DOKTORI (PhD) DISSZERTÁTIÓ

Enhancing Education through Technology

Az oktatás erősítése a technológia révén

Saleem Omar Abu-Abduh

2010

ELTE

EÖTVÖS LORÁND UNIVERSITY

Faculty of Pedagogy and Psychology

Institute of Pedagogy

For PHD Degree

The Dissertation titled

Enhancing Education through Technology

Prepared by:

Saleem Omar Abu Abduh

Supervised by:

Dr. Shaffhauser Franz

EÖTVÖS LORÁND TUDOMÁNYEGYETEM

EÖTVÖS LORÁND UNIVERSITY

Neveléstudományi Doktori Iskola

PhD- School of Pedagogy

Vezető/Head: Prof. Dr. István Bábosik

Saleem Omar Abu Abduh

Enhancing Education through Technology

Az oktatás erősítése a technológia révén

Témavezető/Supervised by:

Dr. Franz Shaffhauser

Tudományos bizottság/Scientific Committee:

elnök/chairman: Prof. Dr. Péter Medgyes

belső bíráló/opponent 1: Dr. Éva Major

külső bíráló/opponent 2: Dr. Attila Horváth

titkár/secretary: Dr. Sándor Lénárd

tag/member: Dr. Endre Barkó

tag/member: Dr. Hassan El-Sayed

tag/member: Dr. András Emőkey

2010

Acknowledgment

I thank Allah (God) Almighty for his graces & blessings "That is the Grace of Allah, which He bestows on whom He wills. And Allah is the Owner of Mighty Grace." Surah Al-Jumuah verse 4.

I would like to express my deep love & appreciation to my mother for her encouragement since my childhood up to now to continue my study and researches.

I would like to thank my wife for her patience and keeping comfortable study atmosphere while I was bogged down in my study.

I would like also to thank my daughters (Nada and Amani) for helping me during my research.

Profoundly, I would like to express my thanks and appreciations for Prof. Dr. Schaffhauser Franz for his continuous support, help, and patience.

Saleem Omar Abu Abduh

2010

TABLE OF CONTENTS

Introduction and Research Methodology

Introduction

The significance of this study comes from the consideration and linkage of all relevant education process elements and factors by specifying their roles and tasks and developing them to be part of the transforming, whether it is directly or indirectly involved in the education process.

The general problem all over the world when they start transforming the schools to the 21st century Digital Age is that they neglect some of the elements and do not identify the roles of each element and the required task and then link all the elements together in order to achieve the required transforming.

Moreover, it is not just having the technology on hand but how best to utilize it. So it is the whole society readiness and development which will bring about the correct transform.

The other important part of my study is that there is no existing bench mark theory for measuring the bench of applying the technology which I have presented and illustrated in my study.

The development of any nation depends on its educational level and continuous process improvement to catch up with latest international developments in all fields.

Therefore, for such a development to be effective and fast, the latest education technology should be utilized to make the educational process easier, faster and more precise and overall more interesting, attractive and fun for students as well as teachers which we could say that technology could help enhancing the education faster. As the attractions are increasing quickly taking away the attention of the students towards education.

Transforming your classrooms into the 21st century learning center with cutting-edge technology requires a great and continuous efforts which are not understood by many people whom they think that using technology in education is just fun without realizing that soon if they will not utilize the education technology in education they will be left behind as past history.

All the people involved in the educational process should be aware of the best utilization of education technology according to the roles they are involved with. They

should learn how to integrate all the education process through technology not part by part, as a simple example if the school starts the transform and the principal has no idea of what and how the transform to Digital Pedagogy will be implemented and how it should be integrated with core academic contents in lesson plans and how to increase student participation in classrooms and increase the learning potential of the students with technology, the Web, interactive games, desktop publishing and moviemaking, implement an innovative curricular framework to stimulate critical and creative thinking especially among young learners, motivate them with real-world learning activities that develop problem solving collaboration, and effective communication skills and engage them with school development, if all the above is not considered that means it is wasting of money efforts,...etc.

In my study, I explained the Process of Transforming to the Digital Age in 13 chapters as the following:

Chapter 1:

Understanding the Digital Age Culture The 21st century new culture (Digital age culture), understanding the new culture is the key of success to start implementing the technology to enhance the education.

Chapter 2:

21st century Learning Spaces Design in School building Design and the necessary infrastructure to accommodate and enable the best utilization of educational technologies

Chapter 3:

Leadership plays a key role in the successful school reform. The effective 21st century administrator is a hands-on user of technology. Much of the benefit of technology is lost for administrators who rely on an intermediary to do their e-mail, manipulate critical data, or handle other technology tasks for them.

Chapter 4:

Preparing Teachers for Blending the Pedagogy with ICT Teachers the core of the education process without preparing them for blending the pedagogy with ICT, it means, no development towards Digital Pedagogy.

Chapter 5:

The Digital age 21st Century student. Students need guidance and support during their studies. In the digital age students need to be skilled computer users and able to deal with different types of media in order to study effectively.

Chapter 6:

Parents Involvement in School Education Technology Process Parents should be acquainted with the basics of computers and to be able to communicate through the internet with the involved education elements, and they should understand the new era in the education and the concept behind the transforming.

Chapter 7:

Integrating Technology into the Curriculum (Curriculum Reform) Applying education technology requires a Vital and effective Curriculum (curriculum reform) in order to utilize the education technology and to help teachers to easily prepare their lesson plans.

Chapter 8:

Instructional Design and Educational Technology. Instructional design should be redesigned to infuse the teaching with a new effectiveness and vitality in order to utilize and incorporate the new technology into the creation of 21st century teaching classrooms environment.

Chapter 9:

Authority and Government Role for Implementing the Education Technology. The Authority and Government support and help, leading the national drive to ensure the effective and innovative use of technology throughout learning.

Chapter 10:

The Experiment (the Case Study) and My Zero Defect Education Technology Bench Mark.

Chapter 11:

The Technology and Multiple Intelligence. Technology can be used to facilitate learning in each intelligence area. There is no "right way" to integrate intelligences or technology into the classroom. The key is to provide the most effective learning environment for students.

Chapter 12:

The Education Technology and Disabilities (Assistive Technology). Despite adequate cognitive ability, learning disabled students' difficulties with basic skills such as reading and writing can prevent full participation in the classroom and later in critical adult life activities. Computer technology provides the answer for many of these students.

Chapter 13

Here are in this chapter some suggested Education Technology Products that help teachers as well as students in introducing technology into education .

The Merits of Digital Pedagogy

- Utilizing the digital pedagogy (Pedagogy and ICT) gets the ATTRACTION for the education back and encourages students and teachers for productive work. This attraction is competing with the attractions around us during this century which normally attracts most of the people more than education.
- It is an INCENTIVE for all the people involved in the educational process
- It makes the school STIMULATING for the student.
- Increases the INITIATIVE of the student
- It MOTIVATES the students for more CONTRIBUTION during the classroom or for homework.
- It makes it easier for the INCLUSIVE EDUCATION for the special needs education.
- It is ENCOURAGING LIFE LONG EDUCATION , by utilizing E-LEARNING
- Enjoyment (Learning With Fun), Engagement.
- Control, Autonomy, Responsibility.

- MULTI EDUCATION RESOURCES TO CATCH UP WITH THE FAST SCIENCE DEVELOPMENT (Extended Access).
- EASY COMMUNICATION AND FOLLOW UP among all the people involved in the education process.
- BEST UTILIZATION OF CLASS TIME and MANAGEMENT
- Helps the teachers for PLANNING & TRACKING , (Learning Management Solution) LMS
- Reaching the ultimate education by satisfying the senses according to the desired learning style.
- Helping the school management and supervisors to setup the subjects schedule and teacher's continuous follow up.
- It makes it easier for student's assessment and improving assessment quality and over all school performance and students achievements and teachers performance.

The following will show the Education Transformation Wheel:

Education Transformation Wheel

Cyber School Technology Solutions

The Recommended Implementation Approach

The recommended implementation approach for integrating or inserting technology must focus on comprehensive planning that involves all of the stakeholders. Critical factors include establishing a vision for the plan, utilizing existing and emerging resources, basing technology decisions on curriculum and instructional needs, focusing on student needs, and providing for local staff development and follow-up assistance.. The approach for implementing technology emphasizes a series of operational steps for integrating technology into the existing instructional program which include:1) establishing a stakeholder planning committee, 2) coordinating with existing plans, 3) identification of student and program needs, 4)identification of available resources to support the plan, 5) curriculum integration, 6) establishing goals and objectives, 7)developing related classroom-based plans, 8) staff development, 9) evaluation, 10) budget and funding strategies, and 11) implementation strategies.

It must be emphasized that school and district plans can only be implemented if teachers are developing and implementing classroom plans or projects that directly support the objectives of the school and district technology plans. The overall recommendations for the basic approach suggested for educational technology planners, developers, and implementers are:

1. Involve educators in the development of individualized instructional applications of technology as part of the overall school level planning process.
2. Ensure that local insertion of technology is driven by the curricular and instructional needs of the school site.
3. Coordinate all technology insertion with the existing national school district, and school level educational reform priorities.
4. Ensure that evaluation of the approaches used in technology implementation are evaluated and that evaluation be used to inform improvements in the program.
5. Developers of technology-based resources must conduct testing at school sites within the context of the school and classroom instructional plans.

6. The government should develop and implement technology plans that leverage and coordinate technology-based resources within and between agencies in resources to support the local implementation of technology.
7. The government should develop a national technology plan that coordinates agency resources to help build the capacity of states to develop, fund, and implement their own technology plans.
8. The government, planners and implementers must be proactive about procuring new, and leveraging existing funding and resources to actually implement plans and to recognize that plans are necessary pre-requisites to obtaining funding and resources.

I hope my study be useful for the new era and meets with the best requirements.

Research Plan and Methodology

My experiment hypothesis will cover the following:

1) Classroom and Student Level:

I will select two identical classrooms with students relatively similar in grade levels, but each classroom the students' grade levels are varied. Then, I will apply the education technology on one of these classrooms and make my experiment on them.

2) The Teacher Level:

I will select two teachers for each subject (mathematics, English and science) with the same level of experience and then train one of them on how to utilize and use the education technology for teaching in order to be in the classroom that is going to use the education technology in .

3) The Studied Subjects:

I will select three subjects to be taught in the classroom using the education technology:

1) Mathematics.
2) English language.
3) Science.

What am I Looking for in the Investigation During my Studies?

1) The effect of education Technology in the Digital Age on all of the educational Process.

2) The effect of using the technology in enhancing the education and the size as a percentage.

3) Will the schools be successful and attractive if they are not using the technology and what is the effect of not using it?

4) The effect of my experiment on the schools and teachers that are not using the technology.

5) If the student likes or dislikes using the technology , how will that affect the results of my experiment and how to solve this problem.

6) Will applying the education technology in the classroom raise the students' level in the same class?

7) The satisfaction of the parents.

8) The result of my study and research, and my Zero Defect Education Technology Bench Mark.

Research Subject:

I will try in my research to find and prove how technology could enhance the education through one or more of the mentioned directions above.

Research Methodology:

Through my study I will do a real and actual experimental application by having a sample to study on and then I will study and analyze the characteristics of the experiment then I will show how I applied the experiment, then I will observe the experiment and record all the observations and then I will write the conclusion .

Chapter 1

Understanding the Digital Age Culture

Understanding the 21st century new culture (Digital Age Culture), is the key of success to start implementing the technology to enhance the education.

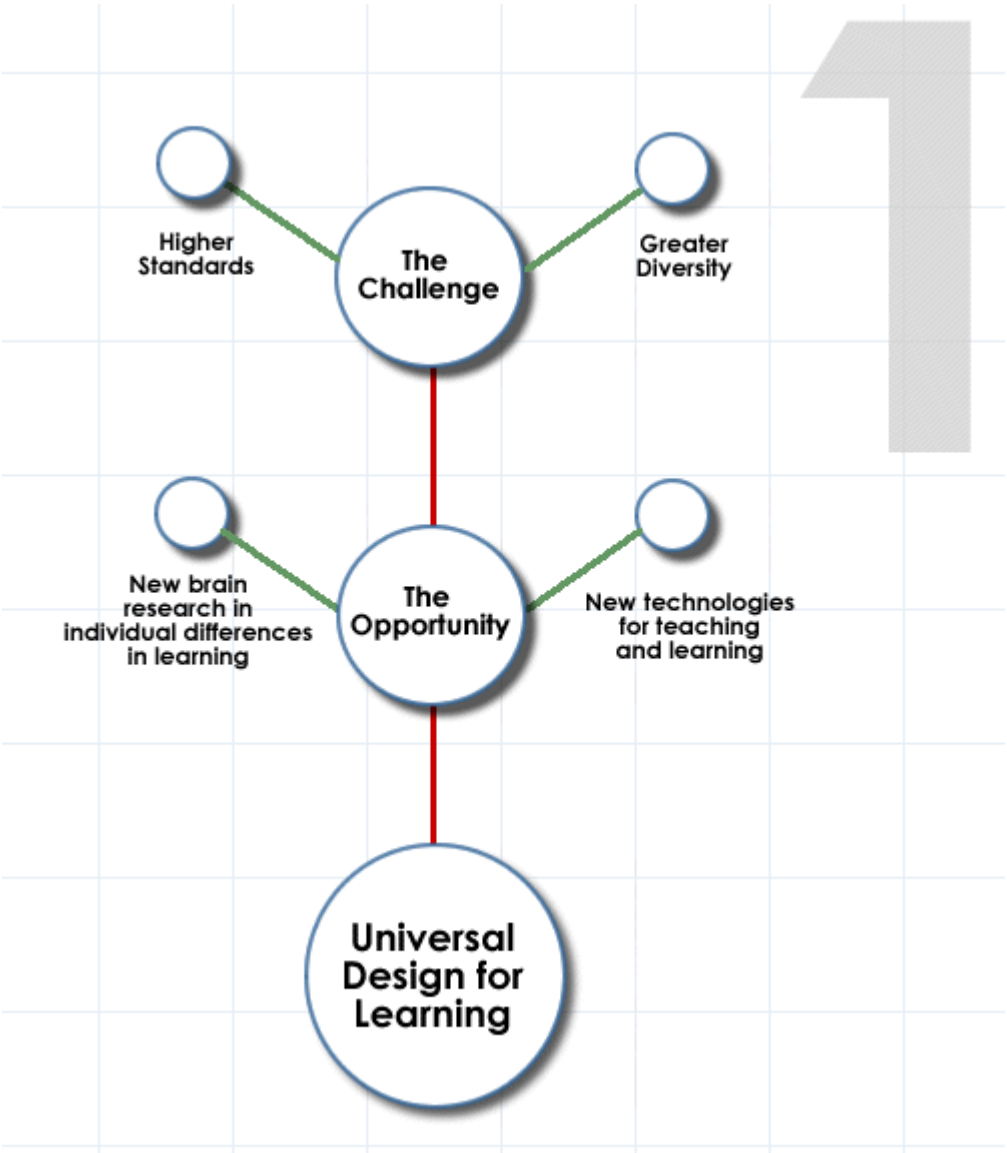
1-1 The Global Technology Culture

It is not Roman culture or Greek culture or Indian culture…etc., it is the Global Technology Culture which now (in the 21st century) is dominating all cultures, in different ratios, some countries more than others, and it depends on if you are contributing on this technology or not if you are not contributing at all you have to watch out your historical culture or one day it will be dominated totally by the Global Technology culture.

Whether you like it or not if you don't use the technology in your education system you will be far a way from being on the latest trends and the update of all sciences which daily changing, you can not depend only on the text books for teaching, but should use all the available resources which are available on the internet or the specified servers.

Let's be more specific, using the technology in education is a must not an optional or your education system will be part of the old history.

The following Figure 1 shows the education in the digital age elements:



1-2 The Digital Age

If the last century did so much to reinvent the art or science of teaching, why does pedagogy need to be re-thought again just now? This is a particularly urgent question in relation to the new digital technologies, because teachers who are excited about these technologies are often accused of using them regardless of whether or not they are pedagogically effective. and even in ignorance of the long tradition of pedagogical evidence and thought. 'pedagogy before technology' is a common catchphrase of reflective practitioners in this field, suggesting that - far from trying to create pedagogy a new - we should be in the business of Locating the new technologies within proven practices and

models of teaching. A second aspect of this argument is that there is nothing new about technologies for learning. Papyrus and paper. chalk and print, overhead projectors. Educational toys and television, even the basic technologies of writing were innovations once. The networked digital computer and its more recent mobile and wireless counter-parts are just the latest outcomes of human ingenuity that we have at our disposal. Like previous innovations, they can be assimilated to pedagogical practice without altering the fundamental truths about how people learn. While this hook will situate discussions about the new technologies for learning firmly within established educational discourse. We also contend that these technologies represent a paradigm shift with specific and multiple impacts on the nature of knowledge in society, and Therefore on the nature of learning. In rethinking pedagogy we are not trying to define some new aspect or area of the discipline: we are trying to rearticulate the entire discipline in this new context.

So how do digital technologies constitute a new context For learning and teaching? The technical advances are relatively easy to identify. Podcasts and wikis are democratizing the creation of information: social software is allowing participation in online communities that define and share the information they need for themselves. Individuals have access to processing power in personal applications that even five years ago would have been confined to specialist institutions. Personal mobile and wireless devices are increasingly integrated with the global computer network to provide seamless, location-independent access to information services.

But what of the Social and cultural changes that have accompanied these technical developments'? The phrase ‘ in formation age' was coined by Manual Castells (1996) to describe a period in which the movement of information through networks would overtake the circulation of goods as the primary source of value in society. Some of the social and cultural reorganization that he predicted can already be traced in the ways that the contexts of education are changing.

Epistemologically for example, what counts as useful knowledge is increasingly biased towards what can be represented in digital form. Many scientific and research enterprises now depend on data being shared in the almost instantaneous fashion enabled by the Internet. Vast libraries are being digitized, and disputes over access to this information look likely to determine the face often internet over the next few years. Academic institutions

have a central role to play in these disputes and in how the conflict between digital commons and digital consumerism is played out.

However, less thought has been given to the knowledge that is forgotten or lost in the process of digitization: practical skills, know-how that is deeply embedded in the context of` use. Ironically, it may be exactly this kind of knowledge that is drawn on by effective teachers, and by effective learners too. The nature of work in Western societies is also changing out of all recognition, and learning institutions have changed their offering in response. As more and more jobs demand information literacy, higher education has become a goal. Often young population. Learning has been refigured as the acquisition of information skills - new forms of literacy and numeracy. adaptability. problem solving, communication - rather than the acquisition of a stable body of knowledge. And as the job market demands ever more flexibility and currency, post-compulsory education has been reorganized around a model of constant updating of competence, also called continuous professional development. These changes have usually been driven by education department directives, or the demands of professional bodies and employers, rather than by learners themselves; nevertheless the underlying rationale is the preparation of learners for work in the new information economy.

Technology has also had a profound impact on educational organizations them-selves. Schools and colleges are being networked in a learning grid that cuts across traditional institutional and even sectoral divides. Learners have increasing opportunities to take their learning from place to place, in the form of e-portfolios and learning records. and to make choices about how, when and where they participate in education. They are also likely to interact differently with those institutions once enrolled: they may use a public web site to find out about courses, contact tutors by email, access resources through an information portal or virtual learning tutors by email, access resources through an information portal or virtual learning environment [VLE), and take examinations via a computer-based assessment system, The wholly virtual learning experience is still a minority choice, and most such courses are provided by specialist institutions such as the Open Universities.

But institutions of this kind are now competing with more traditional universities and colleges for market share, and this is having an impact on the way that all educational institutions relate to their learners and to potential learners in their communities.

Finally, those learners are changing. Most young people in societies make routine use of the internet and email, text messaging and social software, and their familiarity with these new forms of exchange are carried over into their learning. Whether or not they use the `e-learning` facilities provided by their institution, learners will use the communication and information tools they have around them to help manage their learning. Some of the habits of mind associated with these technologies are regarded by teachers as unhelpful, particularly the often uncritical attitude to internet-based information, and the cut-and-paste mentality of a generation raised on editing tools rather than pen and paper. The brevity of chat and text pose a challenge to traditional standards of spelling and grammar, and there is no doubt that the use of personal technologies creates new inequalities among learners. Teachers should be free to respond critically as well as creatively to these new technologies, but they cannot afford to ignore them if they want to engage with their learners.

Many others have covered this terrain - but it dose take change within and beyond the educational organization as essential background for understanding the new pressures on learning and teaching. Against the argument that new technologies make 'no significant difference' (Russell 2001),we contend that learning is a set of personal and interpersonal activities, deeply rooted in specific social and cultural contexts. When those contexts change. How people learn changes also. We do not intend by this argument to suggest that educational practice is determined by technology. The developments outlined in this section were not pre-destined when the first two computers were networked by Thomas Merrill and Lawrence G. Roberts in l 965. Such events may dictate that our society and its relationship with knowledge will change, but not what Form or direction those changes will take. Understood as a social and cultural phenomenon, technology cannot but influence the ways in which people learn, and therefore what makes for effective learning and effective pedagogy.

The idea of ‘effectiveness’ in this discussion should alert us to the fact that pedagogy and technology also involve issues of value. Just as the impact of technology is changing how knowledge is valued in our society, so it is changing how we value different kinds of learning and achievement and different models of the learning organization. Some values, such as the values of the marketplace and the values of the traditional academic institution, are brought into conflict by the effects of technology.

1-3 Transforming Culture in the Digital Age Website!

Increasingly, we see new forms of culture being born in the variety of online environments. Users have become producers taking over production of online content and traditional hierarchies of users and producers are collapsing. At the same time, traditional memory institutions like museums, archives, libraries and acknowledged artists struggle to make sense of the transformations that are coming together with new technologies .

1-3-1 Cultures and Nations Will Change

What originally defined a culture? Geography. We were all once one tribe, one family. But we wandered, climbing over mountains, bridging rivers, navigating seas. We settled. And it was the mountains, rivers and seas which bounded and housed us, became the pot in which a new culture would stew.

The Internet will ultimately greatly reduce geography's historical defining force. This collapse of geography or 'death of distance' as some have called it, will ultimately open up the opportunity for new tribes and cultures to emerge in what we now term cyberspace .The space created when computers and telecommunications marry.

1-3-2 The Internet: Key to the Change

The Internet will increasingly become the world in which much of this change happens. I say 'world' deliberately because I feel that to think of the Internet as a technology is to greatly underestimate its potential.

Those of us lucky enough to be on the Internet today are pioneers gazing across a vast and expanding landscape. Like the first homosapiens we will find things that are hard and shiny. Some of us will throw these things away. Others will see their value and maybe name them 'diamonds,' 'gold.'

Those brave enough will risk, test, figure, explore, look to the distance to expand our horizons. Eventually -- in a year or two -- we will settle on a piece of cyberspace, judging it to have potential.

We will sweat and toil, irrigate, mould and develop. We will in fact be preparing the ground ,draining the swamps, cutting roads through rock, clearing trees, laying down the railway track for the time around the turn of the century when the masses will feel comfortable enough to venture forth en masse into this new land, cyberspace.

All I do know is that old thinking was okay for the old world we are now leaving. We need new thinking for the Digital Age.

1-3-3 Perceived Benefits of the Internet to Culture and Society

The benefits of the Internet that are mentioned most frequently are its perceived benefits as a means to information, communication, commerce, entertainment, and social interaction. These are all functional aspects of the internet: most of its applications and services have been designed explicitly to serve such functions, and many people that the Internet successfully performs these functions. In addition, the Internet has been claimed to have benefits that are less intentional: benefits to individual development and cultural understanding, particularly. The following list of major perceived benefits is suggestive but not exhaustive:

1. Access to information. The Internet makes a vast amount of information available, from a plurality of information sources, and makes it continuously available, more or less independent of time and place. Adequate information is of major importance to the successful functioning of (modern) individuals, and therefore any enhancement of the ability to acquire or access information can be seen as a great benefit to society.

