in 63;47; Ernest (98) in 1; Anderson & Kanuka (97) in 25;91; Savery & Duffy (96) in 91; Hiltz (95) in 25;86].
5. Technology used effectively encourages a great deal of talking, brainstorming and exchanging ideas [63].
6. Technology used effectively involves peer teaching or as one of the pupils indicated: "I don't need the teacher all the time, when I have a problem I ask my friends or if I make a mistake, the computer corrects me" [63].

Findings also revealed an unexpected effect of integrating technology effectively on the grades of the med-low, and low students, as seen in the following figure 3.12 When integrating technology to its effective maximal utilization, no pupil scored low level grades and the percentage of pupils who scored med-low level grades dropped. On the other hand, the percentage of pupils who scored med-high level grades went up. In other words, there was a shift of pupils from low level scores to med-high level scores. This means that the side effect of effectively implementing technology and promoting social interaction is the academic promotion of sub-achievers students.

Figure 3.12: Segmentation of Students Grades in Case Study I



- In order to validate the difficulties and obstacles facing teachers and learners, a research has been conducted divided into three case studies. Two classes of six graders were invited to participate in the research, involving 43 pupils: 19 boys and 24 girls. Data were collected from these three case studies through classrooms observations, questionnaires and quiz scores.
- **Case study I** involved teaching in a conservative way only. There was no implementation of ICT of any kind. Lessons were based on books, and most of the practice was done in the workbook and on the board.
- **Case study II** involved teaching using ICT, with no effective maximal utilization of the technological tools.
- **Case study III** involved teaching using a variety of technological tools effectively. The smart board characteristics were utilized to their full: The digital books were accessible to all the pupils and pupils were invited to the board to take part in the assignments and homework, class projects were assigned to different technological tools.
- Findings provided an answer regarding the research question: **in the computerized classroom, while using effective maximal utilization of technological tools-there is promotion of social dynamics between the pupils.**

- While in case study I only 25% of the pupils were engaged in social activities, in case study II the number of pupils that experienced social interaction was higher by 44.7 % . 95% (**another 50 %**) of the pupils experienced social interaction in case study III where integrating technology was at its effective maximal utilization.
- Findings also revealed an unexpected effect of integrating technology effectively on the grades of the med-low, and low students: when integrating technology to its effective maximal utilization, no pupil scored low level grades and the percentage of pupils who scored med-low level grades dropped.
- The side effect of effectively implementing technology and promoting social interaction is the academic promotion of sub-achievers students.
- Integrating technology effectively into the teaching-learning process is reflected in the pupils reaction to the social processes promoted in class.
- According to the pupils, technology influences social processes in three dimensions:

1 Technology "forces" pupils to work together.
2 Technology used effectively encourages a great deal of talking, brainstorming and exchanging ideas.
3 Technology used effectively involves peer teaching.

Conclusions for Chapter 3

3.1 The intent of this study was to verify the hypothesis that effective maximal utilization of technological tools promotes social interaction in the computerized classroom, and to identify the aspects of the computer's unique potential contribution to promoting social processes in the classroom while developing a model engaging in maximizing the effectiveness of technological tools and their level of impact on social processes in the classroom. Unlike other studies that focused on the effect interaction or the use of ICT have on the promotion of student achievements, this study focused on the promotion of student-student interactions within the complexity of a sixth grade, technology well operated, computerized English classroom.

The findings of this study are divided into two stages. The first stage points to the factors that influence the effectiveness of ICT implementation, and the second stage points to the effect of the last on promoting interaction in the classroom. A third stage was reveled unexpectedly as consequence, pointing to the learning outcomes of the sub-achievers students.

The findings suggest that there are recognizable factors and obstacles that influence the effectiveness of ICT-use by the teachers. These are presented in three levels:

3.2 Decision makers' level (mainly short-term policy plans), school level (reliable infrastructure, technical and pedagogical support, time allotted for planning and preparation, updated ICT school plan that includes evaluation and reflection).

3.3 Teachers level (personal characteristics, ICT skills, ongoing participation in professional developments, teachers working in cooperation).

3.4 Findings also suggest that applying the proper didactical methodology for effective integration of ICT, such as the technology based task, the class organization, the use of alternative assessment and considering learners' characteristic, can promote social interaction between the learners.

3.5 The technology advantages are reflected in the fact that it "forces" pupils to work together, it encourages brainstorming and exchanging ideas, and it involves peer teaching. Finally, analysis of the data shows that when implementing technology effectively into the lesson, there is an improvement in achievements, especially with the weak pupils in class.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

Technology is a catalyst for social processes occurring in the computerized classroom, but technology alone is not enough to accelerate these processes. Education strategies and policies, school policies, teachers and pupils, all have a great impact on promoting social dynamics.

This research has shown that while using effective maximal utilization of technological tools, social interaction processes are encouraged as well. Moreover, there is also an increase in learners' achievements; this is especially true regarding sub-achievers learners. In light of this, conclusions are drawn in three levels, for decision makers and schools use, as well as for teachers who intend to progress towards effective maximal utilization of technological tools. The recommendations however, add the pedagogical aspect that involves all three levels of participants as well as the learners themselves.