2. Information dissemination. The Internet makes it possible for anyone to quickly, easily and inexpensively post and disseminate information and make this information available to a large audience. In this way, the Internet promotes freedom of speech by enhancing the ability of individuals to voice opinions and inform and influence others, which can be considered a great benefit.

3. Communication. The Internet facilitates one-to-one, one-to-many and many to- many communications and enables users to communicate easily and inexpensively with a wide variety of individuals across the globe.

Communication goes beyond the dissemination of information: it is a two-way process that allows for the expression of viewpoints, the creation of intimacy, and the coordination of actions. Because communication is so important to individuals, the Internet's enhancement of the power to communicate can be considered a great benefit.

4. Developing and maintaining social relations. The internet facilitates the development and maintenance of social relations with people outside one's immediate vicinity, and provides added means to maintain relations with people in one's vicinity. Social relations are very important to the functioning of individuals and of society as a whole, and the Internet provides powerful means for developing and maintaining such relations, which is a great benefit.

5. Community formation and social organization. The internet facilitates the development and maintenance of communities of individuals with shared interests and concerns and the formation and maintenance of structured organizations with specific agendas. The Internet also provides new ways for individuals to engage in collective behavior and form social movements.

Community formation and social organization are important in any society, and any technology that provides new means to support these processes can be seen to provide important benefits.

6. Production and Commerce. The Internet enables new models for production by enabling coordination and partial automation of productive processes that span time and space. The Internet also enables new models for commerce, trade and business. These economic benefits translate into social and cultural benefits because they provide people with new products and services and faster and easier delivery of existing products and services at less cost.

7. Leisure and entertainment. The Internet enables new forms of leisure and entertainment, both for individual use and in interaction with others, such as playing games and providing forums for collectively practicing hobbies and for sharing and trading cultural objects like pictures, stories, drawings, software, music, and video.

8. Identity formation and psychological development. The Internet has been claimed to have positive effects on identity formation and psychological development by allowing people to experiment with alternative identities, to hide aspects of their identity that could meet with disapproval or stereotyping in face-to-face situations, to reveal aspects of themselves in relative anonymity, that they would not reveal in real life, and to expose themselves to a very broad variety of views and opinions (Turkle, 1995; Rheingold,2000).

9. Learning and cognitive development. The Internet has been claimed to have beneficial effects on learning and cognitive development. It has been claimed that the Internet, and computers more generally, support interactive learning styles, enhances learning by supporting new multimedial ways of presenting information, and the development of good sensorimotor abilities (Van Dijk, 1999).

10. Cultural understanding. It has been claimed that the Internet can promote a better understanding between cultures and cultural identities by enabling people from different cultural backgrounds and with different social and cultural identities to come together and communicate with each other under conditions that are conducive to cultural exchange (Ess and Sudweeks, 2001).

1-3-4 Education in the Digital Age

Modern educational trends are rapidly moving away from the traditional "chalk and talk" methods of education to more interactive, progressive outcomes-based education. No longer are learners expected to sit passively and absorb information while the teacher drones on in the front of the classroom. Instead they are encouraged to discover things on their own. The premise is that we learn better from personal discovery than from passive listening.

Classroom environments are also changing rapidly with student numbers and diversity increasing constantly. Teachers are faced with the dilemma of how to reach more students at a time, as well as how to teach students of varying cultural backgrounds, languages and abilities in a single classroom. Traditional teaching methods are simply not suitable for the dynamic and diverse face of the modern classroom.

Instead of simply writing tests and reports, children now engage in a host of different learning activities all offering different media to assist the learning process. They can use

more traditional media such as posters, oral reports, written reports; or artistic media such as paint, clay, or collages. Alternatively they can use digital media in the form of voice or sound recordings, podcasts, videos, or interactive computer programmes.

Learners in some countries are already able to study their prescribed books in both the paper and electronic formats. The digital text can be ready aloud by the computer at varying rates so that students studying in a second or third language can learn at their own pace. Prompts, embedded in the digital text, provide support for learners who struggle with reading comprehension strategies such as summarizing, predicting and questioning.

Class projects no longer need to gather dust in the corner of the classroom until they are finally thrown away and forgotten, they can be digitised and incorporated into the class's website or shared on social networking sites such as Facebook.

Parents, teachers and students volunteer at designated centres, where they digitise printed texts, including prescribed books and special project-based content. The newly generated digital material ranges from texts which can be read aloud by computers to multimedia science experiments. These are stored in digital libraries where teachers can access them and customise them to meet the needs of individual students.

Online classrooms are gaining popularity and even multi-user virtual environment websites such as Second Life, are being used as educational tools. In the latter case it is believed that the interactive visual setting increases the depth of experience and enhances learning. Such technology would be especially useful setting where teachers are in short supply and so many learners are situated in remote areas.

Today technology-driven change defines human desires, anxieties, memories, imagination, and experiences of time and space in unprecedented ways. But technology, and specifically information technology, does not simply influence culture and society; it is itself inherently cultural and social. If there is to be any reconciliation between technological change and community will come from connecting technological and social innovation , a connection demonstrated in the history that unfolds.

Contemporary life is mostly a technologically mediated life. Our identities are to a great extent determined by the roles we play in our society. And these roles are often created and constrained by, if not wholly dependent upon, our technology. In its many forms, technology is both something we create "an expression of our understanding and our mastery of the world" and something that recreates us, fashioning new roles and reshaping old ones.

According to Alvin Toffler, author of Future Shock, “The illiterate of the future will not be the person who cannot read. It will be the person who does not know how to learn.” Continuous learning is ageless. Organizations can expect its relevance to grow as a D-Age value. In fact, most large corporations have adopted continuous learning as a core skill. Even so, many companies are still unsure of how best to institute an effective learning program into their organizations. Utilizing training conventions from the Industrial Age is a recipe for failure in the D-Age because it does not involve learning. Traditionally, organizational learning has been content-driven, often leaving out the most important element in the learning process—purpose.

In the D-Age infrastructure, education has a four-fold purpose:

- To transmit and extend corporate values.
- To educate in methodologies and technique.
- To generate the conception of new ideas.
- To communicate paradigm shifts.

The D-Age tools of learning focus on process-utilizing methods such as systemic mentoring, scenarios training, learning extension, and purpose illustrations. Learning occurs by acting and interacting. Companies should make room for trial-and-error experiences that are passed along the organization because it allows employees to learn the best methods for solving problems.

In addition to teaching techniques and methodologies, transmitting corporate values is vitally important to a corporate education program.

1-3-5 TECHNOLOGY AS CULTURE

THE TECHNOLOGICAL IMPERATIVE AS HISTORY

The Discussion so far has highlighted the tendency to establish a hierarchical relationship between technology and culture in the analysis of global relation.

The hierarchy asserts technology as the dominant dynamic influence, the transnational force and culture, in general, as the static bounded notion of national or country culture. The Fukuyama thesis extent this fundamental approach to the point of identifying it as a defining characteristic of the 'end of history' and its ' universal' nature. The distinction between technology and culture disappears and technology takes over as culture. In order to be clear about the implication of such a conclusion we need to probe further the meaning of establishing a hierarchical approach to the relationship between technology and culture in the investigation of global political economy. This hierarchy locates technology as the subject and culture as the object: technology as the realm of effective influence and action. And culture as the receiving domain of that influence and action. Culture may influence the degree to which technological goals may be successful or otherwise, but the technological imperative establishes the rules of the game. In order to express the global power of technological developments, such an approach abstracts technology and culture from once another and opposes them in a way that fixes the power relationship between them. Just as other familiar oppositional framework such as man/ women or science/nature assert a subject/object power relationship, so does this approach to technology/culture.

Critical recognition of the need to explore exactly how technology and culture are being related to one another in any form analysis disrupts any idea that such analysis can be regarded merely as description of what is being claimed as the real conditions of global existence. The team 'merely' is the key one hear.

While the analyst may argue that the power of technology as a global force justifies such a hierarchical framework, that still does not tell us everything we may need to know about the effects of its adoption. In fixing the supremacy of the power of technology over culture, this hierarchy also inhibits any open consideration of possible interaction between culture and technology factors.

Interest in culture is strictly delimited in line position as the object of technological influence. This interest then focuses on the degree to which cultural factors favors or disfavor technological developments. These, broadly speaking, become the parameters of interest in culture. And culture, in the context examined here, tends to be a bounded culture, or cultures, to be more precise.

The problem is compounded by the utilization of this hierarchical perspective on technology and culture in explanation of global history. While this is over in the Fukuyama thesis, it is clearly also a consideration with regards to the Kennedy and Skolnik off investigation referred to above. Technology as a driving force in human history is a common thread here. History, in significant senses, is indeed reduced to developments associated with technological advance and the supporting.

Characteristics of the global capitalist system. It is easy to see the importance of states within that system in Fukuyama's thesis, which places emphasis on politics as well as economics, A distinctive element of Fukuyama's explanation of global relation is the stress on the combined role liberal economics and politics in meetings human needs, material and non-material. His claim that we can talk in terms of 'universe' history at all is highly depended on his arguments the attraction of a certain form of organization. i.e. Liberal democracy, coupled with liberal economic principles, Fukuyama's position rests on idealized notion of liberal politics and It views them very much as open frameworks offering seemingly endless opportunities for individual material gain and a social sense of self. Thus 'global culture' which result is a technologically driven liberal political economy (Fukuyama1992).

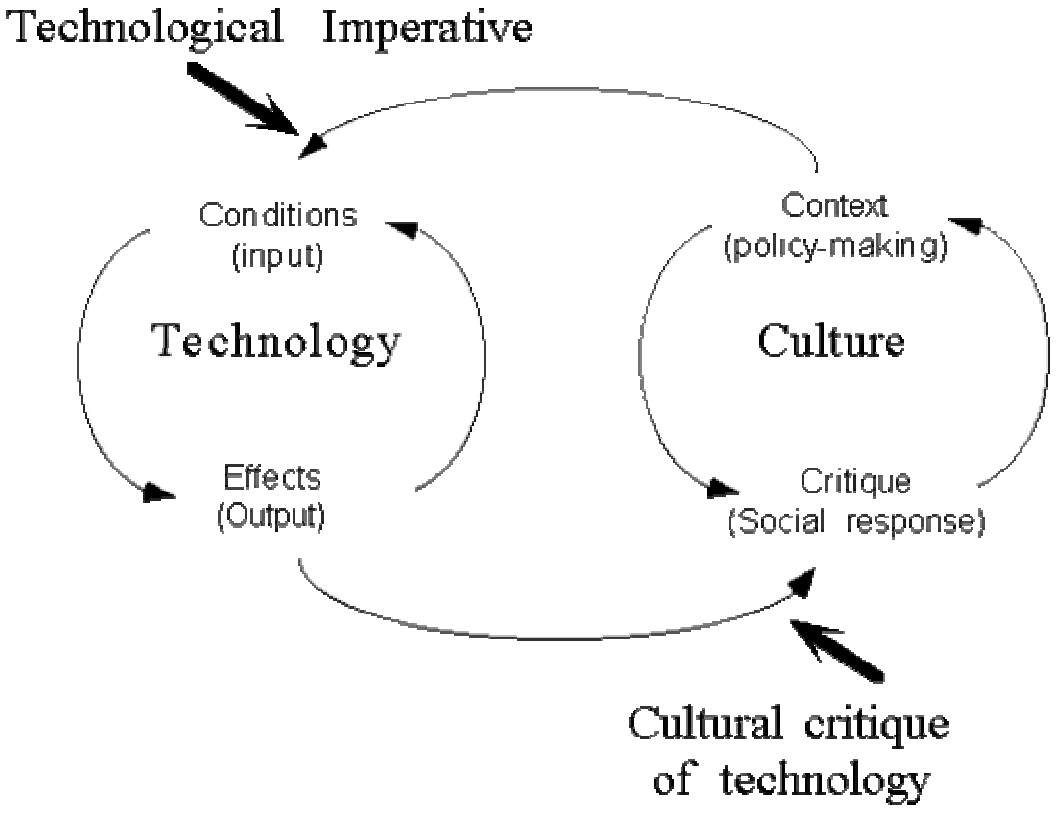
This idea of a global culture signals transnational triumph of the technological imperative. The implicit suggestion is that 'technical rationality' (Ashley 1980) as championed by the politics and economics of liberal capitalism is culture. The assertion erases the importance of any other understanding of culture.

The notion of 'global culture' in this context conveys a particularly powerful universalistic message. It indicates a significant and broad acceptance of the technological imperative as steering a whole global way of life: it identifies technology as intrinsic to understanding what life is actually all about. Technology comes to concern as much as practice. But this process happens implicitly rather than explicitly, in ways which militate against, rather than encourage, a critical engagement with it. In its depiction of a universal

density defined in terms of a West-centric combination of scientific/technical rationality and 'liberal' politics and economics, the Fukuyama perspective is neo-colonial in turn, a kind of post-imperialist dream or vision of the ultimate triumph of the West. The establishment of technology as culture within this framework is presented as a given. The question of the relationship between technology and culture is sealed. As it were, and safe from consideration. If technology and culture are synonymous and the technology imperative supported by liberal political economy the sum of human history. And we are said to have arrived at 'the end of history'. Then the foundation of the future as well as the past and present are settled. According to Fukuyama, we know what we need to know about where we are going and the main difference exists between.

1-3-6 The Relation between Technology and Culture

Defining technological imperative as the universal, modernizing trend in technology development. To balance this technological imperative. At any historical juncture, the "cultural critique of technology exists in society as an overall societal assessment of technological change" (Baark and Jamison). Considering both the technological imperative as well as the cultural critique of technology, they have developed what they term is the technology and culture problematique.



The relations between technology and culture is conceptualized by these researchers in the Figure above. From the perspective of the technological imperative, culture is viewed as forming a context or a background for the development of technologies. The focus, however, is technological development itself in which certain technical, infrastructural and policy conditions lead to new technical products and processes. Culture, in this perspective, comes into play only as a context for technology and technological policy decisions, not as a determinant of technology itself.

The other perspective takes culture as the starting point and "places technology in relationship to the historical evolution of culture and cultural frameworks". Culture is not considered solely as a series of responses or adjustments to technology; rather, it is seen as an essential mediator and adversary to the non-cultural, the "universal," mechanical, and artificial realm of technology. A cultural critique of technology is one in which the non-cultural elements are evaluated, judged and forced into new directions as fits the individual society or culture.

Chapter 2

Twenty First Century Learning Spaces Design

School building Design and the necessary infrastructure to accommodate and enable the best utilization of educational technologies

The 21st century requires to develop a new vision for technology

Every school should have a vision for embedding technology across the school, and for schools that are either being newly built, or undergoing a major refurbishment, this is vital.

Creating a vision for a new school is far more complex than just designing a new building. There is a need to define the outcomes for learning and teaching, relationships and behaviors.

Using the whole school site and designing spaces that will promote new ways of working is only part of the process. Equally important is shaping a strategy for change to ensure that, by the time the new spaces are in place, all members of the community can take advantage of them in the ways they were intended.

An effective vision for technology supports and enhances the school's aims in terms of learning, teaching, management and administration. Technology enables a school to support personalization and offer flexible 'anytime anywhere' access. It allows for effective and secure data management Educational outcomes, not specific technologies, must be the driver of the technology provision. The vision must be aspirational, helping the transformation of education to take place, but it must also be achievable.

Schools must provide the opportunity to combine the best of traditional learning with the unprecedented opportunities technology offers. Capitalizing on these opportunities requires more than hardware and internet access. It must include the "Four Pillars"of educational technology

1. Hardware
2. Connectivity
3. Instructional content
4. Professional development

The Four Pillars provide a foundation for creating an innovative learning environment where students and teachers can reach beyond the confines of a single school building of information, interaction, and enrichment Technology must evolve with a direct correlation to instructional objectives, curriculum goals, and district philosophies. This process will require a strategic and comprehensive long-range plan for the use of technology at the district level coupled with a careful alliance between instruction and technology. Applying the advances in technology to the inherent practices of education will help achieve a vision of education previously unattainable. Where the classroom was once the students' world, the world is now the students' classroom!

2-1 Space Shape and Change Practice

Spaces shape and change practice. Engaging, adaptable spaces energise students, teachers and the community.

Well-designed learning spaces inspire creative, productive and efficient learning.

New technologies and new understanding about learning. In today's interconnected, technology driven world, learning typically takes place in physical, virtual and remote places. It is an integrated, highly technical environment in which learners learn. The new learning spaces incorporate technologies, engage the learner, creating new learning possibilities, enhancing achievements and extending interactions with local and global communities.

2-2 Characteristics of New Learning

- A shift from instruction to active learning and an increased attention to personalized learning.
- An emphasis on collaborative learning and greater attention to human relationships.
- A growing commitment to project-based learning involving problem solving, investigation and trial and error.
- Emphasis on skills needed for the 21st Century
- Emergence of collaborative networks that support professional learning
- Globalization of education – national and international Partnerships

2-3 Design Principles for Learning Spaces

• Learning spaces reflect the culture of the institution
• Provide flexibility and adaptability - accommodate a range of learning
• Learning designs are the result of collaborative and consultative processes of all stakeholders (including learners).
• Design for comfort safety and security

Research indicates that learning is most effective when it is active, involves working on real tasks in collaboration with others – in both virtual and physical settings. In this environment a sense of community and collaboration are important elements and trusting collaborative relationships are formed. The paradigm shift makes us all learners as new tools are incorporated into teaching and learning and one is exposed to an abundance of learning objects, activities and networks. New skills need to be learned and some existing skills become obsolete.

2-4 New learner, New Spaces and Challenges of New Technologies

Characteristics of the New Learner:

• Learns as part of a group
• Communicates and collaborates
• Independent and self reliant
• Learns by doing - is active
• Learns anywhere, anytime
• Technology literate and flexible
• Creative and analytical New learner needs
• Space for instruction, presentations discussion
• Spaces for talk and privacy
• Space for private study and access to resources
• Room to move
• Technology that is ‘just in time’ and flexible
• Tools for communication
• Flexibility in space, location and resources

New spaces

New learning spaces need to be designed to enable and foster new pedagogies, using technologies demanded by 21st century economies.

The new learning spaces are:

- Flexible and adaptable - furnishings and equipment can be rearranged with speed and ease. Able to switch between individual and group settings – for presentation, communication and collaboration modes
- Reflective of the new learning practices
- Designed to support different levels of technological sophistication
- Provided with wireless and mobile computing devices Management of new spaces.
- Centrally managed and monitored for appropriate behavior and security Policies and guidelines/best practice approaches are collaboratively developed and agreed by the school body.
- Cues for appropriate behavior are available/displayed – e.g. graphics, brochures, lighting.

Challenges

- Do we know enough about learning and the use of technologies to enable us to construct effective learning environments?
- How do we develop synergies between formal and informal learning
- Find ways to adequately support teachers in using new tools
- Create a culture for the education profession that fosters innovation and engagement with new learning technologies
- Ensure the investment is spent wisely and that it will transform learning
- Develop and implement different models of assessment

New technologies

Learners need access to tools and media-rich resources that help to express themselves in a world that they will inherit. Educators need access to tools and resources to share knowledge and practice with other professionals. Administrators need access to the same tools to manage – from student records, to personnel management to facilities operations.

- Personal devices (computers, laptops, notebooks, MP3 players)
- Networked environments
- Broadband internet connections

• Wireless networks
• Interactive communications e.g. social networking tools
• Upload and download – to support any time learning
• Enable media production (video, audio, images, text)
• ICT rich environment with access to digital whiteboards, presentation walls, mobile computers, wireless technology and multimedia peripherals
• Access to online services from outside school
• Accommodate regular (electronic) communication with peers around the world to enriching learning
• 24/7 access

2-5 Technology Infrastructure

A set up standards for the design and implementation of technology infrastructure in schools must be prepared. The technology infrastructure consists of all the wiring and equipment necessary to transmit data, voice, and video to all classrooms, building, and ultimately, the world. The infrastructure wiring in the building connects each classroom to the head-end room with a 6-strand fiber cable, a category-5 copper cable, and a coax cable. The head-end room contains all the servers and communications hardware to connect the classrooms to the school's Local Area Network (LAN) and to the District's WAN.

The Classroom In the classroom, a communications panel houses the necessary network hubs, fiber, category-5, and coax cables to enable classroom computers to:
• connect the school LAN and district WAN to access and share resources;
• interact with other students within the district and/or outside the district via email and/or video conferencing;
• access the world-wide resources of the Internet;
• access on-line library references, databases, and catalogs for research; and
• access distance learning between classrooms and schools throughout the district…or world.

2-6 The District Data Communications

All district buildings should be connected to the District's Wide Area Network (WAN) for data, voice, and video communications. Connectivity is provided through gig-ethernet fiber services, both private and leased. This allows all sites to:

- communicate via electronic mail
- access the Management Information System (MIS) for financial and student information and decision-making;
- access world-wide information through the Internet;
- access on-line databases and other educational resources available on the district's intranet.

A necessary bandwidth between campus sites in support of the district's instructional needs should be available, the authority should move to the forefront by developing a private wide-area network. Not only did this provide the necessary bandwidth, but it also eliminated many of the on-going costs associated with leased data lines. The private network includes fiber installed between all south-county and many north-county campuses.

The remaining campuses utilize leased Gig-Ethernet service. Authority should utilize IP telephony in many of its campuses, utilizing the District's infrastructure to carry voice communications thereby avoiding long distance charges and providing a local Phone number for all campuses no matter which area code in which you live.

2-7 Responsible IT Staff

An IT responsible staff should be assigned in the schools to ensure the continuity and adequate installation and usage of the technologies and the staff continuous training, and Training efforts to help schools integrate technology into their instruction.

The IT staff should help the educators through the entire process of upgrading a school's technology -- including team building, planning, and the implementation process , by use of

a functional flow chart diagram called the Infrastructure Decision Tool. Each step suggests issues to consider who should participate in the decision-making process and what should be accomplished.

The process of planning is as important, if not more important, than the plan itself, also school administrators and technology planners through the entire process of formulating a concept to implementing their plan.

Access For all:

1. Technology deployment for individual staff and learners. Workstations should be available to all teachers, and to all learners on a 4:1 ratio. Those workstations must be capable of running productivity and other higher level applications allowing students to work on collaborative projects, higher level computing, video, and connectivity with others locally as well as globally.
2. Technology at the school building level. All classrooms, the library and the administrative offices in a school building should be linked through an "intranet" network capable of carrying voice, video and data. Great efficiencies can be achieved by installing networks that allow all classrooms to access centralized information and software housed on servers, and to communicate with one another, the office, and parents and others in the community. A video distribution system allows classrooms to access video discs and video tapes from a centralized collection. While the initial investment for this building level network may be high, savings are achieved by combining the collections of software stored in multiple locations and classrooms in the building, aggregating the need for bandwidth and combining phone, modem and fax functions, thus eliminating the needs for separate phone lines.
3. District and/or community networks. The local area networks described in the implementation strategy two should be linked to district or community wide networks that ideally link all schools in a district and aggregate bandwidth need community or district-wide. Integration of community needs for networking is essential if we are to leverage the resources necessary to upgrade the telecommunications infrastructure creating the "community on-ramps" to the information highway.

Community networks will also increase communications and improve relations between school and home, bring educational, library and information resources from the school into the home, and extend the community and agency resources into the school. These

networks will result in efficiencies and ultimately lower costs for telecommunications for all partners.

4. Country networks. All should have access to available and affordable high-speed digital communications networks capable of carrying voice, video and data. The electronic countrywide highway should allow all communities to connect to information services, other computers and networks regardless of locale or economic viability of the community.

2-8 Evaluating Progress

Where appropriate, monitoring and reporting the progress of standards-based initiatives, and educational technology programs and grants should take place.

Evaluation is the cornerstone of any successful educational effort. In the area of educational technology, in which change happens at an unprecedented rate, understanding and sharing "what works" in today's classrooms in crucial to planning efforts and to helping educators offer quality programs. The authority should monitor and report on educational technology programs for the purpose of documenting and distributing effective practices and materials with other educators and the public, helping all for the future of educational technology, and fulfilling obligations required .

2-9 Implementation Strategies

1. In general, successful educational technology initiatives at the school or district level are recognized to exhibit some or all of the following:

. The development of an educational technology plan to guide the purchase of equipment, implementation of teacher training programs, use of technology to aid administration, and the infusion of technology in the curriculum.

- A decrease in the computer to student ratio, providing more computer access on a per student basis.
- An increase in the power and facility of the information technology available to students and teachers.
- An increase in the availability of specialty information technology to serve special needs students, or industry specific job training.
- An increase in the use of technology in curricula, units of instruction, and other elements of the educational environment.

- An increase in the number of students and educators who have access to networks and the Internet.
- An increase in the speed and facility of network connections.
- An improvement in student ability to use technology, incorporate it into school work.
- An increase in teacher acquisition of technology training on a pre-service and in-service basis.

2. Evaluation will be carried out by any of the following means:
    - Use of the evaluation capabilities which offer the Department of Education formal research and evaluation services.
    - Use of evaluation and research capabilities internally available within the Department of Education.
    - Research initiated at the classroom, school, or district level.

3. Reporting will occur in any of the following manners:
    - Publishing via the Department of Education's World Wide Web home page.
    - Publishing via the Department of Education's many print-based media.
    - Publishing created at the classroom, school, or district level and distributed via the Department of Education.
    - Reports created on video, CD-ROM, and other emerging technologies.

Chapter 3

Leadership Plays a Key Role in Successful School Reform

School management and staff (supervisors), should know how to link all the elements of the educational process, utilizing the education technology, and supervising the teachers for applying the best methods of blending education and technology with continuous improvement strategy and assessments, making sure of their qualification and competency, and Investors for the private schools should realize the importance of transforming to the Digital Pedagogy, otherwise they will lose their customers soon or later.

The effective 21st Century administrator is a hands-on user of technology. Much of the benefit of technology is lost for administrators who rely on an intermediary to do their e-mail, manipulate critical data, or handle other technology tasks for them. While technology empowers administrators by the information it can readily produce and communicate, it exponentially empowers the administrator who masters the tools and processes that allow creative and dynamic management of available information.

Administrators who recognize the potential of technology understand that leadership has a responsibility to ensure digital equity. They must also know that technology can unlock tremendous potential in learners and staff with special and diverse needs. Administrators are responsible for incorporating assistive technologies that enable a school system to more comprehensively serve its constituents.

I believe that comprehensive implementation of technology is, in itself, large-scale systemic reform. Leadership plays a key role in successful school reform. In order to make sure of that is implemented a Technology Standards for School Administrators should be applied, and focus on the role of leadership in enhancing learning and school operations through the use of technology.

These standards are indicators of effective leadership for technology in schools.

It should reflect what best indicates accomplished school leadership for comprehensive and effective use of technology in schools.

3-1 Leadership and Vision:

Educational leaders inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision.

Educational leaders:

A. facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision.

B. maintain an inclusive and cohesive process to develop, implement, and monitor a dynamic, long-range, and systemic technology plan to achieve the vision.

C. foster and nurture a culture of responsible risk-taking and advocate policies promoting continuous innovation with technology.

D. use data in making leadership decisions.

E. advocate for research-based effective practices in use of technology.

F. advocate, on the country and national levels, for policies, programs, and funding opportunities that support implementation of the country technology plan.

3-2 Learning and Teaching:

Educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.

Educational leaders:

A. identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement.

B. facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning.

C. provide for learner-centered environments that use technology to meet the individual and diverse needs of learners.

D. facilitate the use of technologies to support and enhance instructional methods that develop higher-level thinking, decision-making, and problem-solving skills.

E. provide for and ensure that faculty and staff take advantage of quality professional learning opportunities for improved learning and teaching with technology.

3-3 Productivity and Professional Practice:

Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.

Educational leaders:

A. model the routine, intentional, and effective use of technology.

B. employ technology for communication and collaboration among colleagues, staff, parents, students, and the larger community.

C. create and participate in learning communities that stimulate, nurture, and support faculty and staff in using technology for improved productivity.

D. engage in sustained, job-related professional learning using technology resources.

E. maintain awareness of emerging technologies and their potential uses in education.

F. use technology to advance organizational improvement.

3-4 Support, Management, and Operations:

Educational leaders ensure the integration of technology to support productive systems for learning and administration.

Educational leaders:

A. develop, implement, and monitor policies and guidelines to ensure compatibility of technologies.

B. implement and use integrated technology-based management and operations systems.

C. allocate financial and human resources to ensure complete and sustained implementation of the technology plan.

D. integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources.

E. implement procedures to drive continuous improvements of technology systems and to support technology replacement cycles.

3-4-1 Assessment and Evaluation:

Educational leaders use technology to plan and implement comprehensive systems of effective assessment and evaluation.

Educational leaders:

A. use multiple methods to assess and evaluate appropriate uses of technology resources for learning, communication, and productivity.

B. use technology to collect and analyze data, interpret results, and communicate findings to improve instructional practice and student learning.

C. assess staff knowledge, skills, and performance in using technology and use results to facilitate quality professional development and to inform personnel decisions.

D. use technology to assess, evaluate, and manage administrative and operational systems.

3-4-2 Social, Legal, and Ethical Issues:

Educational leaders understand the social, legal, and ethical issues related to technology and model responsible decision-making related to these issues.

Educational leaders:

A. ensure equity of access to technology resources that enable and empower all learners and educators.

B. identify, communicate, model, and enforce social, legal, and ethical practices to promote responsible use of technology.

C. promote and enforce privacy, security, and online safety related to the use of technology.

D. promote and enforce environmentally safe and healthy practices in the use of technology.

E. participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property developed with country resources.

3-4-3 What should Today's School Administrators Know about Computers?

Computers have not only become commonplace in the classroom, but are now widely used for administrative functions in most school and college systems. While a great deal of attention has been focused on computer literacy for teachers, relatively little has been focused on literacy for administrators. As a consequence, administrators often lack any suitable preparation to effectively manage the computing activities in their schools or colleges.

This lack of preparation has some serious ramifications. In schools or colleges where administrators have a limited grasp of how to use computers, many functions that could be made more efficient through computerization are still done manually. This includes routine activities such as scheduling, registration, attendance tracking, grade reporting, form letters,

payrolls, budgeting and accounting. Lack of sophistication about computers often leads to poor decisions about hardware/software selection or to implementation that limits their usefulness. To the extent that administrators have an educational leadership role in a school, their use and support of computers should provide a model for classroom use.

Computer literacy should be a required competency for all school administrators. In particular, the core curriculum of any college program in educational administration should include an administrative computing course.

The following are the outlines of the syllabus for such a course and discusses the rationale for the content.

3-4-4 Defining Competencies

There are five basic competencies for a computer-literacy school administrator. They include the ability to:

1. describe the possible administrative uses of computers;

2. determine what applications are appropriate for a given school situation;

3. select the best software and hardware for a given administrative application;

4. develop successful implementation plans for computer applications; and

5. use computers as a personal productivity tool.

Let's look at these competencies in more detail.

Possible Administrative Uses. The first step to computer literacy for school administrators is to know the possible administrative applications of computers. Major applications include: student registration, class scheduling, test scoring, grade reporting, attendance tracking and payroll processing. Word processing, spreadsheet and database programs have many administrative applications, such as parent/teacher letters, proposal writing, budgets and recordkeeping. In addition, computers can be used for library, guidance and athletic functions.

Determine Appropriate Applications. Even though there may be many benefits associated with a computer application in general, for a given school at a particular time the application may or may not be a good idea. For each potential application, it is necessary to make a cost/benefits assessment to decide if the benefits are likely to be realized and whether the costs are affordable. In order to make this kind of assessment, it is necessary to thoroughly understand the application and the decision factors that affect its success.

Selecting the Best Hardware and Software. One of the most difficult aspects of getting started with an administrative application is the selection of the appropriate hardware and software. The user knows what he or she wants the system to accomplish and now must find the right program and computer. There are many factors to be examined: how easy is the system to use, how much training is required, does the system do everything desired, how flexible is the system in terms of adding new capabilities or capacity, and is the system compatible with existing hardware and software? Knowing what questions to ask is an important aspect of this competency.

Develop Successful Implementation Plans. Having acquired suitable hardware and software, administrators must know how to successfully implement a computer application. This includes staff orientation and training, facilities planning, backup procedures, security considerations and job re-definitions. It is not unusual for computerization of an activity to require significant changes to existing administrative policies and procedures.

Use As Personal Productivity Tools. One of the real payoffs of administrative computing is that it can allow individual administrators to become more productive and get more done. Through the use of basic applications software such as word processing, spreadsheets and database programs, administrators can write memos and letters faster, can get budgets done with less effort and can keep records more easily. This frees time to spend on the human-interaction aspects of their jobs.

3-4-5 Course Activities

Ideally, a course on administrative computing should consist of the following activities: lectures, software demonstrations, hands-on exercises and group problem-solving.

Lectures should cover the basic concepts and principles, using as many examples as possible from actual school settings. If possible, guest lectures should be given by people

actively using a particular application in their school or college. Slides or videotapes showing how systems are used in schools should be used to illustrate lectures as often as possible; they help to make the technology more concrete and understandable.

Software demonstrations should be provided for each major category of software discussed in the course (e.g., attendance programs, grading programs and test-scoring programs). Such demonstrations can be conducted in a variety of ways: they can be done by the instructor for the entire class; the class can be divided into sub-groups, each of which is responsible for evaluating and describing a program; or the program can be shown by an administrator who uses it or by a sales representative. Each of these different approaches has its advantages and disadvantages

Hands-on exercises are a very important part of the course. Class participants are given brief assignments that require them to use basic applications programs (e.g., word processing, spreadsheets databases). For example, participants are asked to write a proposal to a funding agency recommending the purchase of computers (or other equipment) for their school. Word processing can be used to write the proposal, and a spreadsheet can be used to create the budget. Or, participants may be asked to create an inventory or student-records file using a database management program. These assignments are done in a computer lab using personal computers and suitable software. Having completed these hands-on exercises, participants understand the technology at a nuts-and-bolts level and can grasp the potential implications of computers for their own productivity.

Group problem-solving activities should be based upon short case studies that focus on the trade-offs involved in making decisions about administrative computing. For example, a case study of selecting a computer system should present a number of possible hardware and software alternatives to be considered. A case study on implementation should include a variety of easy and difficult to solve problems. The class should be divided into small groups that discuss the case study and formulate recommendations. One person in each group presents his or her recommendations, and the differences between groups are discussed. Not only does this activity provide practice in the decision-making processes associated with administrative computing, but it also creates an opportunity for participants to share their experiences and viewpoints about each topic.

3-4-6 Course Content for Training

The following topics comprise the lecture outline for a one-semester course:

1. Overview of Administrative Applications--A summary of each potential application identifying the specific benefits, nature of the hardware/software involved and the associated decision factors.

2. Hardware Overview--A summary of the hardware options: personal computers, disk drives, printers, OCRs, mice, modems, and networks. Emphasis is placed on functional characteristics, not technical details.

3. Software Overview--A discussion about major software options, including operating systems, integrated packages, file formats, user interfaces and compatibility. Programming details are not relevant and not discussed.

4. Cost/Benefits--A discussion of how to weigh the costs and benefits of a particular application, how to collect data to determine the feasibility and desirability of a particular application, how/where to get funding and how to write a proposal.

5. Word Processing and Desktop Publishing Applications.A look at tasks suitable to these applications, including form letters, routine report, proposals and school publications.

6. Financial Applications. A look at uses for financial software and spreadsheets, including payroll, accounting, budgets and cost proposals.

7. Database Applications. A discussion of recordkeeping functions suitable for database programs, including student and staff records, equipment inventories and maintenance logs.

8. Student Management Applications. A discussion of applications having to do with student management. These include attendance, scheduling, registration, grading and testing.

9. Library Applications. A discussion of automated cataloging system, bar coding and online databases.

10. Guidance Applications. A discussion of computer-based guidance and occupational counseling systems, test-preparation software and online databases.

11. Implementation Considerations. A discussion of how to plan for staffing needs, training, facility requirements, backup and security procedures and maintenance.

12. Future Developments. A survey of new developments in the computer or educational field that might affect administrative computing, school system decentralization, laptop computers, voucher systems, etc.

Lectures may be combined or expanded depending upon the interests and needs of the participants. For example, networking might be of interest to administrators who work at a district or country level but not as much to administrators at individual schools. Student management applications are usually a lot more complex at the college level, and, hence, more detail would be appropriate for participants at this level. On the other hand, the intent of this course is to prepare administrators to manage computing at any level of a school or college system, even if this does not match their current position. Individual interests can be addressed by the course project.

3-4-7 Course Project

While the hands-on and group problem-solving activities provide frequent opportunities to apply the knowledge gained in the course to "real-world" situations, the most important practical result of the class is the course project completed by each participant. The project requires the student to relate some aspect of the course to his or her own administrative setting. A list of suggested projects include:

1. Conduct a hardware or software selection study for a particular administrative application in your school or district.

2. Develop a plan for a computer facility for a new or existing school.

3. Develop a plan for teacher or staff computer training.

4. Describe in detail how an existing administrative application could be improved .

5. Describe the changes needed to convert your school from manual administrative methods to a computer-based system.

6. Conduct a feasibility study of one administrative application at your school.

7. Compare two or more different systems or programs for the same administrative application.

8. Develop a networking plan for your school that describes how computer equipment and databases can be shared.

9. Write a proposal for funding of administrative applications at your school.

10. Develop your own administrative application using a spreadsheet or database program.

Participants are usually asked to present the results of their projects to the rest of the class in a short (15-minute) "executive briefing." The presentation provides an opportunity to get additional ideas and feedback from the class and serves as an informal peer review activity.

3-4-8 Training Administrative Leaders

End-of-course evaluations and informal follow-up from participants suggest that the course is very effective in achieving its goals. Many of the administrators who take this course have had no prior experience with computers and in some cases are antagonistic or anxious about them. After completing the course, most feel comfortable enough with computer technology to start using it in their schools and encourage others to do so too. Some participants in these courses have gone on to become leaders in their school systems, using their grasp of technology as a basis for advancement.

It continues to be a surprise that a course such as the one described is not found in the education administration curricula of all prominent universities and colleges. If we do not train our administrators to be computer literate, how can we expect them to manage computer-literate students and teachers? I think the answer to that question is pretty clear.

3-4-9 The Relationship between Effective Administrative Leadership Styles and the use of Technology

As the roles and responsibilities of administrative leaders shift, this research was conducted to ascertain what leadership attributes affect the integration of technology to improve teaching and learning The study focuses on the relationship between administrative leadership styles and implementation of new technological programs or instructional strategies.

Support for the use of technology to improve student achievement is soaring. Many educational critics are viewing technology as an instructional tool necessary to increase student gains in the way students access and apply information in complex, authentic tasks. While the nature of education remains highly conservative, experts agree that a more constructivist, student-centered view of learning is most conducive to learning. Administrators who promote technology as a tool for collaboration, and stimulation for authentic, learning experiences can allow for far greater student achievement than ever before. However, there is evidence of strong resistance on the part of teachers to fully integrate technology (Cuban, 1997). Research indicates that teachers need considerable support to integrate technology into the curriculum including a nurturing work environment that provides opportunities for teachers to take risks and collaborate with one another. Furthermore, Bailey, Ross, and Griffin (1995) have identified ten major barriers to technology integration. Among them are the failure to develop a shared vision of how technology should be used to improve teaching and learning, the failure to design and implement effective technology staff development programs, and the failure to empower teachers and students to engage in risk-taking and experimentation with new technologies.

While studies indicate that the proper and appropriate use of technology to support instruction has improved student academic gains across the curriculum, research exists which identifies factors within the school structure that promote higher student achievement. This study attempts to identify the differences in leadership styles in better implementation of technology as an instructional tool to improve student achievement. An understanding of the relationship between administrative leadership styles and the implementation of technology would assist effective reform efforts. As researchers continue to investigate how to most effectively utilize technology to not only prepare students for the

next century, but also to reframe the way we view teaching and learning, it would be reasonable to investigate the leadership qualities of productive schools through successful school reform efforts of the Information Age. Productive schools are defined as those organizations that have a clear and defined vision of high- quality learning, curriculum, instructional strategies, staff development and assessment.

While administrators will agree that the Information Age is forcing country-wide, district-wide and even school-wide changes, they may also agree that managing school change and improvement is one of the most complex tasks they face refers to the organizational structure in the Industrial Age as a bureaucracy and indicates the need to shift to a "connected network" in the Information Age. The individual's view of the world shifts from that of a source of security to a tool for personal contribution to the larger goal. Likewise, leaders in the educational organization must be able to shift toward a more goal-oriented, collaborative effort if they expect teachers to adopt the new or modified values, meanings, and beliefs about how children learn in this technologically advanced world.

Experts would agree that the success or failure of technology integration could be linked to the behaviors and ideologies of the instructional leader. In a survey of educators in the United Kingdom, 81% percent indicated that "more commitment" by leaders was an important component, while only 38% percent felt as strongly about more hardware and software (Cafolla & Knee, 1995). The innovation inherent in exemplary technology use requires more than hardware, software, and ongoing training. Successful leaders not only challenge the existing educational process and inspire a vision for meaningful change, but also provide the necessary support and modeling strategies to enable teachers to become part of a learning community. Modeling and coaching strategies make the vision clear and more attainable for teachers, and reinforce how others perceive what instructional leaders value.

Senge (1990) states that many of the problems organizations incur can be traced to leadership or the lack thereof. Advances in technology and changes in the goals of education are having dramatic effects on both people and organizations. Schools today have a responsibility for preparing children to be productive, contributing members of a technological society. Senge maintains that very few schools are "learning organizations" with a shared commitment to change. His research indicates that only when members are treated as stakeholders and actively participate in articulating a clear understanding of the

tension between current reality and a shared vision of where they would like to be will they develop a commitment to change.

This concept of "creative tension" requires an accurate view of the organization's current reality and is energized by the picture of what the organization could be. As technology continues to drive changes in society as well as education, our educational leaders must be equipped to welcome and manage conflict. Technology integration presents a shift in values in our views of teaching and learning, and raising the level of awareness of this conflict is not only necessary, but also a fundamental component to successful change.

A school's structure for organizational action and the attitudes, values, and skills reflected in the professional community continually reinforce each other. To educators, the infrastructure includes the guiding ideas of the organization, the design for learning outcomes and the support for those outcomes (Senge, 2000). Perhaps the single most important thing a school leader can do is foster professional interaction and reflective dialogue where members are given opportunities to refine beliefs and skills about teaching and learning. Effective leadership is evolving to encompass a broad range of opportunities for all people in the educational community to be learners. Bailey and Lumley (1997) have identified effective technology leaders as those who value technology as the primary tool that will change the way we view teaching and learning. They maintain that leaders who will successfully integrate technology must be able to model the technology, understand how technology can be used as an instructional tool across all disciplines, and continually focus on systems thinking as they assist others through the transformation of teaching and learning. As technology increases our knowledge base rapidly, we must not only teach students how to learn rather than what to learn, we must also redefine our own roles as teachers and leaders in a society that requires all of us to be learners.

Undoubtedly, innovative change efforts in the area of technology are presenting enormous challenges for educational leaders. Researchers maintain that as administrational responsibilities increase and technology continues to grow at a rapid rate, leaders are depending more and more on teachers and technology specialists to utilize technology and model its use (Cafolla & Knee, 1995). Enabling teacher-leadership is another way that leaders can make technological innovation a reality in our schools. Not only does it require collaboration and team building, but also it extends the traditional sense of governance and

decision- making to individuals who would not necessarily serve in an administrative role. Those administrators who allow others to contribute to innovative instructional practices and learn how to incorporate technology in their own work demonstrate the value they place in members of the organization as well as the integration of technology. Furthermore, educational leaders who effectively utilize the expertise of teachers in the area of technology are likely to recognize specific strengths and contributions of staff members in other areas.

The question is not "if" technology will impact our educational system and student learning, but rather how we can most effectively utilize technology as an instructional tool to improve student learning, and under what conditions that learning occurs. Experts are conducting qualitative research to determine what differences exist in learners, environments, policy, and leadership to identify what indicators are necessary to bring about positive changes in learning with regards to the use of technology (Lemke, 1998). Furthermore, leaders in the field who have examined teachers' resistance to accept technology as an instructional tool indicate that often the people who are making decisions about the classroom don't understand the needs of the teachers. Many technology initiatives are top-down. In hierarchical structures, teachers often view the pressure to use technology as a minimization of their role in the organization. Technology integration at the district, building and classroom levels require changes at all levels. While there may be a host of administrators at the apex of the hierarchical structure imposing change on classroom teachers, implementation strategies ultimately rest with the teachers. The literature confirms that school improvement efforts are largely dependent upon the role of the administrator . Unless leaders value the beliefs, constraints, and learning opportunities of their teachers, they are not likely to enlist support of organizational changes.

While adults are paper trained, our children today are children of the digital age, and preparing them for the Information Age means shifting our focus about technology and teaching and learning. Today's school leaders must be prepared to think systemically as they address the overall goals of the educational community. Integrating technology in a meaningful way is not as simple as using new tools to perform the same tasks. When organizations begin to reevaluate the role of technology, a critical component should also be to examine the culture of both student learning and adult learning. The difference between organizations that "automate," or use technology to more efficiently manage existing procedures, and organizations that "informate," those that truly integrate

technology and create learning communities is a shift in control. As roles and responsibilities change, interdependent relationships are created between students, teachers, administrators, and the community outside the school walls. Given this to be true, the progressive nature of these innovative instructional strategies requires attention to professional growth opportunities for teachers, technical support and a sense of collegiality in a learning community where decision-making is shared and risk-taking is encouraged. Leadership is extended to give more people the opportunity to collaborate and examine how the computer literacy can impact education. Furthermore, teachers' motivation for professional development is refined when they share the organizational "vision" and assume ownership over improving instructional strategies and student learning.

Experts agree that leaders must be equipped to create the kinds of conditions that allow for technology integration efforts to be successful. Effective leaders are those who encourage individual learning and promote a sense of collegiality, open communication, and value for professional growth. Furthermore, teachers must be given opportunities to examine their beliefs about teaching and learning in a supportive environment that encourages risk-taking and reflection.

As technology becomes more and more prevalent in our schools, and as districts and policy-makers determine the most effective ways to provide access to technology and meaningful learning experiences in the classroom, this issue represents perhaps one of the most ideological shifts in educational history. Innovative changes in instructional strategies involving technology are defined in the educational standards as well as district- level curriculum plans. However, it is unlikely that technology integration will be successful in schools that have developed plans simply because there is an expectation to have a plan (Oakely, 1998). For technology to be used successfully as an instructional tool in the classroom, teachers must be willing and able to construct pedagogically sound reasons for doing so. Moreover, their own knowledge and beliefs about teaching, learning and technology will lead to the real changes in the classrooms. It is up to the leaders in our educational communities to align those changes in meaningful, productive directions for the future.

Chapter 4

Preparing Teachers for Blending the Pedagogy with ICT

Teachers the core of the education process without preparing them for blending the pedagogy with ICT, it means, no development towards Digital Pedagogy, they should know how to use the software for class management, tracking and Planning, MS office.

Teachers should practice using technology in teaching because this may help them to maximize their time, explain their lesson in simplest ways and a lot more. It can also help them to motivate students; technology catches students' attention because this is what they are into these days.

It is important that teachers know how to use computers sufficiently and to have some certificates for competency of using it like the ICDL (International Computer Driving License) or equivalent, but this is not enough, as they should know how to integrate the technology with the curriculum. Technology must be integrated effectively if it is to make a difference in the way teachers teach and students learn.

One of the most reliable, way for preparing the teacher for applying the education technology in the Classroom Professional development of teachers specifically aimed at increasing infusion of Technology into their classrooms is the EPICT which I have supervised implementing.