1.1 Educators are obliged to cope with the changes and innovations undergoing in the world and influencing the education field.

1.3 The learning process being an interpersonal process emphasizes the importance of encouraging social interaction, manifested with the use of the constructive learning approach. Therefore, advanced pedagogy suitable for the 21st century should be integrated seamlessly into the curriculum.

1.4 Teachers are essential in effectively integrating ICTs into the lesson. They must be more imaginative, using teaching methods that are more appealing to learners. If technologies are used effectively, an increase in interaction during the teaching-learning process will be shown. Unfortunately, findings show that teachers fail to make the correct connection between technology and pedagogy.

2.1 In the education field, ICT has an incredible potential in promoting interaction and learning, but it is challenging to integrate it properly into the teaching-learning process.

2.2 Using ICT effectively contributes to the quality of the teaching-learning process in six aspects: cognitively, pedagogically, culturally, and as an enhancing factor for onvergence, alignment, and data.

The obstacles in integrating ICT effectively are **lack of time** for preparation and planning, the **non-existence of technological and pedagogical experts** in schools, and the lack of **evaluation** of the process.

The factors enabling successful use of ICT can be explained in four levels: legislative factors and external support strategies given by **decision makers**, **schools**' strategic plans,

students' characteristics that must be taken into consideration, and the **teachers**: their characteristics and their acquaintance with technological tools.

2.3 Teachers can intensify the obstacles they are facing, by participating in technological and pedagogical professional developments, as well as being given time for adjustment, and

2.4 models for evaluating their effectiveness of ICT integration.

3.1 Findings suggest that there are recognizable factors and obstacles that influence the effectiveness of ICT-use by the teachers:

3.2 Decision makers' level (mainly short-term policy plans), school level (reliable infrastructure, technical and pedagogical support, time allotted for planning and preparation, updated ICT school plan that includes evaluation and reflection).

3.3 Teachers level (personal characteristics, ICT skills, ongoing participation in professional developments, teachers working in cooperation).

3.4 Findings also suggest that applying the proper didactical methodology for effective integration of ICT, such as the technology based task, the class organization, the use of alternative assessment and considering learners' characteristic, can promote social interaction between the learners.

3.5 Technology has its advantages. It "forces" pupils to work together, it encourages brainstorming and exchanging ideas, and it involves peer teaching. Analysis of the data shows that when implementing technology effectively into the lesson, there is an improvement in achievements, especially with the weak pupils in class.

I believe that ICT can only contribute to the teaching-learning process if it is appropriately embedded in powerful interactive environments within context of pedagogy, therefore an advanced pedagogy that is suitable for the 21st century must be used. This pedagogy should provide alternative ways of teaching, which learners select as they engage in their educational experiences. Other researches, as well as the present research, have shown that setting innovative pedagogical goals will eventually lead to successful ICT programs.

The assumption that social dynamics in the computerized classroom can be encouraged while effectively integrating ICT, was preliminarily validated using three case studies. Aspects of the computer's unique potential contribution to promoting social processes in the classroom were identified and the research has also been successful, indicating students' and teachers' attitudes toward effective technology integration and has provided an understanding regarding the gap between teachers' perceptions of technology integration and the difficulties to implement it in practice. However, the exposure to the complexity of teachers' personalities, significant

differences in their attitudes, their personal background and technological capabilities, as well as their various ways to struggle with changes they are exposed to in the education system, convinced me that there is no general model that can be developed for teachers to follow for the sake of engaging in maximizing the effectiveness of technological tools and their level of impact on social processes in the classroom. It remains an open issue how to design a standard model that will meet the needs of the various and unique teachers and their students.

Recommendations

Decision Makers' Level

- The education policy must be constantly updated and developed.
- Teachers should take part in developing the education policy.

Schools' Level

- Schools must provide high standard infrastructure and quality technical support.
- Schools should allot time for planning and preparation including compensation for it.
- Schools should be able to issue an ICT plan developed and updated jointly by the staff.
- Schools have to evaluate and reflect on the process including mapping levels of teachers skills.

Teachers' Level

- Teachers must be encouraged to acquire ICT skills.
- All teachers must participate in school subject, specific, ongoing, annual professional development.
- Teachers should understand where they are in terms of their level of ICT adaption.
- Teachers should be able to invest in time, effort, new learning and willingness to change existing teaching strategies.

Five factors controlled by the teachers, must be taken into consideration:

- The technology based tasks.
- Class arrangement.
- The use of alternative assessment.
- Considering learners characteristics.
- Using advanced pedagogy that is suitable for the 21st century.

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Appendix 1: Questionnaire Part A,B,C

Questionnaire Part A

Please answer the following questions. This questionnaire is anonymous.