4-1 The European Pedagogical ICT Licence (EPICT)

The European Pedagogical ICT Licence is a modular, flexible and effective training and certification programme. The licence empowers educators in the integration of information, media and communication technology within teaching and training practice

The programme reflects the working practice of professionals in the field of education and training with the core syllabus for each module specifically designed by education advisers and professionals for the needs of modern educators. Each module has its own editorial group thus ensuring that content keeps pace with current classroom developments.

4-1-2 The EPICT Concept

EPICT combines pedagogical knowledge of ICT integration with basic ICT skills training. The basic philosophy is that when upgrading teachers, one without the other makes the training useless.

The training course is realized through blended, flexible learning where the methodology applied is team-based and involves process-oriented learning, problem-based learning, collaboration activities and team-based assessment.

Thus the Pedagogical ICT Licence is a course concept that offers teachers basic ICT skills on a personal and a professional level through focusing on the pedagogical integration of ICT in the teaching practice.

The following example will give an idea of such type of training:

4-2 Preparing the Teacher For Integrating Presentation Technology, Interactive Whiteboards and Interactivity

4-2-1 Aim

The aim of this is to enable teachers to design and deliver a learning episode which incorporates the use of interactive presentational technology. In common with all other EPICT Modules, the assessment criteria for this module focuses on the pedagogical planning and applications of the technology including, in this case, interactive whiteboards.

The assessment of a participant's work will be judged on these factors rather than simply the technical complexity of any resources developed or utilized.

4-2-2Target Audience

This should be undertaken by practicing teachers and tutors. The modules are designed to be of inclusive of all teachers regardless of current levels of ILT usage. Progress through the course is flexible and support is provided by your EPICT facilitator, your study group and the EPICT forums.

4-2-3 Outcome

By the end of this you will be aware of:

- Common advantages and potential issues with the use of presentational technology and interactive whiteboards
- Common lesson and project themes which can be developed using presentational technology
- Some of the features of interactive whiteboards
- Learning outcomes and opportunities afforded by interactive whiteboards
- Approaches to the use of interactive media in teaching
- Methodology and pedagogical approaches when using interactive whiteboards and presentational technology
- The potential effects of learning styles on the use of interactive whiteboards

4-3 Preparing the Teacher for Integrating Literacy and ICT

4-3-1 Target Audience

Individuals currently and directly engaged in learning and teaching practice. Access to this module is at the discretion of the Centre however, the framework is designed to be inclusive of all educators and is flexible in terms of current levels of ILT (Information and Learning Technologies) knowledge.

4-3- 2 Context for Delivery

Module I is an optional module. All EPICT modules are designed with a notional study length of 15 hours.

Progress through the module is monitored and supported by a currently registered EPICT Facilitator and enhanced through the use of study groups and the EPICT Discussion forum.

4-3-3 Module Purpose:

This module enables educators to demonstrate their applied knowledge relating to:-

- The sourcing and evaluation of suitable electronic learning and teaching resources which support the literacy learning and development goals of the educational cohort.
- The effective integration of these educational resources within teaching and development practice.
- Opportunities for the use and integration of ICT tools and materials need not be limited to formal literacy teaching periods. Participants can provide opportunities for literacy development within other areas of the curriculum.

4-4 Integrating Learning Technology into Classrooms:

4-4-1 The Importance of Teachers' Perceptions

Ed-tech professor Bernie Poole identifies six essential technology-related skills every good teacher should possess or acquire. There's no getting away from it; technology in schools is here to stay. But technology must be integrated effectively if it is to make a difference in the way teachers teach and students learn. What are some of the essential technology-related skills every teacher should possess?

4-4-2 Productivity Tools

Every teacher should be proficient in the use of productivity tools. Teachers have to process many different types of data. Productivity tools (word processor, spreadsheet, database, and presentation software) are available on all computers and are the obvious tools to use for most teaching and learning tasks - and yet, it's probably true to say that 80 percent of computer users know only 20 percent of what a computer can do.

Most teachers consider themselves competent using a word processor, but are they? Are you? Do you know how to do mail merge (which involves familiarity with databases)? Do you know how to incorporate pictures into text? Do you know how to use indent markers? Do you know how to create columns of text? Do you know how to use tables? Those are not advanced word processing skills, by any means. The modern word processor is a multimedia tool. Its skillful use can enable capable teachers to create a host of visually attractive, information-rich learning materials. Every teacher should learn how to use it well.

Every teacher also should know how to capture numerical data in a spreadsheet, use formulas to manipulate that data, and display it in charts and graphs.

Every teacher should be familiar with presentation software such as PowerPoint ,not because presentation tools make great slide shows for teachers, but because they make great slide shows for students. Remember, we teach for one purpose and one purpose only , to help students learn.

Drawing tools, which can bring out the creative artist in even the most artistically challenged teacher, often are bundled in with productivity software. Drawing tools, combined with other productivity tools, are invaluable for spicing up handouts, worksheets, slides, and the like. Drawing tools are cool. Check them out!

Teachers need to be skilled in the use of productivity tools, not just because they are the best tools for teaching, but also , and more importantly , because they are excellent tools for learning.

4-4-3- Troubleshooting

Every teacher should be able to troubleshoot technology-related problems that commonly crop up in the classroom.

For example, you should know that when a computer is behaving oddly in any way, the simplest solution often is to turn off the computer and then turn it back on. Sometimes plugs work loose from their sockets or disks get stuck in drives. Disks might need to be formatted, either to fix problems on the disks or to make the disks available for further use. Technology-using teachers should know how to do those and myriad other basic computer troubleshooting tasks.

4-4-4 Technical Assistance

Every teacher should know where to go for technical assistance. Sometimes technical problems arise that are beyond a teacher's competence. Good schools will have responsive and skilled technical staff available full time. The technology-using teacher should establish a good working relationship with tech staff and know how to get in touch with them when the need arises.

4-4-5 Web Resources

Every teacher should be familiar with what's available on the Web in his or her subject area. The Web is a magnificent resource for teaching and learning , and getting better by the day. Conscientious technology-using teachers take time to research what's available so that they can enrich the learning experience for their students. Web sites such as Education World are good places to start.

4-4-6 Search Skills

Every teacher should have well-honed Web searching skills. Searching the Web has become an essential skill for all computer users. Teachers today spend a lot of time online looking for multi-media resources as well as for general informational material to use with students. Almost anything you can imagine is available on the Web ,if you only know how to find it.

4-4-7 Interest and Flexibility

Every teacher should be open to new ways of doing things. That is so important today! Almost on a weekly basis, technologies become available that can change , and sometimes utterly transform -- the way teachers teach and children learn. Good teachers maintain an avid interest in new technologies with a view toward improving the effectiveness of their teaching.

Good teachers should be constantly on the lookout for ideas about how to do a better job in the classroom. One of the best ways to do that is to join an online discussion group, where teachers get together in an open e-forum to share ideas about teaching and learning.

4-5 Integrating Learning Technology into Classrooms: The Importance of Teachers' Perceptions

A qualitative study of experienced high school teachers' perceptions of learning technologies is reported. Underlying the study was a research-based theoretical background that highlighted the importance of appropriate perceptions to successful integration of learning technologies into classrooms. The transcripts of 31 semi-structured, open-ended interviews with a group of teachers were combined to form a pool of decontextualized statements about learning technologies. The pool of statements was analyzed using a phenomenographic research approach. A limited number of qualitatively different perceptions of learning technologies were identified. The perceptions varied with respect to "what" and "how" components. The "what" component concerned perception of what constitutes a technology. The "how" component concerned perception of how the technology impacted on learning. Some of the perceptions were considered inappropriate with regard to the "how" component and unlikely to lead to successful integration. For teachers holding these perceptions professional development is proposed in how learning technologies can be used to encourage enhanced learning outcomes.

Keywords: Learning technologies, Phenomenographic research, Student perceptions, Teacher perceptions

The integration of learning technologies into high school classrooms is being promoted and supported around the world. Underlying the promotion and support are claims that

successful integration will lead to enhanced learning outcomes (DoE, 1998). These claims are difficult to justify, however. Research into the impact of learning technologies on the quality of students' learning outcomes is limited and outdated according to Honey, Culp and Carrigg (2000). A limiting factor has been the difficulty of defining and measuring enhanced learning outcomes attributable specifically to the use of learning technologies (Mitchell & Bluer, 1997).

Recent research has avoided this difficulty and focused on investigating the requirements for successful integration of learning technologies into classrooms. The research is beginning to show that success requires understanding the complex interactions in classrooms between teachers, students and technology (Honey, Culp & Carrigg, 2000). This understanding is currently incomplete. Parr (1999) studied students' perceptions of learning contexts that incorporated learning technologies. Students' perceptions were found to influence the success of integration, specifically the amount of technology use, the ways in which the technology was used, and teachers' and students' expectations about learning. Teachers' perceptions of learning technologies and influence on students' perceptions have not been studied recently. To further understanding, our study investigated experienced teachers' perceptions of learning technologies. The research also considered the likely impact of teachers' perceptions on students' perceptions and, consequently, on the integration of learning technologies into classrooms.

Underlying our study was recent research into teacher and student perceptions of their own experiences. Contributions to this research come from a number of different perspectives on teaching and learning, principally relational (Ramsden, 1988), phenomenographic (Marton & Booth, 1997), constitutionalist (Prosser & Trigwell, 1999) and constructivist (Biggs, 1999). While these perspectives differ on precisely how knowledge is formed, common is a focus on understanding teachers' and students' perceptions of learning contexts in order to improve teaching and learning.

The research into teachers' and students' perceptions of teaching and learning contexts established a series of systematic associations linking teachers' perceptions and approaches with students' perceptions, learning approaches and outcomes (Biggs, 1999; Marton & Booth, 1997; Prosser & Trigwell, 1999). An explanation of these associations is important to understanding the significance of investigating teachers' perceptions of learning

technologies. The associations are summarised diagrammatically in Figure 1, then described.

Teachers conceptualise and approach teaching in a limited number of qualitatively different but related ways. Broadly, teachers who perceive learning as the accumulation of information are more likely to view teaching as the transfer of information. Such teachers are more likely to use a teacher centred approach where the teacher imparts information to students and uses assessment techniques which encourage and test rote learning. In contrast, teachers who view learning as conceptual change are more likely to view teaching as facilitating conceptual change. Such teachers are more likely to use a student centred teaching approach where independence in learning is encouraged through discussion, debate and questioning among students, and assessment which reveals conceptual change (Prosser & Trigwell, 1999).

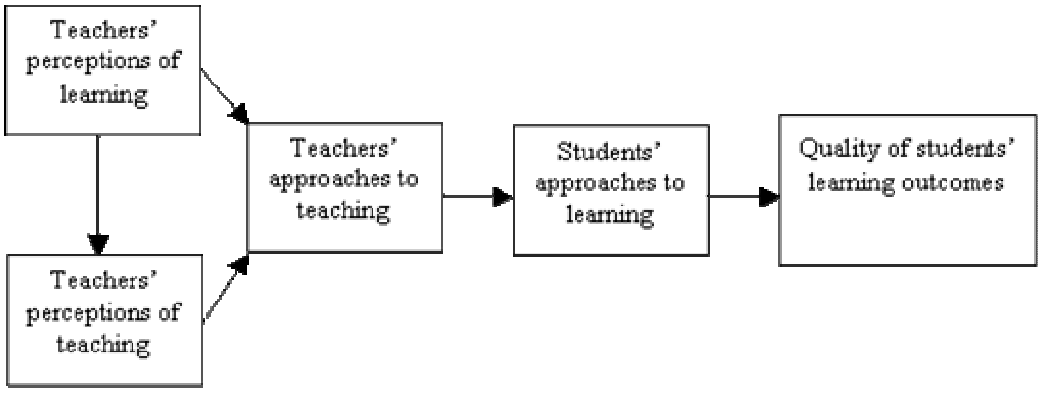


Figure 1. Teacher-student perceptions and the quality of learning outcomes

Students' approaches to learning are related to their teachers' approaches to teaching (Trigwell, Prosser & Waterhouse, 1999). Teachers who describe using a conceptual change/student focussed teaching approach are more likely to be teaching students who report using a deep approach to learning. Deep learning approaches have an intention to seek meaning in learning situations through linking aspects of the content. With a deep learning approach there is the possibility of the conceptual change and deeper understanding which is assumed in this paper to constitute an enhanced learning outcome

(Cope, 2000; Marton & Booth, 1997). Indeed, in many empirical studies deep learning approaches have been found to be strongly associated with conceptual change learning outcomes (e.g., Marton & Säljö, 1976; Prosser & Millar, 1989). In contrast, teachers who describe using an information transfer/teacher centred teaching approach are more likely to be teaching students who report using surface learning approaches. Surface learning approaches focus on memorising aspects of the content in isolation with the intention of recalling the content in assessment situations. There is little intention to seek meaning in the content, and little likelihood of significant conceptual change (Ramsden, 1988).

An explanation of the association between teacher and student approaches has been proposed and supported empirically by Prosser & Trigwell (1999). The learning context provided by a teacher is the practical implementation of the teacher's perceptions of learning and teaching, and approach to teaching. Students have been found to vary their learning approach in response to certain factors they perceive in the learning context. Students using deep learning approaches are more likely to value independence in learning, good teaching and clear learning goals, factors consistent with a student-centred teaching approach. Students using surface learning approaches are more likely to have different values, and, consequently different perceptions.

The major contention underlying our study was developed from the research findings just outlined. Teachers' perceptions and approaches and, consequently, the learning contexts they provide, are known to influence students' perceptions. Successful integration of learning technologies leading to enhanced learning outcomes is unlikely unless teachers perceive and use technology as an integral part of a student centred/conceptual change teaching approach. Only through students perceiving learning technologies as part of a learning context which encourages independence in learning and deep learning approaches are enhanced learning outcomes likely.

So how do teachers perceive learning technologies? Pre-service teacher perception studies indicate that constructivist uses of learning technologies may lead to conceptual change (Carr-Chellman & Dyer, 2000; Marra & Carr-Chellman, 1999). Our concern was with experienced classroom teachers without the benefit of recent pre-service teacher education programs. Some studies (Parr, 1999) provide a basis for investigating perceptions of experienced teachers. In the past decade the nature of learning technologies has changed, with text-based, locally-networked, computer-assisted instructional software being replaced

by graphics-rich, globally-networked computer environments, which makes earlier studies less helpful (Honey, Culp & Carrigg, 2000). Professional development programs have been targeted at keeping experienced teachers' knowledge current. Research indicates, however, that brief-exposure programs about technology made available to experienced teachers have been unsuccessful (Schrum, 1999). Our research investigated the questions:

1. How do experienced high school teachers perceive learning technologies?
2. Are the perceptions consistent with the integration of learning technologies in classrooms in a manner likely to encourage enhanced learning outcomes?

4-5-1 Method

The first research question was investigated as part of a larger empirical study which identified and monitored changes in teachers' perceptions of learning technologies over a two year period. The participants were 15 experienced high school teachers at Euroa Secondary College (ESC), Victoria, Australia. The teachers volunteered to be part of the research. The group had an average age of 39 years. Data was collected through semi-structured, open-ended interviews. A series of guide questions were designed, piloted and refined.. Two pilot interviews were held; 15 teachers were interviewed at the beginning of the research period; and 14 of the same teachers at the end. Teachers' responses to the guide questions were probed during the interviews until an understanding was achieved between the interviewer and the teacher whereupon the next guide question was introduced. The interviews were recorded and transcribed.

The combined pilot, beginning and end transcripts (31 in all) were analysed by one researcher using a phenomenographic research approach as described by Marton (1986). Phenomenographic research approaches were designed in Sweden in the early 1970s to investigate the qualitatively different ways that phenomenon in the world can be perceived, conceptualised or understood. There has been a consistent finding in the results of hundreds of published phenomenographic studies. A particular phenomenon can be perceived in a limited number of qualitatively different but hierarchically related ways. Perceptions of a particular phenomenon higher in a hierarchy are inclusive of those lower in the hierarchy and represent a more complete perception and deeper understanding of the phenomenon (e.g., Crawford et al., 1994).

The phenomenographic research approach used in our study sought to analyse some of the distinctly different ways that learning technologies can be perceived by experienced teachers. Through combining the interview transcripts a large pool of decontextualized statements about learning technologies was created. Analysis was an iterative process of considering and comparing the statements. During analysis the researcher was constantly asking questions adapted from Bowden (1994). 'What does this statement tell me about the way that learning technologies were perceived?'. 'How must learning technologies have been perceived if this statement is to make sense?'. Gradually the researcher divided the statements about learning technologies into groups with a similar underlying perception. In an extended, iterative process, statements within and between groups were compared as part of clarifying and defining the critical differences and relationships between the groups of statements. When the analysis was complete the perception of learning technology underlying each group of statements was given a label, elaborated and illustrated with statements from the pool. Finally the different perceptions were presented in a hierarchy based on more complete perception and, hence, level of understanding.

Establishing validity and reliability in a phenomenographic analysis is important. Justification of validity lies in a full and open account of a study's method and results. The judgement of credibility and trustworthiness then lies with the person reading the study (Booth, 1992). For this reason, the method of our study has been described in some detail.

In this type of research, the communicability of the perceptions identified needs to be established (Cope, 2000). Judgement of reliability is not appropriate because no two researchers can be expected to find identical perceptions underlying interview transcripts. While some call for researchers to suppress prior knowledge in phenomenographic research, in practice this is not possible. Different researchers bring different prior knowledge to the process. The outcome space of related perceptions which form the findings of the research are, therefore, constituted as a relation between an individual researcher and the data. What is important, however, is that the findings are described and illustrated in a manner which communicates to other researchers the critical differences and relationships between the perceptions. Given a description of the perceptions and the interview transcripts, other researchers should be able to see the different perceptions in the data.

In the study the communicability of the results was tested through both the researcher who undertook the phenomenographic analysis and another researcher separately classifying each interview transcript against the hierarchy of perceptions of learning technologies. Classifications were compared and disagreements discussed. Disagreement between the two researchers over the classification of a transcript occurred in less than 10% of cases. Given the interview transcripts and the hierarchy of perceptions, the researcher who was not involved in the phenomenographic analysis was able to recognize the perceptions in the data.

4-4-2 Discussion and Conclusion

The finding of components of learning technologies in which there was distinct variation in perception that can be described in a hierarchy of logical inclusiveness is consistent with the findings of many phenomenographic studies into other phenomena (see Marton & Booth, 1997, for an overview). This variation in perception of learning technologies among experienced high school teachers has, to our knowledge, not been described previously. While data was obtained from a specific group of experienced high school teachers , the process of decontextualizing the data and analyzing across the pool of statements suggests that the perceptions are likely to be found in other contexts. The specific and limited context of our study suggests that only some of the possible variation in perception of learning technologies has been identified. Other contexts may evoke additional, distinctly different perceptions of learning technologies.

The second research question concerned whether the perceptions identified are consistent with the successful integration of learning technologies into classrooms. The theoretical background to our study and the findings of Parr (1999) suggest that teachers' perceptions of learning technologies are likely to be vital factors in the successful integration of learning technologies. Parr found that students' perceptions shaped the way that the learning technologies were used. Our theoretical background suggests that students' perceptions are likely to be influenced by teachers' perceptions and use of learning technologies in their teaching approaches. For successful integration leading to enhanced learning outcomes, teachers need to perceive learning technologies as part of a student centred/conceptual change teaching approach. The learning technologies need to be perceived as tools in the learning context which encourage students to use deep learning

approaches – to seek meaning in the content being studied through interrelating the various aspects of the content, looking for a deeper understanding.

We believe that the findings of our research are relevant for experienced teachers with limited professional development and inappropriate perceptions of learning technologies. Such perceptions are unlikely to lead to the use of learning technologies in the classroom in a manner that facilitates successful integration and enhanced learning outcomes. Teachers holding these perceptions are unlikely to use learning technologies in a manner perceived by students as encouraging deep learning approaches. Without deep learning approaches, conceptual change as a principal learning outcome appears highly unlikely.

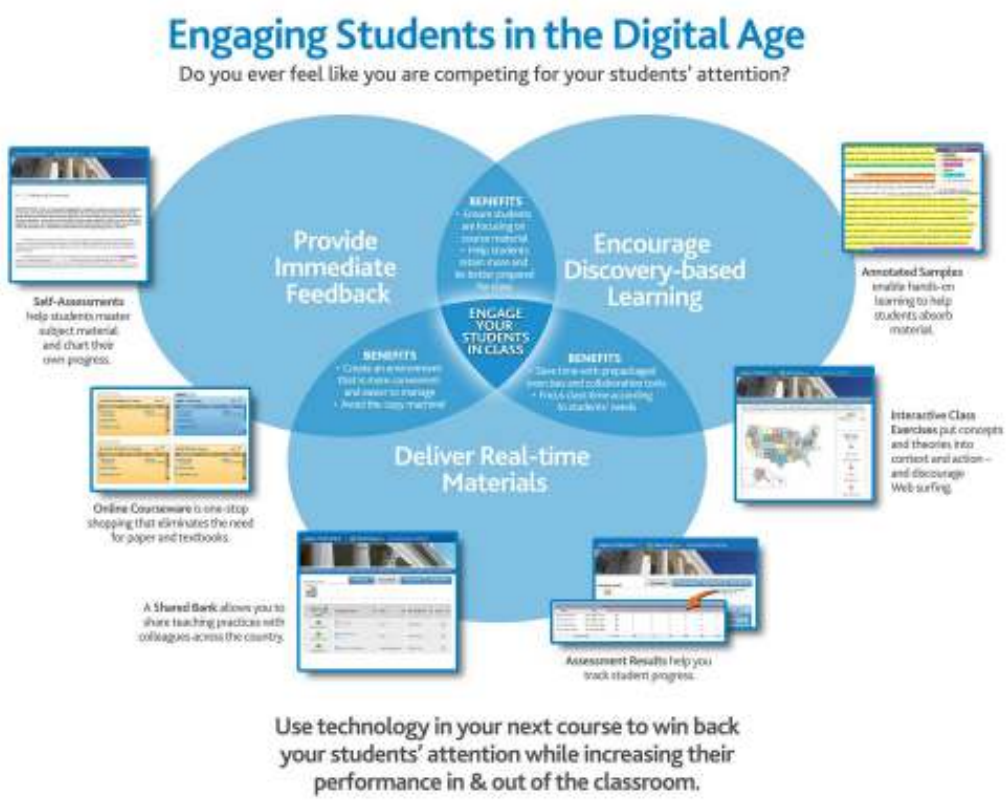
Our findings provide empirical support for claims made by other researchers about the nature of professional development in learning technologies for experienced high school teachers. In addition to instruction in the use of learning technologies, experienced teachers need professional development in modern research knowledge about the nature of learning and how learning technologies can be used to encourage enhanced learning outcomes in students (Carr-Chellman & Dyer, 2000). The current support for and promotion of the use of learning technologies in classrooms, whilst admirable, needs an additional focus – increased time release for experienced teachers to undertake this professional development.

Further research involving teachers' perceptions of learning technologies is warranted in a number of areas. The impact of relevant professional development programs on experienced teachers' perceptions of learning technologies could be assessed. Investigation of the interactions in classrooms between students, teachers and technology is only just beginning. Of value to these investigations would be research into the impact of teachers' perceptions of learning technologies on teaching approaches, students' learning approaches, students' perceptions of learning technology use, and the quality of learning outcomes.

Chapter 5

The Digital Age 21st Century Student

Schools must prepare students with the new skills and ideas that are needed for living and working in a digital society "Net Generation". The student is the OUTCOME or the PRODUCT. Students should have more engagement in the education process as the following figure shows:



5-1 Key Elements in a Learning Environment

A modern learning environment needs to be more than a study guide in computer format. Here we discuss the key elements in a modern learning environment that takes advantage of information technology:

- Understand the relationship between tasks and resources
- Integration
- Establish and maintain new study habits and ways of working

- Confidence building
- Enrichment and annotation
- Tracking and feedback

Students should understand of the role of different learning tools and resources in each course. This knowledge orientates and motivates the students to use these in the most effective way. Students also need support in bridging various activities to the goals of the course. For example, written course material and exercises need to be connected together. Also hands-on advice and help are often necessary.