1. Did you enjoy English lessons the past few weeks? Why?

_____

_____

2. How would you describe the atmosphere in the classroom during these lessons?

_____

3. How would you describe the teacher's methods of action in class during these lessons?

_____

_____

4. How would you describe the communication in class between the pupils during the past few weeks?

_____

_____

5. To what extent do you agree with the statement: "Social interaction in the classroom is important to promote learning".

largely agree	agree	agree to a small extent	disagree

6. How did class organization affected social interaction between the pupils:

to a great extent	to a large extent	to a small extent	no affect at all

7. In what way were social processes promoted during the past few lessons?

_____

_____

8. How often the technology was used the past few lessons?

the whole lesson	most of the lesson	in some parts of the lesson	technology wasn't used at all

9. Briefly describe an interesting educational activity carried out in one of the lessons

_____

Questionnaire Part B, C

Please answer the following questions. This questionnaire is anonymous.

1. Did you enjoy the technology integrated lessons in the past few weeks? Why?

_____

_____

2. How often was technology used in the past few lessons?

the whole lesson	most of the lesson	in some parts of the lesson	technology wasn't used at all

3. How would you describe the atmosphere in the classroom during technology integrated lessons?

_____

_____

4. How would you describe the teacher's methods of action in class during technology integrated lessons?

_____

_____

5. Do you think the teacher demonstrated a good ability in controlling the technological tools in the lesson? What could he do differently?

_____

_____

6. In what way does the integration of technology in the lesson contribute to the atmosphere in the classroom?

_____

_____

7. How would you describe the communication in class between the pupils during the past few weeks?

_____

_____

8. Would you like to learn using technology, subjects that are not currently supported by technology? Why?

_____

_____

9. How did class organization affected social interaction between the pupils:

to a great extent	to a large extent	to a small extent	no affect at all

10. Briefly describe an interesting educational activity carried out with the use of technology in the lesson.

_____

11. Briefly describe an educational activity carried out with ineffective use of technology in the lesson.

_____

12. To what extent, do you think, the use of technology Influenced social interaction in the classroom?

to a great extent	to a large extent	to a small extent	no affect at all

13. To what extent did the teacher demonstrate a good ability in controlling the technological tools in the lesson?

to a great extent	to a large extent	to a small extent	no affect at all

14. To what extent do you agree with the statement: "Social interaction in the classroom is important to promote learning".

largely agree	agree	agree to a small extent	disagree

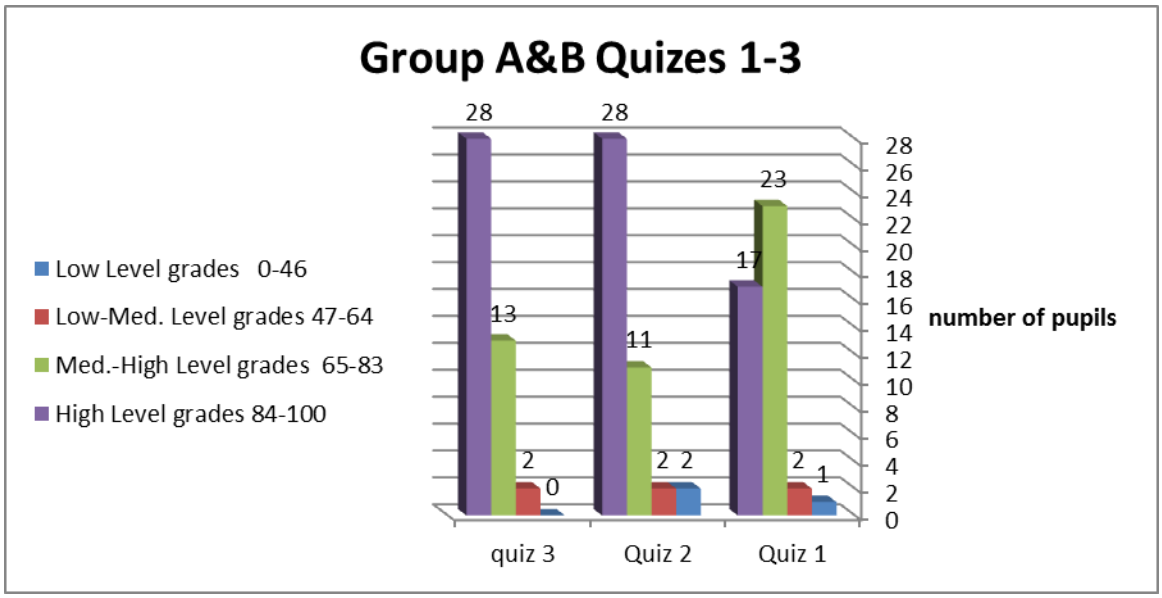
15. In what way were social processes promoted during the technology integrated lessons?

_____

_____

Appendix 2: Quizzes results analysis

High Level grades 84-100	Med.-High Level grades 65-83	Low-Med. Level grades 47-64	Low Level grades 0-46	No. of pupils
17	23	2	1	Quiz 1
28	11	2	2	Quiz 2
28	13	2	0	Quiz 3



Appendix 3: Interview questions

Anonymous Interview Script

Date: _____ an interview with: _____ Job description: _____Gender: _____ age: _____ Seniority as a teacher: _____ Seniority using technology in teaching:_____ Seniority at this school: _____

1. What five words would you use to describe yourself?

2. How would your students describe you as a teacher (Give an example to back up your answer)?

innovative	creative	risk taker	effective	professional
a team player	updated	interesting	traditional	confident

3. What distinguishes you from other teachers?

4. Do you think it's fair to use modern aids such as technology in teaching as opposed to the old teaching methods?

5. Do you prefer the use of technology in your class? Why?

6. In what ways do you use technology to enable and extend learning for all of the children?

7. Tell me about a recent problem you have experienced while using technology, and how you went about solving it.

8. In your opinion, what are the top 3 skills for a teacher integrating technology into the teaching process?

9. What are the major advantages and disadvantages that you see in the use of technology in your classroom?

10. What are the major obstacles that you see to more effective use of computer and information technology in your classroom?

11. Do you think that most students find the use of technology helpful in supporting social interaction in your classroom?

12. What principles do you use to motivate students to work together?

13. Describe effective teaching techniques that result in intended learning.

14. Are you a part of any teacher's forum or teacher's group where you and your associates discuss about the ways to improve the teaching styles and ways to tackle difficulties on the basis of the extensive experience they may have in their career? (Tell about the topics of discussion and the ways in which such discussions help a teacher).

15. In what areas do you feel you need improvement and how do you measure the success of what you're doing in supporting/training?

16. What is different today than what you were doing 3 years ago?

17. What is changing in what you are doing in the next 12 months? 24 months?

Appendix 4: Observation

Observation no. 5 3.3.13 **T** = teacher **P** = pupil The pupils already know where they sit The class is organized in groups ICT: computer, smart board, laptop	1. The pupils are waiting for the teacher outside the English room. 2. They are holding their books in their hands; They are talking to 3. each other. When the teacher comes they welcome her and let her 4. open the door, when she enters the room, they enter the room after 5. her, each pupil goes to his sit. They put their books on the table and 6. sit quietly in their places. The class is organized in 4 groups of 6 7. pupils (Re: but there are only 22 pupils in class so there are 2 8. groups of five). There is a smart board in the classroom and a 9. computer connected to it, the teacher connects her laptop on the 10. other side of the smart board. The classroom is very clean and tidy 11. and there are lots of posters and pictures on the wall. Everything is 12. written in English. There is also a small library and a listening 13. corner. 2 pupils are not going to their places, they are following the 14. teacher to her table. They are asking her if they can leave the 15. lesson a few minutes earlier to take their project from their 16. classroom to the teacher's room. The teacher answers: "O.k. but 17. make sure you get the homework from your friends" She smiles, 18. the pupils nod and one of them says: "of course". The teacher 19. opens her computer and asks one of the pupils to remind the class 20. what they did the previous lesson. 3 pupils raise their hands, the 21. teacher lets a pupil answer. He explains that the chapter they are 22. learning now is about art and that the last lesson was about Van 23. Gogh's life and art. He adds that there was homework to be done in 24. the workbook. The teacher thanks him, her computer is ready now 25. and she reads the names of the pupils, 2 pupils are native speakers 26. and they are studying in a different classroom with their native 27. speakers' teacher.
Teacher promotes interaction between pupils that are not sitting next to each other. Teacher also encourages peer tutoring. The teacher is an instructor and not the source of knowledge The teacher involves other members of the group in the problem	Teacher: "Groups 1 and 2 you are all 'A' and 28. group 3 and 4 you are all 'B'. Now I want each pupil A to find a 29. pupil B and together in pairs check your homework in the 30. workbook. You have 10 minutes for this activity" She writes the 31. time on the board. The pupils are changing places in the classroom. 32. They take their books with them. Some of the pupils call others by 33. name to come and sit next to them. Finally they sit in 3 groups of 34. six and one group of 4 working in pairs. The teacher moves around 35. the classroom. A pupil raises his hand, she stops next to him, P: 36. "What is the correct answer for this question because I think it's B 37. but the other pupil he thinks it's A?" The teacher turns to the other 38. members sitting in the group: "What do you think the answer is?" 39. Their answers are varied. Teacher: "What can you do in order to 40. decide which answer is correct?" P: "We can go back to the text 41. and check" T: "Very good, please do so and give me the line no. 42. where you found your answer". The teacher turns to another group, 43. she listens to the pairs of students exchanging information. The 44. previous group calls her, they say they found the answer in line 5 45. and that the answer to the question should be B. T:" This is the 46. right answer, and you see, all you had to do was go back to the text 47. to check.
Encourage group work and peer tutoring	Some of the pairs raise their hands and say they have 48. finished checking. The teacher asks them to help the pupils in their 1. group and make sure