In traditional, class-room based education can orientation, motivation and bridging be addressed by teachers and other students in the classroom (Taylor, Sumner, & Law, 1997). In such an environment personal advice and hands-on help are not a problem. However, in modern learning environments this is a challenging task. The overall resources can be made explicit and connected together, but hands-on help is a more complicated issue. As an extreme example, in distance learning advice and tutoring are limited to the tools that the student is using, and these are often the ones that students have problems with.

The learning environment should also establish and maintain new study habits and ways of working. The students need to learn to use information as a tool in learning. The role of personal hands-on advice and tutoring are important in learning to use technology in studying. Advice and tutoring are required in the beginning of the studies, but also in the beginning of each course is support needed. Typically, younger students cope with technology easily, but for adult students can computers, and file formats become a real barrier to studying. Differences in skills using technology are large even among students with “similar” background. It is also important to maintain motivation and the methods of studying once they have been learned. Therefore each course should be planned so that student must continuously use the available technology and resources.

Confidence in the technology is important. Therefore the reliability and robustness of the learning environment are important. Technology should function smoothly without interruptions, otherwise the confidence is rapidly lost. The learning environment should also be easy to navigate and understand. Finding information, adding and modifying content needs to be straightforward for both teachers and students. Integration refers here to integrating existing tools, resources and media into a common workplace.

When all tools and resources can be found from one place it becomes faster and more efficient to access and combine information. Therefore, providing a common access-point to learning material is typical to a modern learning environment.
Enrichment and annotation are connected to adding and modifying the material and content in the learing environment. The modifications need to be possible without technical expertise or help from ITpeople.
It should also be possible to adapt the environment to user's requirements. This should make it possible for both teachers and students to share their ideas and questions.

Generally, feedback increases motivation and it is considered essential for effective learning process (Rowntree, 1992). Feedback gives student a more realistic view of skills and knowledge (Scott, & Phillips, 1998). In traditional classroom-based education feedback can happen face-to- face and range from one-to-one conversation to a group discussion. However, in "virtual" learning there is lack of immediate feedback. Even though the richness of face-to- face discussion is lacking, technology can be used in giving feedback to student and in tracking the study progress. In addition, information technology allows customization of the learning experience and respects different learning styles (Albright, 1999; Wild, & Quinn, 1998). Fit to individual preferences and learning style – also called adaptation - can further increase motivation and empower students to study further.

5-2 What Students must know to succeed in the 21st Century?

Parents, educators, and others must prepare student to succeed in tomorrow's world, providing them with not only technical competence, but ethical and interpersonal abilities as well.
"There is nothing like a dream to create the future," wrote Victor Hugo many years ago. It is high time to determine just what the dream should be as educators prepare children to thrive in the twenty-first century.
Some hard questions demanding answers include:

- What should educators and parents be doing today to prepare children for the twenty-first century?
- What will student need to know?

- What behaviors and skills will be important?
- How might educators, parents, citizens, business, and government contribute to children's success?

In looking for answers to these questions, School Administrators asked a panel of 55 distinguished experts in such fields as education, business, government, psychology, sociology, anthropology, demography, etc., to name the most important knowledge, skills, and behaviors that K-12 students will need to develop if they are to prosper in the twenty-first century.

This is based on the results of the study and on the views of these wise and visionary individuals concerned about children and the future. Many of the skill needs mentioned and actions prescribed could apply to preparing all the world's students for the future we will share.

Part I: What Students Must Know Our panel of 55 educators, business persons, and other experts envisioned that K-12 students will need several types of skills in order to prosper in the 21st century. The following skills are loosely categorized as academic, personal, and civil; many of these key skills are holistic and cross-disciplinary. Underlying the goal of preparing students to live and work in the future is the goal of preparing them also to build that future.

Academic Skills and Abilities

* Writing skills to enable students to communicate effectively.

  Writing is one of the essential elements of literacy. It is a key to effective communication, and the very act of writing demands thinking and reasoning. Writing helps individuals develop initiative as they sort through ideas, organize thoughts, and draw parallels. It develops courage, since sharing ideas leaves students open to the scrutiny of others. Writing also has been shown to contribute to improved reading skills.

* Comprehensive reading and understanding skills.

  Reading is central to education and one of the primary requirements for literacy. While the merits of reading words and reading for comprehension are a subject of constant discussion, and while phonics versus whole language instruction is frequently debated,

the fact remains: student must read well if they hope to do well in the twenty-first century.

* Use of math, logic, and reasoning skills; functional and operational literacy; and an understanding of statistics.

Mathematics, it has been noted, is a language, a way of communicating, a way of making sense of the world. Math is one way to generate thinking and reasoning skills among students. Math standards should be established that guide schools in developing and judging the content, teaching, and evaluation of math curriculum. An understanding of math concepts, computation, and problem solving is essential to a truly literate person.

* Scientific knowledge base, including applied science.

Scientific discovery and the practical and commercial applications of discoveries have brought profound changes to the nation and the world. Leadership in science is directly connected to a nation's capacity to maintain a sound economy and may determine whether that nation or even the planet will survive. Therefore, science education is essential - from knowledge about scientific principles to applied science to an understanding that, over time, evidence may suggest new theories.

* Skill in the use of computers and other technologies.

Computers and other technologies are important as tools in delivering academic content, but students also need to develop skills in operating and making the most of these systems. Technology can encourage active learning, aiding students in doing research, accessing information, and using resources to answer questions and solve problems.

* Effective information accessing and processing skills using technology.

A plethora of information is virtually at students' fingertips. Education cannot stop with simply helping students learn to access information; they will also need to understand how to process and use the volumes of often conflicting information that will reach them every day.

* Ability to conduct research and interpret and apply data.

To thrive in the twenty-first century, students will need to be able to conduct various types of research and to interpret and apply data. Their library and media skills need to be finely honed, and their reasoning abilities must always be on alert. Schools may wish to bring people into the classroom who can demonstrate how research and gathering, interpreting, and applying data are important to them in their jobs. Real-life examples often enliven student interest.

* Knowledge of history and government to function in a democratic society.

Some key concepts include: What is civic life, politics, and government;; how does the government established by the Constitution embody the purposes, values, and principles of democracy; what is the relationship of the country to other nations and to world affairs; and what are the roles of the citizen.

* An understanding of the history of the world and world affairs.

Political, technological , sociological, economic, and environmental issues jump both natural and political borders. They affect us all. Therefore, students need to understand world history and world affairs. Cyberspace. Students need to be grounded in the cultures of other peoples, if only to understand them and to maintain peace in an interdependent world.

* Knowledge of world geography.

A lack of knowledge about geography is a potentially costly barrier to understanding our shrinking universe. The planet is becoming ever more crowded, the physical environment more threatened, and resources more depleted. Learning geography will help students to understand connections and relationships among the peoples of the world that are affecting the future of the planet.

* Knowledge of foreign languages.

How can we make ourselves understood if we aren't able to communicate in languages of the world marketplace? How can we be sure we aren't being taken advantage of because we don't understand the conversations taking place around us? How can we fully enjoy the history and culture of other nations or of the immigrants who come to our own country without an understanding of other languages? These are questions demanding our

attention as we are in the twenty-first century. The lack of ability to communicate in other languages is a costly barrier; multilingualism could contribute to economic competitiveness and world peace, as well as knowing and appreciating our neighbors.

Personal and Interpersonal Skills

* Oral and written communication skills.

Clear communication is critical to success. One reason is that teamwork and other new models in the workplace will require communication ranging from face-to-face to messages exchanged through sometimes faceless electronic systems. In the marketplace of ideas, the person who communicates clearly is also the person who is seen as thinking clearly. Oral and written communication are not only job-securing, but job-holding skills.

* Critical thinking, reasoning, and problem-solving skills.

An urgent call has been raised nationwide and even worldwide about the need for students to make even better judgments, to think and reason more effectively, and to solve problems. But while critical thinking is important, so is creative thinking, or thinking "outside the box." While inductive and deductive reasoning skills provide a logical framework for reaching conclusions, occasionally students will need to think laterally and rely on flashes of insight that go far beyond the traditional reasoning processes.

* Self-discipline; the ability to act responsibly, apply ethical principles, and set and assess goals.

Today's children and youth are bombarded with examples of unethical behavior from television, radio, newspapers, and the bad example set by many adults. To survive and prosper in the twenty-first century, students will need self-discipline, which entails an ethical code and the ability to set and assess progress toward their own goals.

* Adaptability and flexibility.

In a fast-changing world, students will need a catalog of skills broad and deep enough to allow them to adapt and attitudes that encourage flexibility.

* Critical interpersonal skills, including speaking, listening, and the ability to be part of a team.

The ability to work with and communicate effectively in collaboration with different people is an essential part of knowledge, skills, and behaviors. This includes respect for other opinions and perspectives. The classroom should be a laboratory for collaborative decision making and team building.

* Respect for the value of effort, understanding the work ethic and need for individual contributions, and self-discipline.

It will be self-disciplined young people who will ensure that their country is economically competitive as well as free and democratic. Without self-discipline, talents are squandered. Discipline should be viewed as a positive form of behavior. An attitude that work is good, and that individual as well as team efforts are useful and even exhilarating, can lead to greater productivity in society, better communities, and vastly increased personal satisfaction.

* Being excited about life and setting goals for lifelong learning.

Students need to focus on what they would like to do in life. Institutions such as the family, religious groups, businesses, and professional organizations need to work with schools to help young people find purpose in life and to cultivate in them the desire to continue learning throughout their lives.

Civil Skills and Abilities

* Multicultural understanding, including insights into diversity and the need for an international perspective.

The world has become more interrelated as satellites, cyberspace, and jet travel bring people and nations closer together. Communication transcends political boundaries. All peoples are seeking common as well as divergent purposes in free and democratic societies. Now more than ever, an understanding of diversity is key. In the future, it will only become more important. Properly managed, diversity can enrich. Not properly managed, it can divide. The key is education.

* Conflict resolution and negotiation skills.

When people know how to work out their differences, they often experience breakthroughs in mind-sets and can resolve problems more easily. These skills may even save lives. Within families and organizations, students who will live their lives in the twenty-first century will need skills in negotiation. While these skills have most often been seen as the purview of labor negotiators or diplomats, they will become increasingly essential for everyone. Finding "win-win" solutions will be part of seeking common ground and dealing with our differences. Some schools are offering conflict resolution and peer mediation programs for students, faculty, administration, and parents. Some are helping students better understand each other through multicultural education.

* Understanding and practicing honesty, integrity, and the "golden rule."

Treating others as we would like to be treated, personal and organizational integrity, and basic honesty must be a part of preparing students. Adults don't always serve as models of the best behavior for students or provide them with good examples in school curricula. Some possible solutions include conflict-resolution teams, collaborative learning, mentorships, the study of classic stories, character education, and role models in the community that could help reinforce ethical behavior.

5-2-1 Actions for Schools

* Incorporate "marketplace" technology in learning and as part of graduation requirements, and ensure that new and emerging technologies are incorporated into the school program.

Technology has changed the way the world does business, opening up global economic competition and offering nearly limitless opportunities. In addition to looking up information in the school library's encyclopedias, students now connect with interactive information available on CD-ROM or on the Internet. New technologies will greatly improve education and training, allowing education to become more individualized. To make optimal use of current technology in schools, teachers and administrators also need computer literacy.

* Respect all students' abilities to learn by promoting "active" versus passive learning.

Students do best when they are learning actively rather than simply listening to lectures. Some active learning practices include hands-on projects, Socratic questioning, cooperative learning, field trips, and experiments.

* Commit greater time for professional development for teachers and administrators.

Professional development often gets short shrift in education. While professionals within the schools are a great resource, they seldom get called on to share with their fellow educators. Peer coaching and mentoring programs could help transform teaching into a more respected profession.

* Develop world-class standards, redefine the basics, and clarify what is expected of students. Schools must know what is expected of them ,and they must be held accountable for achieving the highest of standards for student performance. Without this, no other educational reforms will work.

* Provide more time for students and teachers to work on "real world" projects.

More and more, students are demanding that what they learn actually connects to the real world or will have a real economic benefit later in life. If it doesn't benefit them, or isn't usable, they are likely to lose interest. Schools can make what they teach more relevant by encouraging teachers to use examples from life in problem solving, asking students to relate themes from literature to current events or apply scientific principles to ecological problems, and teaching practical applications of math, such as balancing a checkbook or figuring out percentages.

* Increase parental and community involvement in the schools.

Schools could encourage the formation of parent advisory councils that have a real purpose. They could hold community forums and conduct surveys to attain input from parents. Teachers need to be trained to deal with parents as well as students.

* Strengthen the authority and control of schools and teachers.

Some see local school councils and other forms of site-based management and decision making as a way to involve staff and community more deeply in decisions, to increase a sense of ownership, and to get everyone working in a common direction. Others see

them as attempts to get around a bureaucratic system. To be sure such activities help instead of hinder progress, school boards and administrators need to make sure training and information are offered and that expectations are clear.

5-2-2 Actions for Parents

* Work cooperatively with teachers and the school. Visit and communicate with the school.

When parents work closely with a child's teacher and school, the student is the winner, though parents also benefit: Parents gain self-confidence in parenting, an understanding of their home as a learning environment, an understanding of school programs and services, an increased comfort in communicating with the school, and input into policies that affect their children's education.

* Support education and schools. Take an active interest in children's school work.

A parent's attitude toward education and school can have a profound impact on student achievement. For example, when parents ask about and check students' school work or discuss their children's likes and dislikes, strengths and weaknesses, and otherwise show they care about school, they send a very basic but powerful message: School is important. It is valued.

* Provide a rich, stable home learning environment.

Parents can make their homes rich with learning opportunities for children in many ways. For instance, studies have shown that the more reading materials parents provide the better readers children will be. The local library can supply a constant source of free reading materials. Also, parents can set a good example by reading often themselves. One byproduct of a family that reads is that the TV is on less frequently, which may also improve student achievement.

* Read to and with children.

Reading aloud is one of the most important regular activities a parent can do that will help students achieve later in life. In this age of video games, VCRs, and highly structured schedules with little free time, children don't seem to have much quiet time to read or be read to. By reading aloud, parents introduce children to literature. They model the importance of reading throughout life. Books help to improve a student's vocabulary and familiarity with history, other countries, and lives not his or her own.

* Spend more quality time with children.

One way to make the most of time spent with children is to plan activities the whole family can enjoy, which will stimulate the child's interest, imagination, and self-image. Some examples include taking up a family. A quiet evening at home after a leisurely family meal may be the best quality time for many in today's overscheduled world.

* Use the best of TV, and then turn the rest off. Foster media skills.

Parents shouldn't allow children to watch just any program that comes on. Children can and do watch programs that support what they are learning in school. And television isn't the only media culprit; issues already have been raised over whether children are able to access pornography or adult-only information and images on the Internet, CD-ROM, and other technologies. In order to help students make the best use of today's technology, parents should stay informed about what their children can access, how much time they are spending on-line, and why they are using such media outlets.

* Model moral/ethical behavior and decision making.

Parents can model moral and ethical behavior, build self-confidence and self-reliance, pass down values, and help children to make responsible decisions. They can do this by talking about values with their children, thinking about the messages they send with their actions, supporting the child's values, and teaching responsible decision making.

* Enhance children's self-esteem through attention and care.

Positive self-esteem can help children understand and appreciate themselves and enable them to resist negative peer pressure. Those with low self-esteem rely heavily on what others think of them and are more susceptible to being controlled by other kids, possibly leading them to join gangs. To be truly prepared for the twenty-first century, students must be able to learn lessons from their parents, who have had broader experiences in life than children's peers have had.

* Model and value the concept of lifelong learning.

Lifelong learning is the idea that each person is constantly learning and growing. Parents can foster this love of learning by encouraging reading at home for pleasure, taking trips to the library, and making sure each child has a library card. When parents

don't know the answer to a child's question, it is okay to say, "I don't know - let's go look it up." That way, both the parent and child learn something, and the parent is sending a message to the child that learning never stops.

5-2-3 Catching the Dreams of Tomorrow

As we look toward the 21st century , parents, educators, citizens, government leaders, and businesses have an opportunity to be the weaver of dreams for children's futures. By surrounding students with a circle of support and a consistent message emphasizing education and lifelong learning, we can better prepare students for the twenty-first century - and for a lifetime of success.

5-3 Connecting to the 21st Century Student by Connectivism

Ranging from the local area network and the available information on the local area network server, to the wide area network for group of schools to the district wide area network resources to international internet resources, sets the importance of the new learning theory where you will not find excuses for not updating your knowledge to be implemented at the learning organization.

Saying that does not mean to forget the communication between the all education stakeholders, communications do not mean only talking by telephone, they mean all the details of the education process from the text books, curricula, tracking and lessons planning to the results…etc. further, not to forget the other important education theories, I mean while benefiting from the connectives theory, we should not neglect the other important education theories, which should always inspire the new theories.

Connectivism, "a learning theory for the digital age," has been developed by George Siemens and Stephen Downes based on their analysis of the limitations of behaviourism, cognitivism and constructivism to explain the effect technology has had on how we live, how we communicate, and how we learn

Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the

connections that enable us to learn more are more important than our current state of knowing. Connectivism is driven by the understanding that decisions are based on rapidly altering foundations. New information is continually being acquired. The ability to draw distinctions between important and unimportant information is vital. The ability to recognize when new information alters the landscape based on decisions made yesterday is also critical.

In other words, "know-how" and "know-what" are being supplemented with "know-where" (the understanding of where to find the knowledge when it is needed), and meta-learning is becoming just as important as the learning itself

5-3-1 A Learning Theory for the Digital Age

Educators must work to understand and motivate a new kind of digital learner.

5-3-2 Principles of Connectivism:

- Learning and knowledge rests in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- Capacity to know more is more critical than what is currently known
- Nurturing and maintaining connections is needed to facilitate continual learning.

- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

Connectivism also addresses the challenges that many corporations face in knowledge management activities. Knowledge that resides in a database needs to be connected with the right people in the right context in order to be classified as learning. Behaviorism, cognitivism, and constructivism do not attempt to address the challenges of organizational knowledge and transference.

Information flow within an organization is an important element in organizational effectiveness. In a knowledge economy, the flow of information is the equivalent of the oil pipe in an industrial economy. Creating, preserving, and utilizing information flow should be a key organizational activity. Knowledge flow can be likened to a river that meanders through the ecology of an organization. In certain areas, the river pools and in other areas it ebbs. The health of the learning ecology of the organization depends on effective nurturing of information flow.

Implications

The notion of connectivism has implications in all aspects of life. It largely focuses on its impact on learning, but the following aspects are also impacted:

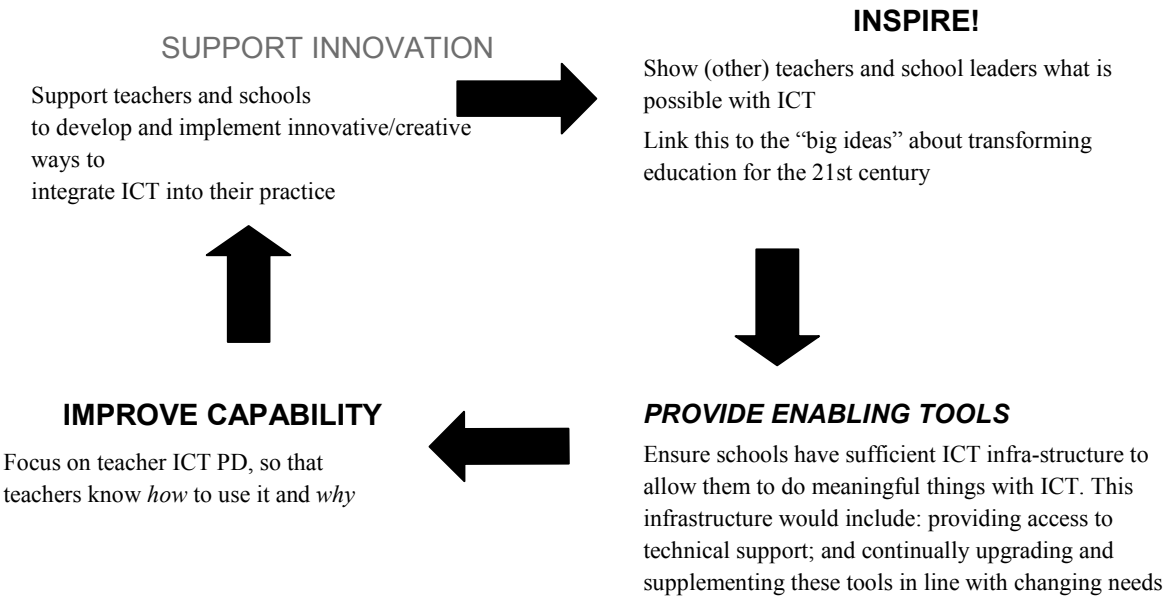
- Management and leadership. The management and marshalling of resources to achieve desired outcomes is a significant challenge. Realizing that complete knowledge cannot exist in the mind of one person requires a different approach to creating an overview of the situation. Diverse teams of varying viewpoints are a critical structure for completely exploring ideas. Innovation is also an additional challenge. Most of the revolutionary ideas of today at one time existed as a fringe element. An organizations ability to foster, nurture, and synthesize the impacts of varying views of information is critical to knowledge economy survival. Speed of "idea to implementation" is also improved in a systems view of learning.

- Media, news, information. This trend is well under way. Mainstream media organizations are being challenged by the open, real-time, two-way information flow of blogging.
- Personal knowledge management in relation to organizational knowledge management
- Design of learning environments

The pipe is more important than the content within the pipe. Our ability to learn what we need for tomorrow is more important than what we know today. A real challenge for any learning theory is to actuate known knowledge at the point of application. When knowledge, however, is needed, but not known, the ability to plug into sources to meet the requirements becomes a vital skill. As knowledge continues to grow and evolve, access to what is needed is more important than what the learner currently possesses.

Connectivism presents a model of learning that acknowledges the tectonic shifts in society where learning is no longer an internal, individualistic activity. How people work and function is altered when new tools are utilized. The field of education has been slow to recognize both the impact of new learning tools and the environmental changes in what it means to learn. Connectivism provides insight into learning skills and tasks needed for learners to flourish in a digital era.

Theoretical “loop” of ICT innovation and change



5-3-3Connectivist Teaching Methods

Summing up connectivist teaching and learning, Downes states: "to teach is to model and demonstrate, to learn is to practice and reflect."

In 2008, Siemens and Downes taught a course called "Connectivism and Connective Knowledge" which both taught connectivism as the content and modeled it as a teaching method. The course was free and open to anyone who wished to participate, with over 2000 people worldwide signing up. The phrase "Massively Open Online Course" was coined to describe this open model. All course content was available through RSS feeds, and learners could participate with their choice of tools: threaded discussions in Moodle, blog posts, Second life and synchronous online meetings.

"theory that learning consists of making the right connections."

Connectivism has been met with criticism on several fronts. Pløn Verhagen has argued that connectivism is not a learning theory, but rather is a "pedagogical view." Verhagen says that learning theories should deal with the instructional level (how people learn) but that connectivism addresses the curriculum level (what is learned and why it is learned). Bill Kerr, another critic of connectivism, believes that, although technology does affect learning environments, existing learning theories are sufficient. It has also been noted that connectivism can be seen as an off-branch to constructivism called social constructivism

Chapter 6

Parents Involvement

in

School Education Technology Process

Parents should be acquainted with the basics of computers and to be able to communicate through the internet with the involved education elements, and they should understand the new era in the education and the concept behind the transforming.

Parent involvement could include anything from assisting a student with homework to volunteering in a student's classroom "parent involvement" includes any action a parent can take to support his/her student's schooling both in the home and outside the home. The kinds of parent involvement…include but not limited telephone and written home-school communications, attending school functions, serving as classroom volunteers, parent-teacher conferences, homework assistance/tutoring, home educational enrichment, and parent involvement in decision making and other aspects of school governance.

Communication with all the people involved in the education process should be by online reporting, which means parents will be able to gain an insight into their student's school life; enabling them to access a wealth of information including school grades, attendance, special needs information, and home and class work schedules online. In addition a learning platform will enable parents to communicate frequently and freely with teachers; this means that they can be kept abreast of their student's education and any events which may have taken place during their child's school day.

6-1 Parent & Community Participation in the Education Process

A significant body of research from around the world indicates that when parents and communities participate in their children's education, the result is an increase in student achievement, improved student attitudes and other positive effects, including: increased attendance, fewer discipline problems, higher student aspirations, and increased number of years that children stay in school.

The Community Participation standards include the following focal points:

- Partnership with Families
  - Parent participation in school vision setting and planning
  - Open communication between parents and school staff members
  - Orientation of parents to educational practices in the school
  - Parent input on planning extra school activities
- Serving the Community
  - Expansion of school use for community services and social activities
  - Expansion of school participation in social and other community programs
- Mobilizing Community Resources
  - Utilize community resources to implement educational programs
  - Obtain resources for the school from both the social and business community
- Voluntary Work
  - Implement programs encouraging volunteer work inside and outside the school
  - Create programs to help volunteers participate in school projects

While the standards represent a well-articulated range of connections between parents/communities and teachers/schools, they are ideals. In reality, there is a large gap between the standards and the existing situation.

Positive Exposure of Parents to Schools: It is important to create positive experiences to parents in visiting schools. Hopefully, this will begin to change their attitudes about schools and teachers … and ultimately will lead to increase their own participation with the school, in school activities and in the schoolwork of their children at home.

The types of activities that will encourage parents to communicate with the school:

- Orientation meetings for parents to visit their children's classrooms at the beginning of each school year.
- School based meetings to present information on topics of interest (i.e., student health issues, suggestions for parents support to students in the home)
- Student performances and exhibitions of student work for their parents.
- General assembly meetings to share information with the community.
- Summer recreation and entertainment activities.
- School clean-up activities in preparation for the new school year.

While many parents and community members are very receptive to invitations to come to the school, there are other parents who still do not tend to come to the school.

6-1-1 The Role of Technology in Fostering Parent Involvement

The use of technology provides the capability for parents to be more involved in their child's education. Technology fosters communication between the home and school by using such tools as e-mail and web pages as well as providing access to on-line grading and attendance programs.

E-mail can be a powerful tool that provides for immediate communication between the parent and school. Due to parent and teacher schedules, it is often difficult to contact one another during the school day. Technological tools such as e-mail provide a viable solution to this barrier to parent involvement.

Teacher web pages are another way that parents can be involved in their child's education. A teacher webpage can provide access to student projects, homework assignments, classroom calendars, etc. Web pages can be used to provide parents access to information that may have traditionally only been sent home with the student.

On-line attendance and grading programs provide parents with up-to-date information about their child's attendance and grades. Through the use of parent portals parents can access their child's data anytime, anyplace via the Internet.

6-1-2 The School's Role in Fostering Parent Involvement

In light of the importance of parental involvement, schools should communicate a genuine desire to involve parents. School staff wishing to institute effective programs will need to be both open-minded and well-organized in their approach to engaging parent participation.

Some steps that schools can take to foster parental involvement include:

- Communicate to parents that their involvement is both sought after and desired.
- Encourage involvement not only when the child begins school but throughout their K-12 education.
- Train staff to emphasize the importance of the partnership between home and school.
- Emphasize to parents the importance of modeling life-long learning in the home environment.

Family involvement in the education of children is essential to academic success. Research shows that several barriers stand in the way of parent involvement. In order to foster parental involvement in each child's education, schools must address the barriers to parent involvement. Until these barriers are addressed and eliminated, children will not reap the benefits of parents who actively participate in the educational process.

6-1-3 Online Reporting the Aim of and Most Important Way of Parents Involvement:

So what does online reporting mean for parents? From 2010 they will be able to gain an insight into their child's school life; enabling them to access a wealth of information including school grades, attendance, special needs information, and home and class work schedules online. In addition a learning platform will enable parents to communicate frequently and freely with teachers; this means that they can be kept abreast of their child's education and any events which may have taken place during their child's school day.

Traditional reports will be replaced with regular and up-to-date online reports which parents can access whenever and wherever they happen to be. Being able to access their child's educational information as and when they wish has already been very successful in many schools with parents gaining greater understanding of day to day school life. For busy working parents and those whose work necessitates travel, online reporting could hold the key to ensuring that they are kept informed and up to date regarding their child's progress. They can access the information themselves as required resulting in them feeling actively involved in their child's learning journey.

Parents + engagement = positive learning experience

Parents are a crucial component in their child's education. If they encourage and take an interest in what their child has done each day at school, what lessons they have, and assignments they have been set, then this increases the likeliness of the child being engaged and interested in learning.

However, once reaching secondary school, students gain a new level of independence and this is sometimes where a breakdown in parental involvement can result. For example, with younger children, parents or a guardian are required to collect their child and drop them off at school - which means teachers and parents have frequent interaction and communication. In comparison, secondary school students make their own way to school and generally discuss less about their activities with parents. There are fewer opportunities for parent-teacher liaisons and increased need for communication between school and home.

If parents are able to support children while at home, and if they see parents play an active role and take a genuine interest, then they are more likely to feel engaged and want to succeed. Responsible authority should introduce online reporting in order to deepen the school-parent relations

6-2 The Digital Divide

Online reporting also generates a number of issues which need to be addressed to ensure a smooth introduction. Effective technology systems can actually significantly cut the staff workloads – but it has to be manageable for individual schools and meaningful for parents.

Many parents will be comfortable with technology and suitably 'tech-savvy' to deal with online reporting. However there will be those who are daunted and feel out of their depth at the prospect of using a computer. With online reporting becoming an essential component of a child's education, it is vital to make sure parents are up to speed with modern technology. Tackling the so-called "digital divide" is the main challenge. If parents are not up to scratch with technology, then rather than helping to increase the level of involvement in their child's education, it could exclude them further from their child's school life than previously before.

The introduction of technology as a way of updating parents is to enhance communication and cannot be viewed as a replacement for face-to-face contact. Its introduction should help stimulate a dialogue between the school and parents, and can be perceived as an additional and more immediate method to engage with parents rather than used to replace parent's evenings. The need for contact is still as important but parents will be able to attend school with more insight into attainment, attendance and behavior than was previously possible. If incorporated into school life effectively, the implementation of technology should act as a significantly beneficial accompaniment to traditional forms of contact.

6-3 Bridging the Gap

With the arrival of online reporting there is also the risk of excluding parents financially and this could again trigger a digital divide. Many of us commonly take instant internet access for granted and assume that other homes would have similar access. However, in reality many low income families do not own a computer and cannot afford to go out and purchase one which therefore makes online reporting a complex issue.

6-4 It's a School's Duty

Prepping parents about online reporting and ensuring that they have internet access. Creating a flurry of interest and engaging parents in the process is part of the recipe to ensure its introduction is effective, thus saving both teachers and parents' valuable time in the future. Parents need to feel included in order for them to feel engaged and motivated by online reporting. There are a number of ways that parents could be informed about online reporting, below are a few suggestions:

Small-scale Pilot Schemes

Local Authorities could run small-scale online reporting pilot schemes, selecting two or three schools in the local area to participate. This is a positive way to gain case studies of success and demonstrate the scope that online reporting can provide. It also serves to highlight initial problems, meaning that potential issues can be ironed out before the scheme is fully launched.

After-school Lessons

One way of educating and training parents could be via holding after-school lessons for parents where a teacher will explain use of the learning platform and demonstrate how parents can utilized online reporting to its full potential. Schools could also host some training classes during the evenings for parents who have work commitments. Schools also need to consider that parents have varying abilities. Some will be accustomed to using computers on a daily basis at work, whilst others may have never have even switched a computer on.

Online Lessons

For parents unable to attend after-school or evening training sessions there is scope for them to be trained online. Schools could potentially create a workshop detailing step-by-step guidelines for parents; they can log on to and access the learning platform at any time suitable for them. However, this would again be problematic for those parents without a computer or internet access.

Posted Teaching Packs

Another option that schools could consider is the possibility of mailing teaching packs to parents. This is a relatively simple option which means that all parents will be able to access the information. Schools could personalize their teaching packs and involve students in their design and create activities that parents can complete whilst getting to grips with the system. The key to the successful introduction of online reporting is via inclusion; connecting teacher, parent and child ensures engagement from each party.

Getting the children involved

Students are more likely to have used the learning platform and will probably be the most experienced at using it - therefore, it is a fantastic idea to get them involved. Perhaps students could assist teachers in after-school classes and go around and speak to parents. There is even scope for students to get involved via teaching their parents at home! As a homework assignment each student could be given a guide written by the teacher and asked to go through online reporting with parents. They could also help to produce the guide, suggest designs and also help to create the online guide. Keeping it fun and interesting is positive for all parties.

6-5 Internet Basics

Electronic mail (Email) is usually used to communicate with individuals you already know. With email personal messages are sent back and forth with people all over the world. Teachers and parents can use email to keep in touch on a more regular basis. Parents can use email to keep in touch with other parents as an electronic support group. Students can write students from all over the world as electronic pen-pals. Email is less intrusive then using the phone as email will not interrupt dinner or a quiet moment, but is read at the leisure of the receiver. Email is also more productive than the phone since users can take more time and give more thought to questions concerns, and answers.

File transfer protocol (FTP) is another very useful tool on the Internet. It is used to transfer files over the Internet. This is useful for downloading educational shareware and freeware from servers on the Internet to the home or school personal computer.

FTP is also an efficient way to get software and driver updates that keep your computer running smoothly.

Chats are virtual rooms where groups of individuals talk to each other with type written words in semi "real time." There are many different types of chat rooms designed to cover many different topics. Look for a chat room connected with parenting, educational, or children web sites.

The World Wide Web (WWW) came into existence in 1991. For the first time the Internet had a truly graphical interface. The web is similar to an interactive magazine, it is full of pictures and text, and so much more. You interact with the web with forms, search engines, animation and sound. There are many wonderful web sites oriented to educating the family. The web, void of time or space, can bring the world into you home. Parent and child can visit museums and art galleries, research how to take care of the family fish tank, or find an extinct animal. You could go to the opera, or find out what a cello sounds like, or maybe just hear the howl of a wolf.

6-6 Conclusion

It is hard to tell what the future will hold for the Internet. Some exciting new advancements are already becoming a reality on the web. Things like live video, live audio and virtual reality are already beginning to emerge. It is difficult for working parents to get involved by helping out in the school. With the Internet parents can feel more involved by interacting with the teacher, other parents, and researching information with their children. Some wonder if the Internet is just a passing fad. More likely the Internet will continue to grow into one of the more important aspects of our lives, and each day getting on the Internet is getting less intimidating, because of more service providers, and easier to use graphical browsers.

Chapter 7

Integrating Technology

into

The Curriculum (Curriculum Reform)

Curriculum and literacy in the digital age will be personalized, customizable, discoverable, remixable, combinable, interactive, participatory, and scalable.

Applying education technology requires a Vital and effective Curriculum (curriculum reform) in order to utilize the education technology and to help teachers to easily prepare their lesson plans.

Change Issues in Curriculum and Instruction/Curriculum, Textbook, and Pedagogy

7-1 Cultural Evolution and Education

The 21st century has brought with it the expansion of communication technology that has altered the way humans communicate with each other, learn material, and interact with text. This cultural evolution into a "techno" world has ramifications that affect educational curriculum, textbook development, and pedagogy. The need to educate those who have grown up in the world of fast-paced, immediate feedback from recently available technology has created new educational concerns.

7-2 Student Knowledge

Students must be taught skills that will allow them to be successful in their future endeavors, regardless of what they may be. The technology that exists today will not be the technology of the future. Students should acquire a set of generic skills and knowledge they could utilize in the decision-making process and other academic and occupational pursuits. Although there is some benefit in teaching kids skills they can apply immediately, there's more value in teaching them deeper concepts that will benefit them forever, regardless of changes in specific applications. Educators need to find stronger themes, around which they can coordinate big ideas. This allows students to make deeper connections with academic material. These themes can successfully be developed with the integration of current technology. Technology has the ability not only to develop these skills but also to present material to students in a manner to which they are accustomed. These computer literate students have been "programmed" to learn through digital technology. In order to be effective in teaching, teachers need to incorporate not only problem-solving skills, but incorporate appropriate technology training as well. If students learn problem solving skills, how to analyze data, and how to apply new knowledge to novel situations they will be prepared to tackle any task they may encounter in their future. Because technology is embedded in so many aspects of a student's life, students need to learn skills that will allow them to effectively use this technology. These include creating hypertext, computer-supported presentation skills, and basic usability guidelines. In addition, students should be able to analyze the validity of data received digitally and assess the value of the material they obtain. There is increasing recognition that the end result of computer literacy is not only knowing how to operate computers but also using technology as a tool for organization, communication, and problem solving (Johnson, D. & Eisneberg, M., 2002).

7-3 Textbooks

A textbook is to students what software is to computers; something to be installed on them so that if testing reveals that loading did in fact occur, they can be certified as fit for use . Some textbooks lack coherence, and others do not challenge students to think.. Textbook are designed in a way that makes it look at once authoritative (with lists of endorsements, ample footnotes, a hard cover, relatively expensive paper and graphics) and easy for students to study from as they prepare for tests (major concepts in bold face, a glossary of memorizable definitions, chapter summaries for last-minute cramming). Today's students quickly become bored with the traditional textbook design. Life and learning can be so much richer, more constructive, more joyful than the textbook world allows (Westhues). Textbooks need to support the knowledge that is required for a course of study, but they need to do so in a way that allows today's students to effectively interact with this material. Textbooks should be marginal in courses, while debates, discussions, computer-based presentations, and other forms of communication should be the main focus of the classroom. Textbooks should be chosen based on their ability to incorporate problem-solving skills, use real-life situations to support concepts, link material to broader understandings, and incorporate computer technology. Modern technology has allowed textbooks to be interactive by accompanying traditional texts with CD's as well as having companion websites. There are also now electronic textbooks that are exclusively online and that are written collaboratively using wikis. These textbooks are unique in that they can be accessed and edited by anyone on the internet. Electronic textbooks can present animation and sound and provide links to several items and suggest associations among ideas (Blystone, Barnard & Golimowski, 1990). Providing links to other websites allows students to learn about topics in more detail by reading additional articles, participating in online activities, and even watching movies. This allows the students to interact with the material in a way that the traditional textbook does not. With the new technology of wikis, students themselves are able to take part in writing part of their textbook. This enables them to learn about a specific topic in detail, write about it, and then post it on the internet for anyone to read. When students do this, they take more responsibility and ownership in learning about the topic.

This is not to say that textbooks should be discarded completely. Rather, they should be used as one possible resource among many. A good textbook can help to structure content

and provide solid groundwork for further learning. For the inexperienced teacher especially, the textbook may provide information in a well-organized, coherent framework and could well save him or her precious hours that might otherwise be used for research rather than for preparing ways of making the material interesting to students. Moreover, the instructor is responsible for structuring the presentation of the material in ways that appeal to students with all possible kinds of learning styles. Whereas many students may respond more readily to digital text, no doubt a few will remain who enjoy reading and find the appearing solidity of the textbook reassuring.

However, in addition to the format of instructional materials, we must also look closely at content. Textbooks are often rife with inaccuracies, biases, and outdated information. Whether presented as a book, interactive CD, or on-line, texts and instructional resources must be selected carefully and questioned critically. History texts in particular are biased with a Eurocentric view. As teachers select materials to reflect the cultures represented in their classroom, they must not neglect those that are not.. Textbooks, in whatever form, can be very influential, and we must ensure that students understand how they are presented. Students should be taught to question the information in any text and to look further for additional information. Never before has this been so easily accomplished. In this digital age the information is literally at our fingertips.

7-4 Digital Natives

We cannot consider the issues of what students should learn and how textbooks should be formatted without looking at the audience of the 21st century. Today's students are computer savvy. They have grown up in a digital world that has allowed them access to information at unprecedented rates. Today's students are no longer the people our educational system was designed to teach. Today's students are comprised of the first generation to have grown up in a world of technology. Email, the Internet, cell phones, PDI's, instant messaging, and computer games are integral parts of their lives (Prensky, 2001). These digital natives are vastly different from the students who our current educational system was designed to teach. They have been networked most of all their lives. Today's students will spend hours on My Space and Facebook, while they find it difficult to focus on book work for any duration of time. They have little patience for lectures, step-by-step logic, and "tell-test" instruction. To design engaging learning experiences for these digital natives, the digital immigrants (those who have not grown up

in a digital world) must be well trained in technology and understand its potential. In many countries standards address teacher proficiency with technology, as well as provide a framework for inclusion of technology in ways that will meet the learning preferences of today's students. Those who have grown up surrounded by digital technology communicate differently and use different problem solving methods (Pasteur, 2007). They prefer receiving information very quickly, parallel processing and multi-tasking, and working with graphics and hypertext over text. They thrive on instant gratification and frequent rewards, and they prefer games to "serious" work . Games embody well-established principles and models of learning. For instance, games are effective partly because the learning takes place within a meaningful (to the game) context . Research has consistently found that games promote learning and/or reduce instructional time across multiple disciplines and ages.

7-5 Why Integrate Technology into the Curriculum?

The Reasons are Many

Technology is ubiquitous, touching almost every part of our lives, our communities, our homes. Yet most schools lack far behind when it comes to integrating technology into classroom learning. Many are just beginning to explore the true potential tech offers for teaching and learning. Properly used, technology will help students acquire the skills they need to survive in a complex, highly technological knowledge-based economy.

Integrating technology into classroom instruction means more than teaching basic computer skills and software programs in a separate computer class. Effective tech integration must happen across the curriculum in ways that research shows deepen and enhance the learning process. In particular, it must support four key components of learning: active engagement, participation in groups, frequent interaction and feedback, and connection to real-world experts. Effective technology integration is achieved when the use of technology is routine and transparent and when technology supports curricular goals.

Many people believe that technology-enabled project learning is the new plus ultra of classroom instruction. Learning through projects while equipped with technology tools allows students to be intellectually challenged while providing them with a realistic snapshot of what the modern office looks like. Through projects, students acquire and

refine their analysis and problem-solving skills as they work individually and in teams to find, process, and synthesize information they've found online.

The myriad resources of the online world also provide each classroom with more interesting, diverse, and current learning materials. The Web connects students to experts in the real world and provides numerous opportunities for expressing understanding through images, sound, and text.

New tech tools for visualizing and modeling, especially in the sciences, offer students ways to experiment and observe phenomenon and to view results in graphic ways that aid in understanding. And, as an added benefit, with technology tools and a project-learning approach, students are more likely to stay engaged and on task, reducing behavioral problems in the classroom.

Technology also changes the way teachers teach, offering educators effective ways to reach different types of learners and assess student understanding through multiple means. It also enhances the relationship between teacher and student. When technology is effectively integrated into subject areas, teachers grow into roles of adviser, content expert, and coach. Technology helps make teaching and learning more meaningful and fun.

Teachers should have the knowledge and skills to overcome obstacles when integrating technology into their curriculum--across the content areas.

7-5-1 Technology Integration Made Easy

Integrating technology into the curriculum is a priority , if not a mandate ,in most schools today. Most educational technology experts agree, however, that technology should be integrated, not as a separate subject or as a once-in-a-while project, but as a tool to promote and extend student learning on a daily basis. The challenge, of course, is in finding ways to use technology ,and to help students use it , that don’t take time away from core subjects.

For many teachers, a lack of personal experience with technology, presents an additional challenge. In order to incorporate technology-based activities and projects into their curriculum, those teachers first must find the time to learn to use the tools and understand the terminology necessary for participation in those projects or activities.

Used properly, however, technology can be a tool for teachers as well as for students. To help teachers new to technology gain experience in using it, and to help tech savvy teachers incorporate technology more fully into their daily routines

7-5-2 Characteristics of Learning Technology

To achieve the best possible learning outcomes in technology, programmes should reflect the following characteristics of technology education.

- Technology education builds on students' existing knowledge and skills, values, interests, and aspirations. All students will be familiar with many technologies, but may not have articulated their understandings, nor recognised their own skills.
- Technology education deals with real, identified needs or problems, and with multiple solutions. There is no single "right answer"- lateral thinking and willingness to test divergent options are to be encouraged -although some solutions will be more successful than others.
- Further learning in technology occurs through failure analysis, recognizing the value of alternative and unexpected outcomes.
- Technological activities usually lead to a tangible outcome: a product, a model, a modified environment, or a system. All students should experience the satisfaction of developing a range of outcomes.
- Technological developments are advanced by sharing ideas, presenting concepts, and evaluating possible solutions.
- The teacher's knowledge, experience, and skills provide input to assist in refining ideas, selecting resources, and achieving quality in products, as well as guiding students towards viable solutions.
- The teacher supports, guides, challenges, and learns with the students, interacting with their thinking and helping to clarify ideas.
- Technology education encourages risk taking: students' ideas should be accepted and valued, and students challenged to realise their aspirations. It provides opportunities for

students to show initiative, make choices, and take more responsibility for their own work.

- Technological activities often require students to work co-operatively and collaboratively—with each other, their teachers, and other adults.
- Technology education recognises that students have different starting points and will progress at different rates: the teacher's role is to motivate, encourage, support, and provide feedback to students.

- Technology education gives opportunities for a wide range of people in the community to provide specialist input.

7-5-3 Implementing the technology curriculum

Technology and the Teacher

Technology involves knowing and doing. Learning and teaching approaches should address both of these areas. Technology is derived from a variety of knowledge bases, values, processes, and skills. These are used both to create and to evaluate designs, products, systems, and environments critically. There should be flexible, open, collaborative approaches to classroom teaching which accommodate all students' perspectives, interests, aspirations, and learning styles.

Students' technological capability will be enhanced through engagement in purposeful and comprehensive activities. An appropriate technological activity will require thoughtful planning and negotiation between students and teachers.

Technological activities often involve students working as a team and undertaking a variety of roles and tasks. The successful management of knowledge, skills, and resources is crucial to group activities in technology.

Teachers, too, will often work collaboratively to plan and deliver the curriculum. In particular, teachers with special knowledge and skills in different and existing disciplines will have important roles in working with their colleagues to achieve the successful implementation of a school's technology curriculum. This technology curriculum will need teachers who can contribute expertise in using a wide range of materials; in food technology and processing; in information and communication, such as keyboarding,

computing, and language; in electronic, mechanical and biotechnologies; and in drawing and graphics.

7-5-4 Implementation across the curriculum:

- demands careful planning to ensure that students experience a coherent programme which meets the full range of achievement objectives;
- needs a monitored programme to ensure that achievement objectives are reliably assessed, and that they are not obscured or confused with objectives from other learning areas;
- should help to increase the transfer and reinforcement of skills and knowledge across subjects;
- should increase communication and exchange of ideas among teachers;
- helps to overcome the distinctions between academic and vocational orientations;
- recognises the contributions made by all subjects to technological education.

The implementation of the technology curriculum requires school-based decisions.
Teachers should make full use of their flexibility to develop technology programmes that reflect the particular character of their school.