Teacher uses the digital book Teacher involves pupils with ICT It seems pupils are excited to participate in the activity ICT: using visual and sound aids Working in groups: teacher encourages cooperation Task: authentic and interesting, each group adds different information to the general subject Collaborative work-the	they answered correctly. The teacher turns to 2. the whole class: "Are there any questions regarding the homework? 3. Is there something that is still not clear?" no one raises his hand, 4. they are all looking at each other. Teacher: "O.k. if there aren't any 5. questions, return to your places". The pupils return to their places 6. (Re: where they sat at the beginning of the lesson). The teacher 7. turns on the projector and the pupils can see their books on the 8. screen. The teacher clicks a few buttons to get to the page she 9. wanted. All the pupils are looking at the board. There is a list of 10. words in English on the left side and a list of words in Hebrew on 11. the right side. The teacher invites pupils according to the order 12. they sit, each pupil comes to the board, takes a special stick from 13. the teacher, and drags a word in Hebrew next the word in English 14. according to its definitions. The teacher calls each pupil by his 15. name according to the order they sit. 3 pupils are raising their 16. hands, P:"me…me". Teacher: "You are all going to use the board, 17. I promise, wait for your turn there is no need to raise your hands". 18. The list of words ends, the teacher clicks a button and 5 sentences 19. appear on the board, with missing words, the words appear in a 20. box above the sentences. The teacher continues to call the pupils 21. one by one this time they drag the word from the box into the right 22. sentence and then they read the whole sentence out loud. After the 23. last pupil reads the last sentence, the teacher says: "Today I am 24. going to show you some pictures of a new artist that I am sure you 25. all heard about". P:" Ohoooo… you didn't call me to come to the 26. board." T: "Don't worry, we have still a lot of activities this year 27. and everybody will have a chance to come to the board". The 28. teacher clicks a button and three pictures appear on the board. "Do 29. you recognize any of these pictures? Do you know who painted 30. them?" P. "Hey, we have this picture in our house" P:"We learned 31. about this artist last year in art lessons, this is Nahum Gutman" 32. Teacher: "That is correct, these are all pictures made by Nahum 33. Gutman who was an Israeli painter and a writer". The teacher 34. explains what the pupils see in every painting, when it was painted 35. and the name of the picture. She presses a button on her computer 36. and a voice is heard in the surround sound system of the 37. classroom, it speaks while pictures of paintings and pictures of 38. Nahum Gutman appear on the board. The pupils listen to a short 39. description of the painter's life. When the recording is finished the 40. teachers closes the projector. Teacher: "Each group is going to 41. explore a different aspect of this painter's life. Group no. 1 you are 42. going to explore his childhood life and family". The teacher hands 43. out the group a paper with instructions. T:"Group 2 you are going 44. to explore his paintings" The teacher hands out the group a paper 45. with instructions. T: "Group 3 you are going to explore the books 46. he wrote" The teacher hands out the group a paper with 47. instructions. T:"Group 4 you are going to explore the museum 48. opened in his house". The teacher hands out the group a paper with 49. instructions. T: "Please read the instructions carefully, you have to 50. make sure that each member of the group is knowledgeable in the 1.

teacher is a group coordinator Different kind of group work Pupils are excited to work in the computer room Authentic task There are not enough computers for every pupil, and the room organization does not promote interaction Working in shared document: a technological way for interaction It is important for some pupil that the members of the group will all participate in the activity The teacher encourages the pupils to work together	topic you received, because next lesson you are all going to tell 2. your friends about your findings." The pupils gather in their 3. groups, some of them lean on the table to read together the 4. instructions. In group 1 a pupil is reading the instructions out loud 5. and the other pupils are listening. The teacher is moving between 6. the groups and listens to the pupils reading the instruction. The 7. school bell rings. The teacher says: "We are going now to the 8. computer room, [some pupils call:"yes"] take all your books with 9. you, and make sure you don't leave anything behind. When you 10.enter the computer room, choose a computer for your group and 11.you can start working". The pupils take their books, they are talking 12. to each other (Re: they seem very excited). The teacher waits for 13. the last student to leave the English room. She locks behind him 14. and walks to the computer room with the pupils. The pupils tell the 15. teacher about a TV show they saw about Nahum Gutman. One of 16. the pupils tells the teacher that he visited the museum with his 17. family and that it was a really interesting experience. The teacher: 18. "Do you have pictures from your visit? P:"Maybe, I'll ask my 19. parents". T: "It would be really nice if you can add them to your 20. project". When the teacher and the pupils enter the computer room, 21. some of the pupils already sit in groups around the computer, and 22. they join their groups. The computer room is a small room with a 23. regular board, there are 14 computers in the room organized along 24. the walls in a way that pupils sit with their backs to the room and 25. their front to the walls. Group 1 turned on 2 computers. They use 26. one to write the answers to the project and one for research they sit 27. closely together and brainstorm ideas. Group 2 sits at the other side 28. of the classroom, they divided the work between them and each 29. pupil is working using his own computer. The computers are next 30. to each other. They opened a shared document. Group 3 turned on 31. only one computer. One of the pupils sits in front of the computer 32. while the others sit around him looking at the screen. The group 33. has a discussion regarding their project and the pupil types what 34. they decide together to write. Group 4 turned on 2 computers. 4 35. members of the group sit around one computer, except for one 36. pupil that sits next to the other computer looking at Gutman's 37. museum site. P1: "Why aren't you working with us?" P2: "I will 38. look at the museum site, this way we can do it better" P1 calls the 39. teacher and says: "P2 doesn't want to work with us, he opens his 40. own computer and he doesn't want to share the assignment with 41. us". The teacher asks pupil 2 to step outside the classroom for a 42. moment with her, after a few minutes they enter the room and P2 43. goes back to his group. P2:" I have an idea, maybe we can divide 44. the work between us, each pupil will look for information about 45. something and then we can add all our findings together". The 46. teacher follows him to his group. Teacher: "you don't have to work 47. on one computer, you can use as many computers as you like". 48. P3:"O.k. P2 and I will look for the museum site on this computer, 49. and you can choose the design for our presentation". As the pupils 50. sit in their places and start working the teacher goes to group 1. 1. She

The teacher as a group coordinator Teacher: an advisor giving directions and suggestions Teacher sums up the lesson ICT advantage Pupils were very involved in the project People enjoyed the activity	sits with the pupils and answers their questions, than she 2. moves to group 2 and the pupils show her what they already found. 3. They start the presentation showing Gutman's paintings (Re: they 4. are very proud). Teacher: "It looks great, but don't forget to add 5. explanations under each painting". The teacher goes to group 3. 6. They show her a list of the books they found that were written by 7. Gutman. They explain that they would like to choose together 8. which books should they focus on. Teacher: "Gutman also draw the 9. pictures in his books he was the illustrator, maybe you would like 10.to focus on the connection between his writings and drawings." The 11.teacher moves to front of the class and asks for her pupils' attention. 12. They all stop working and turn around to look at her. She describes 13. what they learned today, explains again the group assignments and 14. gives the dates to hand in each part. She reminds the pupils that 15. they don't have to physically meet and that they can use shared 16. documents and presentations. The teacher tells the pupils to save 17. what they did and send it to themselves by mail, and then to close 18. the computers. She turns to the 2 pupils that asked her to leave 19. early: "Didn't you want to leave the lesson early?" P:" Oh I forgot, 20. I was so busy with the project…" The bell rings. The pupils close 21. their computers and leave the classroom. The teacher is waiting 22. for them to leave the room. P: "Wow it was really fun today, I like 23. working in the computer room" Teacher: "I'm glad you liked it, our 24. next lesson is going to be here too." They leave the computer 25. room. The teacher turns off the lights and closes the door.

Appendix 5: A Lesson Plan

Vincent Van Gogh

Topic	**Art For You And Me: Famous Painters**
Developed by	Efrat Baranetz
Date	October 2013
Grade	6th grade
Suggested Time	two lessons
21st Century Skills	• Copying and pasting pictures in a Shared Word document • Downloading and up loading materials. • Media Literacy (you tube, gallery) • Conducting a survey using Google Forms • Being creative • Being actively involved in meaningful learning • Collaboration - working in pairs and groups **HOTS** Applying your own life Comparing Contrasting Collaborative Work Problem solving and creativity Enhancing motivation
Domains	Social interaction Appreciation of language Access to information presentation
Purpose of Activity	• Pupils will be able to look for relevant information. • Pupils will be able to ask and answer what pictures they like. • Pupils will be able to fill in a shared-document chart and present their findings.

	• Pupils will be able to fill in and produce a google form. • Pupils will become familiar with Van Gogh's paintings. • Pupils will be able to write descriptive sentences. • Pupils will be able to react to the paintings.
Description of Activity	After learning about Vincent Van Gogh's life (Panorama Unit 2) the students will be exposed to more of Van Gogh's art work. 1. Introduction- teacher will show clip in Youtube of the song "Vincent" as a trigger to elicit topic. 2. Pupils will complete a listening follow-up assignment regarding the song in Socrative where results will be displayed on the smart board, and will be discussed. 3. Teacher will show pupils a PowerPoint of Van Gogh's Paintings. 4. Classroom discussion when showing the paintings for the first time: What is your impression of Van Gogh's art? Do you like his paintings? If yes, what do you like about them? If no, what don't you like about them? Do you like his style? What colors does he use? What can we learn about his life when looking at his self-portraits/ paintings? 5. Teacher reminds students that they learned from the textbook that Van Gogh did not sell any paintings during his life because people at that time did not like his style. He became very sad and depressed. Teacher elicits students' experience in life: "Have you been in a similar situation before - that you did something you thought was great but nobody liked it? How did you feel? What did you do?" 6. After learning about Vincent Van Gogh's life (Panorama Unit 2) the students will be exposed to more of Van Gogh's art work. See PowerPoint. 7. Paintings are downloaded from Wikipedia. 8. Second viewing: Students get a link to a shared document and a list of phrases and personal response questions for each painting and while viewing the art work for the second time they have to describe what they see and answer the questions in pairs. After students finish feeling in their chart in the shared document, they have to add comment on the shared document to at list 2 other pairs. Note: Personal response refers to questions that call for students' personal involvement. 9. Divide the pupils into groups of 4 each group will have to make a survey using Google Forms the pupils will choose their own format. Each group will ask questions regarding a picture it chose, and will answer questions other groups composed. Each group will process the information and the survey will help them choose their favorite Van Gogh's picture. 10. The groups will display in their favorite picture and the information about

	the picture in a shared power point presentation (Google Drive Presentation), that will up loaded to the school web site. 11. Summing Up-show movie Van Gogh: painted With Words on Youtube
Students' Outcomes	• Pupils will become acquainted with Van Gogh's paintings • Pupils will choose their favorite paintings and will be able to explain why. • Pupils will be able to write descriptions of the paintings • Pupils will give their personal responses • Pupils will have the ability to process the information in google forms • Pupils will have the ability to upload their projects to the school web site • Pupils will have the ability to save their recording under their playlists in Audioboo.
Homework	A virtual activity: Pupils will record their final thoughts and reflect on the activity using Audioboo.
Follow-Up	1. Pupils will present their projects to the class. 2. A QR Code will be generated for the recording and will be presented for the parents (on Parents Day) to be scanned and listened to.