7-6 Curriculum Reform

7-6-1 Teacher Preparation and Curriculum Reform

Technology should be an integral part of teacher preparation programmes. Research shows that teachers tend to teach the way that they were taught. Therefore, if we expect teachers to teach in a constructivist way using technology, we need to be teaching them in constructivist ways using technology. In a course on educational technology for teachers, the goal should not simply be to teach the use of several technology systems, their advantages and disadvantages; instead, the goal should be to provide students with opportunities to think like experts in making instructional decisions, selecting media for appropriate use, structuring learning activities and employing sound pedagogical strategies in real-life contexts.
The instructor in a teacher preparation course should structure the learning environment so that he\she will have the opportunity to model expert behavior to students in sound uses of technology-based teaching and learning. It is important that the teacher–educator is an

expert in technology-based learning because only then he\ she can model to their students' – future teachers – expert behavior. Furthermore, teacher preparation programmes should not simply offer a course in educational technology, but also demonstrate effective use of technology in teaching teachers several other courses. Constructivist uses of technology in teaching should be modelled in the teaching of other subject matters such as mathematics education, science education and social studies. For example, during a course in science education, future teachers should be taught with technology in ways that model appropriate technology-based learning for science education. There are numerous ways of integrating technology in teacher education since technology can provide a rich context for learning. Technology rich environments allow prospective teachers to experience real-life scenarios of classroom teaching, construct multiple perspectives and reconnect on their practice. Several rich interactive multimedia systems exist in the market that allow students to work in groups to review video of classroom teaching, identify good practices and discuss them with their peers. This professional development program blends pedagogical techniques and concepts with state of the art presentation and delivery mechanisms. Its main purpose is to improve the mathematical discourse abilities of primary teachers.

Methodology is based on a digital library of classroom video depicting primary teachers teaching mathematical concepts using professional standards on discourse.

7-6-2 Teacher Professional Development and Policy Reform

All the above suggestions can help reshape teacher preparation programmes so that they can prepare teachers to integrate technology in teaching and learning. Curriculum, pedagogical and policy changes are essential for the success of reform. To effectively integrate technology in teaching, pre-service teachers need to be well prepared, but also in-service teachers need to deepen their knowledge and skills as well. In-service teachers need time to develop, master and reconnect on technology-based learning approaches. They need time and incentives to participate in lifelong professional development.

Changing the philosophical and pedagogical assumptions of education systems require time, effort and strong political will. Programmes developed need to be evaluated thoroughly to determine their effectiveness in preparing teachers to teach with technology. Skilled personnel are needed to develop, implement and evaluate educational technology programmes in teacher training. There is also a need for increased funding and strong

determination of all parties involved; administrators, teachers and parents should unite their efforts for the development of serious programmes that will support education reform.
There are always obstacles to attempts for educational reform: the resistance to change that is deeply rooted in education systems and the fear of technology dominating our lives – forces that can withhold change. However, technology can help reform education and the education system needs to be reformed for successful technology integration. If we believe that teachers are the primary agents of change, then a good place to start is by reforming our teacher education programmes to better prepare teachers take advantage of the affordances of the various technologies and successfully integrate them in their practice.

7-6-3 Models of Curriculum Integration

The notion of curriculum integration is not new. Dewey and Kilpatrick advocated forms of integration early in the century (Vars, 1991). More recently, however, educational theorists have been advocating curriculum integration for a number of reasons. The challenge has been for those who attempt to put theory into practice. The purpose of this is to define curriculum integration, discuss selected research related to curriculum integration, present several curriculum models for integration, and discuss some of the implications curriculum integration will have on education.

7-6-4 Integrated Curriculum Defined

"The very notion of `integration' incorporates the idea of unity between forms of knowledge and the respective disciplines" (Pring, 1973,). In practice this can take many forms. Those who consider astronomy, biology, chemistry, geology, and physics as distinct disciplines consider a general science course a step in the direction of integration. They use the metaphor of a marble cake versus a layer cake to signify different levels of integration. The layer cake means each of the sciences maintains an identity in a general science course while the marble cake is more problem based with the various sciences contributing to the solution of the problem. They argue that the layer cake is more of an interdisciplinary approach to curriculum because the boundaries among the disciplines are maintained. Therefore, if one is discussing curriculum integration with a science educator, one must first determine the context because integration could refer to integration within the sciences rather than integration among a wide range of disciplines so that the learner experiences a number of interconnections among disciplines.

An interdisciplinary curriculum can be closely related to an integrated curriculum. Most educators represent the view that knowledge in interdisciplinary studies is a repackaging and, perhaps, enhancement of discipline based knowledge. Interdisciplinary means conscientiously applying methodology and language from more than one discipline to a theme, topic, or problem.

Whether a curriculum is interdisciplinary or integrated is not the main issue. Rather, the focus should be on designing a curriculum that is relevant, standards based, and meaningful for students. At the same time, the curriculum should challenge students to solve real world problems.

7-6-5 Research Supporting Curriculum Integration

During this decade, cognitive scientists have been able to use advanced imaging technologies to study the operation of the brain. Much of this research has yet to be directly translated into curriculum and pedagogy. This research is spawning a dynamic educational philosophy referred to as "constructivism" which refers to engaging students in constructing their own knowledge. "The single best way to grow a better brain is through challenging problem solving. This creates new dendritic connections that allow us to make even more connections" (Jenson, 1998,). And one of the best ways to promote problem solving is through an enriched environment that makes connections among several disciplines.

Educational researchers have found that an integrated curriculum can result in greater intellectual curiosity, improved attitude towards schooling, enhanced problem-solving skills, and higher achievement in college.

Some schools have used an integrated curriculum as a way to make education relevant and thus a way to keep students interested in school (Kain, 1993). In a traditional program, relevancy can be a problem. One of the most common questions in a mathematics class is, "Why are we learning this math?" And the common response is, "Because you will need to know it in your math class next year." This response seldom satisfies the learner. Schools report higher attendance rates when students are engaged in an integrated curriculum (Meier & Dossey, unpublished manuscript). Having the opportunity to utilize knowledge and skills from several disciplines does offer increased opportunities for making the

curriculum relevant. A word of caution is in order, however. Just because a curriculum is integrated does not automatically mean that it is relevant.

7-6-6Models of Curriculum Integration

Over the past decade, several models of curriculum integration have evolved. A review of the literature revealed that far more curriculum integration occurs at the lower levels of education (K–8) than at the high school and college levels. The emerging trend is for elementary schools to build interdisciplinary curricula around themes, whereas in high schools and colleges integrated curricula are more likely to be based around problems. An example of a theme at the elementary level could be "Our Community," which affords a relevant setting to specify distance, area, and quantities in the community; to read descriptions of the development and growth of the community; to interview and write about senior citizens who live in the community; to focus on the resources needed to sustain a community; to recognize the blend of ethnic influence on community life; to investigate community festivals and other cultural activities; and to engage in some of the technologies important to individual and community growth. On the other end of the spectrum, a university capstone course might involve students in solving a real world problem such as the design, development, and installation of automated tooling in a manufacturing plant. A solution of this problem would naturally lead the students into mathematical, scientific, and technological issues that would have to be addressed. The following integrated curriculum models are presented in generic format.

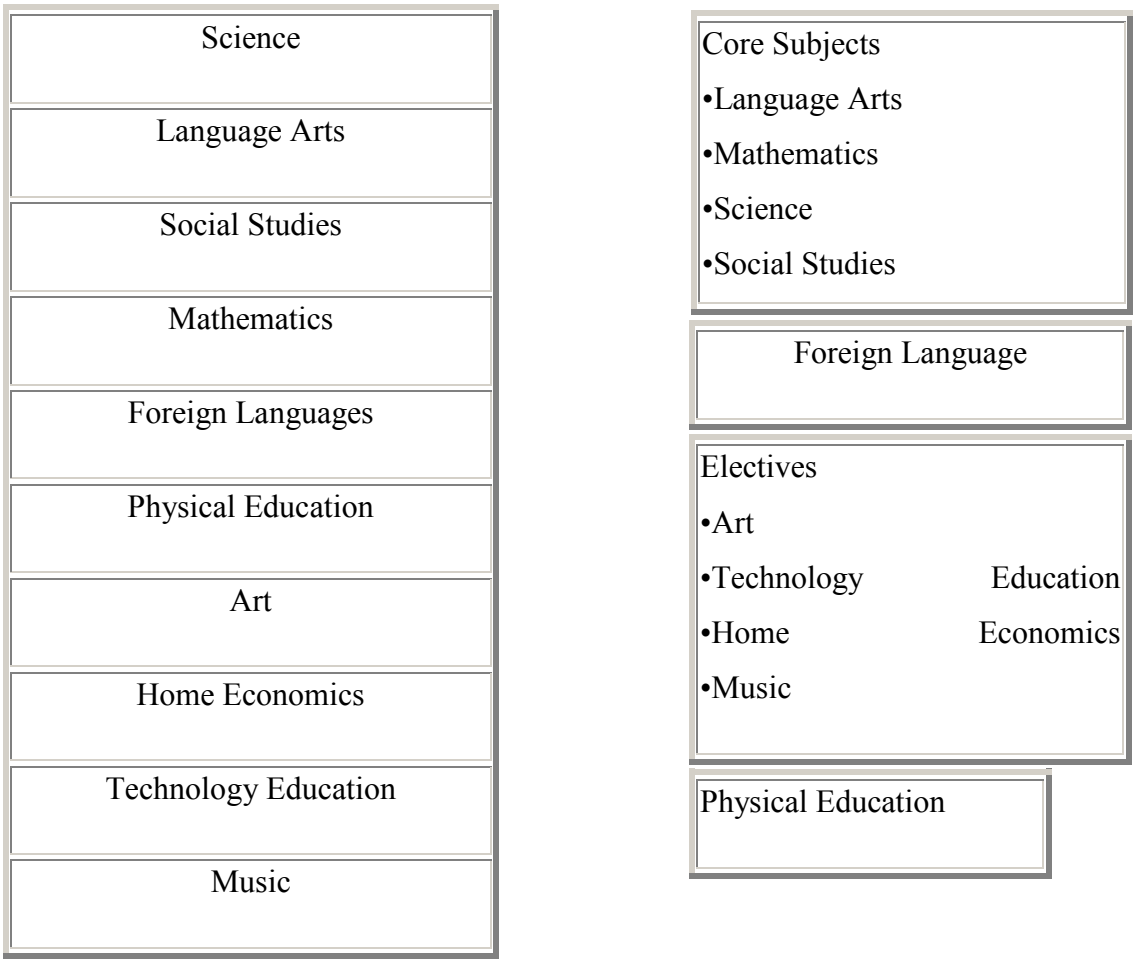


Figure 1. The interdisciplinary model.

In the interdisciplinary model, schools group traditional subjects into blocks of time, assign a given number of students to a team of teachers, and expect the teachers to deliver an interdisciplinary or integrated curriculum. For example, in Figure 1 the core team consists of four teachers who have approximately 110 students for a block of four periods a day. They are given one hour of common planning time and another hour to learn on their own. The administration empowers them to use their block of time (approximately 175 minutes) in any way they wish. The most typical daily schedule involves groups of approximately 30 students rotating through the four disciplines. Occasionally, the teachers may decide to introduce a new theme to the entire group at the same time. Or, they may take all of their students on a field trip. In practice, this model is being used with greater and greater frequency at the middle school level. This model offers several advantages: Teachers are given time to work together, they have a limited number of students, and this model can support a traditional curriculum while offering scheduling flexibility to the team. One disadvantage is that it is easy for teachers to simply continue doing what they have always

done with little or no attention given to the interdisciplinary or integrated curriculum. The biggest disadvantage is that standards-based, integrated curricula across the disciplines are scarce, which means that teachers need to develop the curriculum on their own. Since the process of curriculum development is so time consuming, they are able to implement an integrated curriculum for only a small portion of the school year.

Another curriculum integration model can be referred to as the problem-based model. Ideally, this model places technology education at the core of the curriculum. Since we live in a highly technological society and technology is a human endeavor, this is a natural way to design the curriculum. With a technological problem at the center, disciplines lend their support in helping to solve the problem. An example problem might be to determine how the waste produced in a community could be turned into an asset. In this instance, the social studies class can address the role of local government in collecting and disposing of waste; in science the emphasis could be on reducing materials to their basic elements and recombine them; and in mathematics one could study measurement, area, volume, and so forth. In technology education, the focus might be on the various technologies used to separate waste into categories as well as the transformation of waste into usable materials.

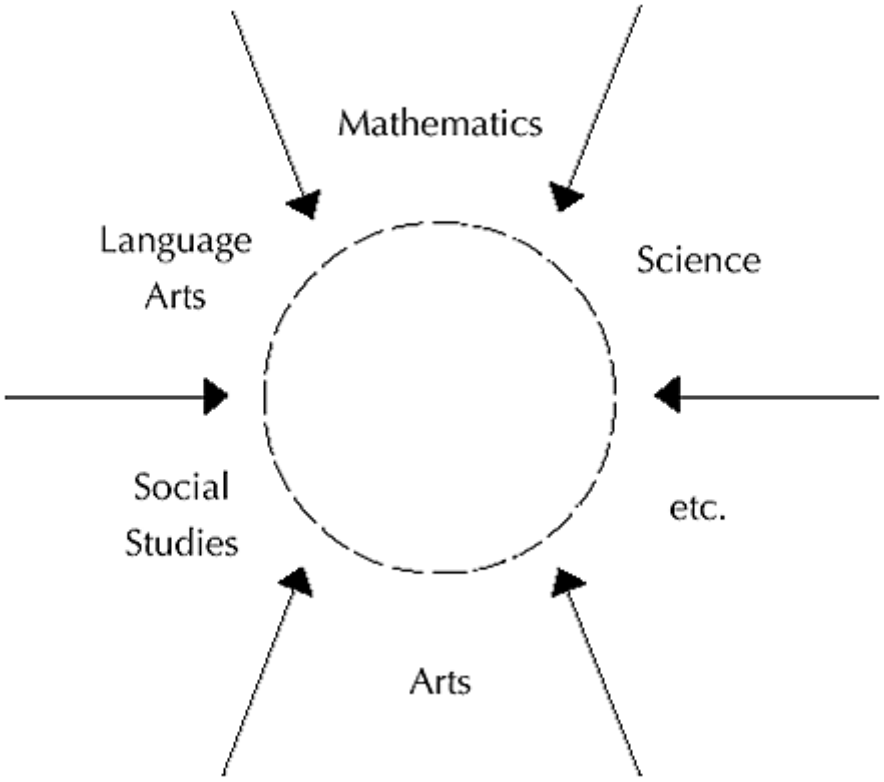


Figure 2. The problem-based model.

An advantage of this model of integration is that it offers high potential for the identification of relevant, highly motivating problems. On the other hand, a disadvantage of this model is the difficulty of assuring that the country frameworks and standards are fully addressed in a given grade level.

An example of the application of this model is the Technology, Science, and Mathematics (TSM) Project directed by LaPorte and Sanders (1996). The project resulted in 17 connection activities that encourage middle school students to learn the concepts of science and mathematics by motivating them with real world situations of interest to them. The activities use design-under-constraint and handson technology (in contrast to hands-on science) to motivate the learning of science and mathematics. The goals are to increase the ability of students to apply concepts of science and mathematics to real world situations; to strengthen communications among science, mathematics, and technology teachers; and to explore the role and effectiveness of technology-based activities.

The third model of integrated curriculum is referred to as theme-based education. Advantages of this model are that teachers can still identify with a given discipline, it is easier to connect the curriculum with standards and frameworks, and students are able to make connections among objectives from various disciplines. There could be a tendency, however, for a given theme and/or key concept to have little relationship with a specific discipline, causing the tendency for teachers to engage students in shallow or irrelevant learning.

An example of the use of this model is the Integrated Mathematics, Science, and Technology (IMaST) Program. IMaST is a two-year integrated mathematics, science, and technology curriculum for the middle grades. The program is composed of 10 modules, which provide the full curriculum for each of these disciplines. The program is designed to be taught by a team of three teachers for approximately 120 minutes per day for the full year.

The IMaST program integrates mathematics, science, and technology into a coherent theme-based curriculum; promotes experientially based, hands-on learning set in a learning cycle; promotes teaming among teachers from three or more disciplines; provides an opportunity for students to apply the concepts and skills to new situations using problem solving strategies; utilizes authentic assessment; makes frequent use of student group work; fulfills benchmarks, standards, and frameworks in mathematics, science, and technology; connects to other disciplines, such as social studies and language arts; and responds to the latest research in teaching/learning as well as to systemic reform initiatives.

After reviewing the aforementioned generic models of curriculum integration, one can readily see that researchers and practitioners must have a strong belief system in favor of the integrated curriculum if, in fact, they are to succeed in a sustained manner.

THEME

Key Concepts.

Mathematics	Science	Technology	Language Arts	Social Studies
Objectives				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Figure 3. The theme-based model.

7-6-7 Implications of Implementing an Integrated Curriculum

No matter which model is selected, there are several common factors that tend to emerge. **First**, teachers must shift their belief system from one that is primarily didactic in nature to one that has a foundation in constructivism. Rather than asking students to follow the steps of procedure, memorize facts, or verify given principles or laws, students work together to discover knowledge, applying their knowledge as they solve real world problems.

Second, an extensive amount of professional development is needed for teachers. This includes a significant intervention of two or three weeks of knowledge development in curriculum areas other than the one they are certified to teach. Also, this professional development must include extensive practice in the use of constructivist-oriented pedagogy.

Third, the teachers need to become members of learning communities. At one level this means working with one's peers to improve education. At another level teachers work with their students in solving problems that have multiple answers.

Fourth, teachers need to become skilled in facilitating small group learning. Research has shown that learning is a social process and that students learn a great deal by interacting with one another.

Fifth, teachers need to manage experiential-oriented instruction. This includes inventorying and storing materials; the safe operation of instrumentation, machines, and equipment; and leading students toward efficient progress.

Sixth, teachers need to learn to use authentic assessment strategies such as portfolios, performance exams, and rubrics to document student progress.

Seventh, administrators and school boards need to be oriented so the necessary resources and ongoing support can be provided to the teachers.

Eighth, public information strategies need to be implemented in order to inform the community and parents that a new paradigm of education is being used. The expectation is for education to be provided as it has always been, and unless the public is informed of changes to be made, there is likely to be resistance.

Finally, changing to an integrated curriculum requires systemic reform. This includes the way teachers are prepared, certified, and assessed. Attention must also be given to countrywide assessment of students and the process whereby teacher credentials are renewed.

Given the implications listed above, the prospect for moving to the implementation of an integrated and/or interdisciplinary curriculum on a nationwide basis is bleak. On the other hand, research in the area of education as well as in cognitive science suggests that some form of an integrated curriculum is likely to promote more learning. This being true, the topic of integrated curriculum is destined to receive a lot of attention soon.

Chapter 8

Instructional Design and Educational Technology

8-1 New Trends and Approaches in Instructional Design and Technology

Instructional design should be redesigned to infuse the teaching with a new effectiveness and vitality in order to utilize and incorporate the new technology into the creation of 21st century teaching classrooms environment.

The instructional design and content elements that form a learning ecology must ideally be dynamic and interdependent. The learning environment should enable instructional elements designed as small, highly relevant content objects to be dynamically reorganized into a variety of pedagogical models. This dynamic reorganization of content into different pedagogical models creates a learning system adaptive and personalized to varying student needs.

With good instructional design strategies and adequate technological resources, e-learning can provide a high level of learner-content interactivity that can motivate learners to engage in their learning.

8-1-1 From school to industry

Key words: instructional system design, instructional design, instructional technology, new approaches in IDT, and history of IDT

All educators, designers and scholars involved in instructional design process have taught of the boundaries of the field they are in for ages. There are important questions that professionals in the field should be able to answer or, because there is no generally

accepted correct definition or answer, at least be able to discuss intelligently. This paper intended to provide readers with information to get answers these questions.

There are two points for examining changes in this field. It is important to point out that not only have the definitions changed, but also the actual name of the field itself has often varied (Reiser, 2007). ID has been used interchangeable with the following terms; audiovisual instruction, audiovisual communications and educational technology. However, the term that has been used most frequently has been instructional technology. The next question will be what the instructional technology is. The question is difficult to respond because the field is continuously changing according to the technological developments. Over the years, there have been many discussions and attempts to define the field. Several definitions have been accepted by a great many professionals. Although the origin of the field was based on Aristotle, the field has been developed respectfully after world war two. The field has an important role in the educational environments, industry, and business and health education.

8-1-2 Foundations of Instructional system Design

Instructional design had a long run. Instructional system design (ISD) approach was developed to solve instructional training problems in the different sectors from schools to industry and military. First time Instructional design institute (IDI) consortium developed this approach. Their approach was named as ISD approach and model. After this effort several ISD models were involved and developed in education. At this time instructional design and instructional development were used interchangeable in institutions. According to Seels and Glasgow (1998), “Instructional design is a process of solving instructional problems by systematic analysis of the conditions for learning. To do this, one makes decisions related to each step in the instructional system design (ISD) process". The field of instructional design has been affected by many disciplines and the basis of its theory is indicated in Figure 1.

8-1-3 Definitions of Instructional Design (ID) and Instructional Technology (IT)

In the history, there are different approaches for defining ID and IT. The developments of ID approach became significant instructional events with technological changes. The definition of the field of ID and IT has been accepted as a new field recently (Reiser, 2007).

Instructional technology has the same meaning with the combination of instructional design and instructional development. For this reason, both Instructional technology (IT) and instructional design (ID) are accepted as a field of Instructional design and technology (IDT). The definition of instructional technology has been made by the Department of Audiovisual Instruction in 1963 (now known as Association for Educational Communications and Technology- AECT). The definition was a traditional view that included designing messages to control the learning process. The definition identified a series of steps that individuals should undertake in designing and using messages. These steps were planning, producing, selection, utilization and management. They were similar to systematic instructional design approach. At the beginning of 2006, AECT was presenting a new definition as follows; (Januszewski, in press)

> "Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources", (n.p).

The latest definition of Instructional Technology was announced by Reiser (2007),

"The field of instructional design and technology (also know as instructional technology) encompasses the analysis of learning and performance problems, and design, development, implementation, evaluation, and management of instructional and non-instructional processes and resources…"

According to Reiser and Dempsey (2007), their accepted definition uses both systematic instructional design procedures and media. Instructional design procedures and practices associated with human performance technology have been integrated into the training future of ID&T which professionals receive and the activities individuals undertake.

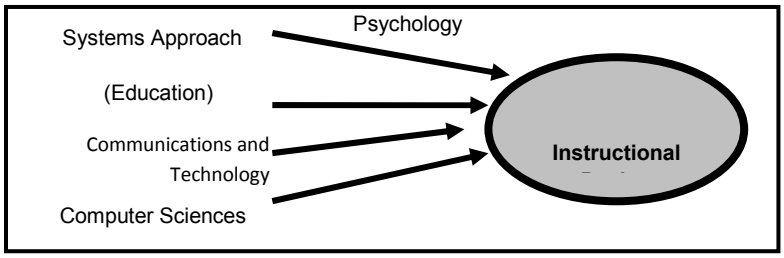


Figure 1. The theory bases of instructional design

8-1-4 Future of IDT Field

Integration of ISD models. In the history, there are many definitions of ID. Early definitions of instructional technology (IT) were based on media and process. Finally, IT was defined as the theory and practice by Seels and Richey (1994, p.1). ID begins with a generic definition of ISD approaches, including analysis, design, development, implementation and evaluation (ADDIE). Today, all ID models have similar levels in the models with some contributions to the field. The term instructional design (ID) refers to the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation (Smith & Ragan, 2005).

In addition, instructional design is the systematic process of designing, developing, evaluating and managing the entire instructional process to ensure effective and efficient learning. It is based on what we know about instructional and learning theories, systems design, information systems and management (Morrison, Kemp & Ross, 2004). Instructional design (ID) is the process of solving problems by systematic analysis of the conditions for learning (Seels & Glasgow, 1998). There are many approaches for using or selecting an ID model.