Appendix 6: English Curriculum of the unit

Class: 6 **Students Course Book/s:** Panorama+ Grammar Worksheets 2

Content Pupils will know at end of unit:	**Language elements pupils will know at end of unit:**	**Assessment Planned** * at least 2 alternative tasks with rubrics * Tests or quizzes	**Assessment Results**	**Plan of Action & Reflection**: *Content/language to be reinforced * Pupils Who need help
<u>Art for You and Me</u> 1. Meet Van Gogh, Van Gogh Become Sick, Van Gogh Dies, Van Gogh today- a biography. Words that express feelings. 2. Nahum Gutman-An Israeli Artist- an article. 3. Listening: Famous artists and painters. 4. Elvis on Toast- an article and a recipe. Extra: Comic Art- an article	1. Present Progressive: Positive and Negative Yes/No questions Wh Questions 2. Imperatives.	1. Make two different pictures, and then describe the differences between two pictures. (Weaker pupils: describe the differences between two pictures). 2. Write instructions to make something (Weaker pupils: write instructions in order) 3. computerized based projects 4. Three dictations 5. Quiz-Present Progressive 6. Oral individual reading test at sentence and paragraph level. 7. Book Report. 8. Test: vocabulary, present progressive, listening comprehension, unseen, writing.	See in lesson plan	

Additional Tasks	**Reading & Writing Strategies Targeted**:	**Targeted benchmarks according to Domains**:		
1. Yitzhak Rabin Memorial Day activity. 2. Hanukka activity. 3. Pupils will review content and language through games on the computer. 4. Pupils will learn two new songs (topic related) 5. Math week in school- Pupils will take part in English math activities.	*Understanding general meaning, main idea and sequence of events. * Using a glossary. * Locating relevant information * Identifying different text types. * Identifying feelings.	• Access to information • Social interaction • Appreciation of language • Appreciation of literature and culture • Presentation		

Appendix 7: Interaction Level Indicator

Class Organization	**Audience** 1	**Individual** 2	**Groups as Separated Units** 3	**Coordinated Groups** 4
	Students are seen as individuals forming a class	The class is a single entity in which all the students go through the same sequence of experiences	The students are members of a small group, the group belongs to the whole class	Small groups working with shared means and outcomes while connecting and communicating with the other groups
	The whole class is issued the task	There are patterns of individual organization and working in pairs for a short time in certain tasks	Initially the groups are working for a short period of time, and then for a longer period of time, depending on the nature of the task	There are "organizations" between the groups (coordinating committee, Moderator)
	The whole class is taking part in a similar and equal activity		The group operates as a standalone system performing similar tasks to the tasks of other groups	At some point the class returns to function as a single organization
	The class works as one group, the individual wishes to fit in		Groups are not connected to each other	Dealing with the learning outcomes of the group in a socially cooperative climate
	Knowledge and learning are centralized in school , inside the classroom		Groups are organized randomly	Distributed knowledge, the principle of mass media and distance learning synchronous and asynchronous
	Higher levels of organization of the classroom do not contribute significantly to the learning			Creating learning networks with unlimited number of students
				Dismantling the structure of the classical classroom, flexible and differential organization of the learning according to the needs

Learning Task	**Homogenous** 1	**Homogenous or Special for Individuals** 2	**Divided Between Group Members** 3	**Divided Between Group Members and Correlated with the Other Groups** 4
	A task characterized as homogenous and individual	One homogenous Task divided into two parts	A complex task divided into sub-tasks	Completeness within the group attempt to create a group model
	Each student performs the task by himself at the same time with the rest of his classmates	The completion of the task is adding both parts to one outcome	Each member of the group learns a small part and later adds it to the group's outcome	Each group is engaged in other aspects related to the class theme
	The task should be performed in full	The task requires one lesson or a part of the lesson	Most of the task is independent and ends with a report to the group	Holistic stage, including relations between groups dealing with comprehensive approach of the theme
	The structure of the task and the presentation of knowledge is hierarchical and linear	The does not require dividing of assignments (only as a mean for saving efforts)	Sharing means, processes and outcomes	The adjusted learning task is distinctive in essence and includes specialization in specific elements of the overall theme
	There is one goal to which the process leads to		Longer time is allotted for the task	The completeness of the learning task is a process between learners and no within an individual learner
	The text book forms the standard knowledge for the field / discipline		The Group operates in interdependence and unique contribution of each member to achieve the goal of the group defined in the task	The use of artificial knowledge representation (Hypermedia and databases) allows the student to complete the learning task in the same context but within different targets
	The more learning time=the more knowledge, brings to a waste of time			The individual shapes the quality of learned knowledge and its significance using his own interpretation
				Significant utilization of time

Learners Behavior	**Class=Audience of individuals** 1	**Individuals creating an activity with one or two individuals** 2	**The learner as a member of a subsystem** 3	**The learner carrying a dual role: a member of a group and a member of a class** 4
	The student's self-esteem is with relation to others	Short contacts between pairs of learners	Working in groups and teams of 3-6 students	Developing the skills of acting in a group with connection to other groups
	Development of social skills of competition over learners' appreciation and the teacher's attention	Social skills of relating to others, the perception of the other as another source of ideas, mutual reciprocal activities	Attentional skill-development, speaking in turns, equal participation, tolerance and coordination	Experiencing the processes of socialization that characterize the human society, with the aim of synergistic integration in the classroom
	The teacher as a 'reward' provider, is the most significant figure for the learners	There is a movement in the classroom as a part of an agreement between the teacher and the students	The performance of the task is individual, but there is group sharing at the beginning and the end of the task	Developing learning skills of problem design and problem solutions
	Development of social skills connected to the relationship with the teacher	One-way and two-ways communication between pairs of students	There is an understanding among the students that in order to achieve academic goals, a social supportive climate in class must be created	Focusing the learning on research
	Partially ignoring other students, who are not considered as a source of ideas to refer to, for achieving educational goals	Partial skills-development of learning and teaching, still within the limits of absorbing information	Students' emotional capability to give and receive feedback	Developing the skills of negotiation, discussion capabilities, critical comparison, evaluation, organization capability and finding comprehensive contexts
	Passive learning skills of absorbing information		Multi-directional communication which is done mainly by the teacher's guidance	Characteristics of initiative, creativity, personal involvement and interactions
	Learning communication: one-way or two-ways if the learner is required to respond			Development of a team learning skills while creating connections to the class assignment

Teacher's Activity	Teacher as a Lecturer 1	Task-Designer for Individuals and Learning Supervisor 2	Advisor and Groups' Guide 3	Groups' Coordinator 4
Organization and Leadership	The teacher manages all activities with no regard to personal pace	There is an initial distribution of authorities and responsibilities	Using a variety of methods for supervision in the classroom	Teachers take part in the learning challenge while dealing with the learning process without knowing the path and final goal they are about to reach with their students
	The teacher evaluates students' achievements in the class and initiates discipline rules	The learning process is mainly Self-learning supervised by the teachers and without full reliance on them	Emphasis on socialization processes of students while creating a new organizational climate	The teacher as a task leader rather than an authoritarian leader
	Teachers perceive their role as passing knowledge to their students and believe they knows more		Training students to work together in groups	The teacher as a facilitator for groups to reach a comprehensive conception of the subject by the exchange of information and ideas between groups
			Teacher raises controversial issues, teaching concepts and principles of thinking, guiding through the learning tasks	
			The teacher is a source of intellectual stimulation	
Communication	Communication is done mainly by the teacher, students are not allowed to speak with no permission	The amount of the teacher's Talking is greatly reduced, there is development in communication between students but it is still under the supervision of the teacher	Students create multi-directional communication networks; the teacher contributes to the development of communication within group members. Teacher is watching and listening to students' activities in order to be updated regarding their achievements and understand their difficulties	The teacher is interconnected with: organizational and content coordination between individuals, groups and the whole class
	Conversation is focused on formal content and does not relate to personal perceptions	The teacher is not always aware of what is happening in every engagement, and occasionally centers networks to get updates regarding the events	The teacher is available to help during key stages, using more thoughtful and supportive attitude	

STATEMENT ON ACCOUNTABILITY

I declare the personal liability that the materials presented in this thesis are the result of the research and scientific achievements. Aware that otherwise, is to suffer the consequences in accordance with the law.

Baranetz Efrat

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Curriculum Vitae

Personal information
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Work experience
2006-2015: "HOVAV Community School", **English teacher**.

1996-2006: "DROR Educational and Cultural Campus", **English teacher**.

1999-2002: "The College of Management Academic Studies (COMAS)" Beit Berl College and Hadera Extension, **English lecturer**.

1995-1996: "Hadasim" high school, **English teacher**.

Education and training

2001-2002: **M.A in Education**, **with distinction**, pathway: Information & Communication Technology (ICT), "University of Derby", Extension in Israel.

1992-1996: **B.A in Geography and English** pathway combined: literature and linguistics, "Hebrew University", Jerusalem.

1994-1996: **Teaching Diploma** in English, "Beit Berl" College.

1984-1989: Marticulation Certificate, "Hebrew University High school", Jerusalem.

Language(s)
Hebrew - Mother Tongue English – Mother Tongue level

Personal skills and competences Paramedic: Magen David Adom (MDA) volunteer.

Additional information and annexes
Computer knowledge: Office: Word, Power Point, Excel Internet, Access, Flash, Publisher, Flow Works (smart board) Leading teacher in teachers' training: "Intel Teach to the Future Programme".