The basic elements of instructional design include:

- Analysis of learner and organization needs
- Determination of instructional goals and objectives
- Construction of a method for the evaluation of learner achievement
- Design and selection of instructional strategies
- Implementation the training
- Evaluation of the training

Today, all ID models have similar steps of ADDIE generic model, recently ID approach is effectively combined with the field of instructional technology; thus, it started to be defined as instructional design and technology field respectfully. Educators and different sectors have started to use different IDT model steps for training and solving complex problems that they need in the instructional process. In this case, according to Gustafson and Branch (2007), instructional design (ID) characteristics are as follows:

- Instructional design is learner centered.
- Instructional design is goal oriented.
- ID focuses on meaningful performance.
- ID assumes outcomes can be measured in a reliable and valid way.
- ID is empirical, iterative and self-correcting.
- ID is typically a team effort

Computers tools for instructional design. ID field and its influences on the different fields require use of new technologies during the instructional process. For this reason, computer tools and new media have been developed for using ID strategies to solve training problems in business, industry and education as well. These technologies have applied IDT strategies to develop training materials and contents as computers tools.

Integration of technologies and learning theories. Integration of technologies is important at instructional material development. Some of the techniques to be used for developing technical characteristics in learning processes are sound, text, image and mobility for developing lessons and modules in traditional instruction and e-learning courses. These are integration technologies for developing instruction as well as integrated learning theories from different learning approaches.

8-1-5 Dimensions of ID and the Role of Instructional Designers

Basically, ID is a systematic and reflective process. For the provision of effective process, efficient learning and systematic analysis of the conditions, IDT can be used for learning. To develop materials, activities and information resources, IDT approach can be used for. Instructional designers can work as research and practice experts.

An instructional designer is somewhat like an engineer. Both plan, their work based upon the principles that have been successful in the past. The engineer is on the law of physics, and the designer is on the basic principles of instruction and learning. Both try solutions

that are not only functional but also attractive or appealing to the end user. Both the engineer and instructional designer have established problem solving procedures to use them in making decisions about their design. Through this systematic process, both the engineer and instructional designer plan what the solution-often a finished product- will be like.

Designer has a production role. This holds true for instructional designers. However, some designers, such as those with production skills (computer, video production or development of print materials) translate their applications into the final instructional materials. Classroom teachers often implement their own plans. In any event, the designer typically begins the production or implementation once specifications are completed.

8-1-6 New Directions in IDT Process

Distributed learning is any educational or training experience that uses a variety of means, including technology to enable learning. It can provide intentional and incidental learning outcomes. It includes, but not limited to distance learning and online learning. In distance learning the learner is separated in space and time with teacher and peers. In on line learning the learner is limited to Internet-based learning technologies. Another commonly created subset of distributed learning is e-learning; the new approaches in e-learning have been mentioned as integrated e-learning courseware (Ipek, Izciler, and Baturay, 2008, in press; Jochems, van Merriénboer and Koper, 2005). The alternative ID models have been created and applied for integrated e-learning, which includes pedagogical, technological and organizational dimensions for e-learning courses. Integrated e-learning covers complex learning, flexible learning and dual learning. The 4C/ID model can be used for the design of integrated e-learning as well as other integrated ID models such as Seels and Glasgow, Gagne, Keller, Dick and Carey ID models. Using rich media wisely is a significant process for learning and teaching in integrated e-learning. Using computer based training tools helps people to understand some complex learning and technical skills. Rich media means learning products that incorporate different technologies such as video, animation, sound and simulation in computer based training environments. For instance, rich media provides using special players such as Flash or Shockware. Also rich media are commonly seen in the production of CD-delivered training. In the instructional design process defining goals, planning and monitoring indicate human learning strategies as a metacognition. In this case

designers and developers should be aware of cognitive and technological processes for learning and developing instructional materials as a rich media production.

8-1-7 IDT and Future Developments

In the future, IDT model will possibly integrate different learning objects and technological changes. Recently, object oriented distributed learning environments and programming languages such as C++ and Java have been used for several years. The programming has a dominant role in guiding the future software application development, including designing, delivering instruction in traditional education and distance learning. IDT model should have a relationship with linked objects by technology-based training (TBT) program. Other new technologies can be defined as electronic training jackets, metadata tags, and artificial intelligence applications. Recent cognitive science, neuroscience contributions, cybernetics and nanotechnology applications have provided effective contributions to future instructional design and technology. Science will continue using both research and theory for instructional design. Technology will provide technology-based tools and contribute instructional development and evaluation of IDT process. IDT process and knowledge will have foundations in media studies, systems thinking, curriculum development, and design thinking appropriate use, tech-mediated instruction, learning theories, technological change and reform, and technologies for performance support in the future developments.

To recap, in this study, the history of instructional system design, instructional design, instructional technology and broadly educational technology were discussed and future development of new technologies have been considered and mentioned regarding the learning process. ID models and integrated ID models were defined as an example from hundreds ID approaches. Moreover, the definition of IDT and new approaches for the information age and future developments were discussed and clarified to present possible applications for schools and industry. These applications include managing instructional projects, human performance technology, trends and issues in a variety of settings such as military, business, industry and health care education and new directions in IDT by using rich media.

8-2 ADDIE Based Five-Step Method towards Instructional Design

Simple step methodologies provide an organized design procedure for the use of instructional materials that can facilitate the creation and maintenance of classes and trainings. These methodologies are applicable to current courses, suggesting practices for redesign to infuse your delivery with a new effectiveness and vitality. They may be utilized for incorporating new technology into the creation and delivery of courses. They are also beneficial for the development of courses using alternative delivery methods.

First apply the ADDIE Instructional Design technique methodology: individual steps are to Assess and analyze needs, Design instruction and presentations, Develop materials, Implement activities and courses, and Evaluate participant progress and instructional materials effectiveness. Next, review Gagne's Nine Events of Instruction as a participant centric mechanism for progressing from lecture based to activities based constructivism instruction, where learners "construct" their own knowledge based on their interpretation of the subject matter.

Because ADDIE was one of the first Design Models, there has been much discussion about its effectiveness and appropriateness. This methodology for its simplicity, ease of application, and cyclic nature.

8-3 ADDIE (Analyze, Design, Development, Implement, Evaluate)

Analyze:

Teacher should Analyze how my last class/presentation went and about what he/she can do to do to make it better. I examine the goals and objectives of the presentation and the nature of the participants to try to determine the appropriateness of the instructional design. How did the last session go? What stimulated the participants, when did their eyes start glaze over, the yawns start, and the heads nod? Am I meeting their needs?

Design:

Design is concerned with subject matter analysis, lesson planning, and media selection.

A course of instruction may focus on skills from three different objective domains, Cognitive, Psychomotor, and Affective. Bloom's taxonomy orders this Cognitive domain from the most simple, Knowledge, through Comprehension, Application, Analysis, Synthesis to the most complex, Evaluation.

The Psychomotor domain is concerned with gross and fine-motor skills looking at behaviors that can be determined through task analysis.

The Affective domain deals with attitudinal behavior from simple awareness and acceptance to internalization as attitudes become internalized. Progress can be mapped utilizing Krathwohl's five levels of: Receiving, Responding, Valuing, Organizing, and Characterizing.

Lesson planning requires that you determine your:

- Objectives defined in terms of specific measurable objectives or learning outcomes.
- Skills, knowledge and attitudes to be developed.
- Resources and strategies to be utilized.
- Structuring, sequencing, presentation, and reinforcement of the content.
- Assessment methods matched to the learning objectives to ensure agreement between intended outcomes and assessment measurements.

Joyce and Flowers list seven instructional functions to be used; you may find these useful in determining how best to incorporate available technology into your presentations.

- Informing the learner of the objectives,
- Presenting stimuli,
- Increasing learner attention,
- Helping the learner recall what they have previously learned,
- Providing conditions that will provoke performance,
- Determining sequences of learning,
- Prompting and guiding the learning.

The choice of media is determined by contingencies of the participant's needs and available resources.

Development:

Development is a process of creation and testing of learning experiences and seeks to answer questions such as:

- Have the learning needs and characteristics of the participants been accurately analyzed?
- Were the problem statement, the instructional goals and the instructional objectives appropriate for the learning needs of the participants?
- To what extent are the teaching resources, instructional strategies and the participant learning experiences successful in effectively meeting the instructional goals and objectives of the target audience?
- Is it possible to accurately assess participant learning with the proposed course of instruction?

Implement

Negative responses indicate a need for revision. Implementation is the presentation of the learning experiences to the participants utilizing the appropriate media. Leaning, skills or understanding, are "demonstrated" to the participants, who practice initially in a "safe" setting and then in the targeted workspace. It may involve showing participants how to make the best use of interactive learning materials, presenting classroom instruction, or coordinating and managing a distance-learning program. The progress of the learning frequently follows cyclic patterns based on motivation and intention. Curriculum should be organized in a spiral manner such that the participant continually builds upon what they have already learned.

Evaluate

Evaluation is of two levels. The most important is to gauge the success of the participant obtaining and retaining the demonstrated skills and understandings. The second is to determine how successful the instructional design package was in facilitating effective participant learning. The final question becomes, How can I modify the package to improve its next presentation?

The following instructional design strategies could be considered before starting the development of e-learning materials.

1. Modularity

The core content for e-learning materials should be shorter in extent so that they are more appropriate for online study. The amount of text is reduced to a minimum. The small and modularized units of content will be emphasized and presented in various formats including key links, optional links, multimedia components, video lectures and so forth.

2. Learnability

With the help of multimedia learning components, a small chunk of information should be helpful to illustrate and demonstrate the process and some abstract content. It also encourages learners to have self-reflection and promotes their collaboration and problem solving skills through written messages posting in the discussion forums. Due to varieties of learning styles needed, it suits different types of learners.

3. Interactivity

Interactivity is the key to a quality e-learning experience. Four types of interactions including learner-content, learner-instructor, learner-learner, and learner-interface need to be critically considered in the development of e-learning.

4. Collaboration

Learning process involves collaboration and a social context, with learners working together. The use of sharing ideas in groups, collaborative learning and discussion of assignments should be employed when designing e-learning materials.

To develop e-learning materials, in fact, takes time and resources. What do learners expect to get when they are involved in the process of learner-content interactivity? Among the levels of learner-content interactivity, the instructional design strategies should be adopted differently, hence enhancing learners' motivation and participation. In order to improve the effectiveness of e-learning, the appropriate e-learning content presentation and approaches discussed above should be developed

to strengthen the learner-content interactivity. In the long run, the development strategies of e-learning materials are the potential area to be explored.

8-4 Participant activation and motivation using Gagne's Nine Events of Instruction

1. Gain attention - Start by gaining your learners' attention using an analogy, anecdote, paradox, photograph, magazine article, demonstrations or any other media. Display an outline of your lecture plan in a visual form (e.g. an illustration, a summary, a diagram, a map, or chart). This gives learners a framework into which they can organize subsequent content.

2. Inform learner of objectives - Describe what you plan to achieve, what learners will be doing and what they may be using. State, ‘At the end of the lecture you will be able to….'. Create expectancy via your objectives and description of the structure of the lecture.

3. Stimulate recall of prior learning - Relate your new lesson to situations or knowledge that your learners are already familiar with, e.g. the previous lesson.

4. Present stimuli with distinctive features - Describe the key points in your lesson, emphasizing distinctive features, using a variety of techniques if possible. For example, use photos, drawings, the real thing etc. Vary the format in order to maintain attention and to increase comprehension.

5. Guide learning - Present your instruction in small steps (chunking) leading from simple to complex.

6. Elicit performance - Involve learners in questioning, discussion and demonstration to confirm that they have learnt from your instruction, to increase comprehension and to maintain attention through active participation.

7. Provide feedback - As learners respond to your questioning, provide them with reinforcement or remediation when necessary.

8. Assess performance - Use a quiz or assignment to confirm mastery of your objectives.

9. Enhance retention and learning transfer - Provide the opportunity for learners to apply the outcome of their training in a real world environment e.g. realistic assignment using real data and equipment. Incorporate the full experiential learning cycle into activities so that students are encouraged to reflect on and analyze their experiences.

8-5 Three Purposes of the Instructional Design Process

1. To identify the outcomes of the instruction
2. To guide the developing the instructional content (scope and sequence)
3. To establish how instructional effectiveness will be evaluated.

8-6 Stages of Instructional Design

Stage 1: Define instructional goals.

A goal may be defined as a general statement of desired accomplishment. It does not specify exactly all of the components or steps or how each step will be achieved on the road to accomplishing the goal. Example Goals: (1) Students will master the procedure of a generic history and physical. (2) Students will understand the biochemistry of diabetes.

Stage 2: Conduct an instructional analysis

Identify what learning steps will be involved in reaching the goal. This is done through a task analysis, which identifies each step and the skills needed in order to complete that step, and an information processing analysis, which identifies the mental operations the learner needs to employ in performing that skill. The task analysis is performed by asking "What are all of the things the student must know and/or be able to do to achieve the goal?"

Stage 3: Identify entry behaviors/learner characteristics

Having determined via the instructional analysis which steps and skills the learner must accomplish, it is now necessary to identify the knowledge and skill level that the learner possesses at the outset. Although there may be pronounced differences from learner to learner in in their knowledge and skill levels, the instruction must be targeted as much as possible to the level of the learners' needs.

Stage 4: Develop performance objectives.

At this stage, it is necessary to translate the needs and goals into objectives that are sufficiently specific to guide the instructor in teaching and the learner in studying. In addition, these objectives form the blueprint for testing as a means of evaluating both the instruction and the learning that has occurred. Example: The student will be able to explain the role of the Krebs cycle to thermogenesis.

Stage 5: Select an instructional method.

The purpose of selecting an instructional method is to identify and employ teaching strategies and techniques that most effectively achieve the performance objectives. Current educational theory and research support the use of instructional methods that make students active learners (e.g., lecture, lab, small group discussion, case-based study, simulations, independent study, etc.).

Stage 6: Assemble instructional material.

Once the instructional methodologies have been identified for each objective or unit of content, it is important to assemble the necessary instructional materials. The materials may be in various forms: print, computer, audio, audio-video, etc. Although the necessary instructional materials may already exist, they may need improvement or revision. For example, slides that have been used in the past but that have been problematic, need to be modified. The danger of settling on preexisting instructional materials is that some instructors may allow the materials to determine the direction of the instruction rather than vice versa. Currently, more instructors are using the Web as a way of making didactic information available to students, rather than using lectures or transcripts.

Stage 7: Plan and conduct formative evaluation.

Formative evaluation, evaluation that occurs from feedback while the instruction is in progress, provides data for revising and improving the instructional materials that were used and those that are yet to be used. It is important to remember that sometimes the plans that look so good on paper actually fail in practice. When possible, test instructional materials with one or a small group of students to determine how students use the materials, how much assistance they need, etc. Considering the teaching methods implemented and the course materials provided, are students learning what they should be?

Stage 8: Plan and conduct summative evaluation.

Summative evaluation, evaluation that occurs at the end of the instructional effort (unit, course, etc.), provides data on the effectiveness of the instructional effort as a whole. This is the evaluation that provides information on how the whole instructional unit enabled the learner to achieve the objectives that were established at the outset.

Chapter 9

Authority and Government's Role for Implementing the Education Technology

Without the support and help of the authority and government , leading the national drive to ensure the effective and innovative use of technology throughout learning. providing the resources and make sure of the availability of E-Content, multi resources educational learning media, and learning gateways, and by assigning qualified personnel through associations established for the purpose of transformation no development will be reflected. Also encourage and help ICT services providers, for hardware and software which they will help on the know how and using of the technology, and the training institutes. The authority should assist the association for setting up technology standards for school building, management, teachers, students, parents, society in general as a new culture.

- Technology standards for students are integrated into and aligned with content standards for students.
- Assessments of students' progress in meeting technology standards are integrated into and aligned with country assessments of students' progress in meeting content standards.
- Technology standards and assessments for students at all grade levels
- Validates its technology standards for students against national models such as ISTE standards.
- Technology standards for students include provisions for learners with special needs and varied linguistic, cultural, ethnic, and socioeconomic backgrounds, including educational resources designed for universal usability
- Provides online resources for model curriculum units and lesson plans linking content standards and student assessments
- Assessment strategies exemplify effective use of technology for assessment
- Provides incentives to develop virtual learning environments for students who have difficulty obtaining access to classroom settings and for all pupils' educational access outside of classroom settings

The authority should have the ambition to utilize the benefits of technology to create a more exciting, rewarding and successful experience for learners of all ages and abilities, enabling them to achieve their potential and to lead the delivery and development of the e-strategy, and influence the strategic direction and development of national education policy, to best take advantage of new and emerging technology. Also work with industry and education providers to make sure the right technology is available, and set standards and provide tools that help establish and promote best practice.

Enabling people to have equal opportunity and access to learning resources, creating links between schools and the home, ensuring the safety of all learners, personalizing learning to enable learners and practitioners to interact and inspire each other, helping providers to plan effective investment in technology in building or refurbishment work, and using technology to ensure efficiency and value for money.

Strategy:

To ensure co-ordinated national leadership in harnessing technology for the benefit of learners.

To support a strong, shared understanding within education policy and leadership of the role of technology in supporting education reform by undertaking research and disseminating evidence, resulting.

To ensure an awareness of, and a positive reaction to, the Next Generation Learning campaign within key target audiences.

To ensure that key target audiences are aware of, understand, and have positive attitudes with respect to authority aims and objectives.

To increase the number of children and schools making effective and safe use of technology in areas such as leadership, workforce and business processes.

To ensure that learners systematically make effective and safe use of technology to support their learning.

To have conducted and implemented a review of the efficiency and effectiveness of the delivery chain for technology investment so that providers can make informed strategic investment choices in technology and learning resources that represent value for money.

To have developed a capable and confident education and training workforce that is skilled in the effective deployment and exploitation of technology and is achieving top Skills performance, in the deployment of technology.

To establish recognized quality standards for digital learning resources and professional tools, resulting.

To achieve the deployment of efficient, cost-effective, and appropriate technology to support improved education and training businesses.

To increase the proportion of institutions and training providers with integrated learning management systems.

The Government should have a vision to get to a position where technology is built into our learning culture , both in our schools, and in our homes, with parents fully on board, and teachers making the most of the resources available to them. With this in mind, this will provide key industry players, the voluntary sector, and education representatives with the opportunity to gain an insight into how 21st century learning will be enabled through technology.

- Designing learning environments fit for the 21st century.
- Teacher training: technology integral to the curriculum.
- Parental engagement and support: key to success of embedding ICT in education.
- Eradicating the "technology divide".
- Home Access packages and Computers for Pupils.
- Raising attainment in a digital world: using technology to engage more readily with students.
- Independent learners: expanding students' horizons using personalized learning pathways.
- Opportunities and challenges ahead .
- Developing partnerships with ICT providers.
- Using mobile devices to extend and share learning opportunities more easily.
- Design and develop school Management Information System
- Online access to assessment records to promote self and peer-to-peer assessment.
- Using online assessment to support an effective learner support and mentoring programme.

9-1 Implementing Technology in Education

The approach to implement technology based on experience in this area, plus the findings of studies related to technology implementation. The approach suggested emphasizes instructional and student needs first and then through planning integrates technology in ways that enhance and extend instructional and learning opportunities.

Systematic planning as an approach to technology implementation provides:

- a rationale for the technology and related resources.
- the stakeholders get involved in the decision making process .
- a way to promote thinking about the most cost-effective uses of technology.
- assurance that technology applications are aligned with the curriculum.
- help in determining the specific training and assistance needs.
- assurance that existing resources are used in the plan.
- a needed vehicle for procuring funding.
- a method for determining how to evaluate the impact and progress of the technology.
- a vehicle for communicating steps for others to follow adapting the plan.
- a process for coordination with other programs and projects.
- that the teaching addresses the needs of all learners.
- guidelines and a context for the insertion of new technologies.
- software developers with a definition of the technological needs of users.

9-1-1 The classroom planning steps address:

1. Student needs and related instructional priorities and needs

2. Classroom-specific instructional activities to meet the needs

3. Technology-based applications to support the instructional activities

4. Individualized staff development for the teacher

5. Classroom-specific performance-based assessment methods

6. Hardware, connectivity, software, and other resources needed

7. School management commitment to ensure that the time and resources needed to successfully implement the CIP(Classification of Instructional Programs) are provided for the teacher

8. Specific budget needed for the teacher to implement the plan

Evaluations consistently found that the classroom planning process:

- increased teacher commitment
- sustained increased levels of technology use
- improved coordination of resources for the project
- focused resources on the educational needs of students
- helped teachers determine what technology to implement
- provided a way for teachers to communicate about the project to other educators and to parents.

9-1-2 Important and more general considerations to take when implementing technology

Experience shows that when doing technology planning several factors must be constantly considered.

- Teachers must have a reason to use the technology; it is important to promote teacher-development of projects or plans were teachers can apply technology to meet particular instructional and student needs identified within such projects or plans.
- Curricula must drive technology; technology should not dictate curricula.
- Check out what other schools have done-both successes and failures. Seeing a system in use makes it easier to envision in your own school, an you can learn from the mistakes of others. This is the reason that the Model Technology are and important resource.

- Don't accept materials or hardware that do not fit with the curriculum and technology plans. Haphazard acquisitions or computers here and there will not bring the school up-to-date technologically. Technology involves interfacing with other classrooms, libraries and networks.

- Training teachers is critical and ongoing. Set aside time and money for formal training classes as well as opportunities for teachers to discuss discoveries or problems with their colleagues. Training should account for at least one third of the budget allocated for the educational technology program or initiative.

- Technology planning is never-ending. A technology plan cannot be developed and the technology committee then disbanded. As the project is implemented, as technology changes, as the school grows, the plan must change.

- The technology plan must include maintenance, trouble-shooting and network management.

- Acquiring technology is not a matter of plugging in a computer. It will affect all aspects of the school culture, from architecture to interpersonal relations. Include the whole picture in your plan and training program.

- Technology requires community support and involvement. Money, inkind services, and training must come from all parts of the community and will cross traditional boundaries.

- Administrative support and involvement is critical to the successful integration of technology; Studies constantly show that the commitment and interest of the principal is the most critical factor for successful implementation of any school innovation-especially technology.

9-1-3 Recommendations:

The recommended implementation approach for integrating or inserting technology must focus on comprehensive planning that involves all of the stakeholders. Critical factors include establishing a vision for the plan, utilizing existing and emerging resources, basing technology decisions on curriculum and instructional needs, focusing on student needs, and providing for local staff development and follow-up assistance. The approach for implementing technology emphasizes a series of operational steps for integrating technology into the existing instructional program which include:

1) establishing a stakeholder planning committee.

2) coordinating with existing plans.

3) identification of student and program needs.

4)identification of available resources to support the plan.

5) curriculum integration.

6) establishing goals and objectives.

7)developing related classroom-based plans.

8) staff development.

9) evaluation.

10) budget and funding strategies.

11) implementation strategies.

It must be emphasized that school and district plans can only be implemented if teachers are developing and implementing classroom plans or projects that directly support the objectives of the school and district technology plans. The overall recommendations for the basic approach suggested for educational technology planners, developers, and implementers are:

1. Involve educators in the development of individualized instructional applications of technology as part of the overall school level planning process.
2. Ensure that local insertion of technology is driven by the curricular and instructional needs of the school site.
3. Coordinate all technology insertion with the existing national, school district, and school level educational reform priorities.
4. Ensure that evaluation of the approaches used in technology implementation are evaluated and that evaluation be used to inform improvements in the program.
5. Developers of technology-based resources must conduct alpha and beta testing at school sites within the context of the school and classroom instructional plans.
6. Authority should develop and implement technology plans that leverage and coordinate technology-based resources within and between agencies in ways that pool and target such resources to support the local implementation of technology.
7. Government should develop a national technology plan that coordinates resources to help to develop, fund, and implement their own technology plans.
8. Planners and implementers must be proactive about procuring new, and leveraging existing funding and resources to actually implement plans and to recognize that plans are necessary pre-requisites to obtaining funding and resources.

Chapter 10

The Experiment (the Case Study)

and

My Zero Defect Theory (for the Bench Mark)

The Case Study that I have applied in the school

Country : KSA

City : Dammam

School : The 3rd Intermediate Girls School

NO. of Students in the Classroom: 32 Students.

Objective:

Enhancing Education through Technology

How education technology improves education quality.

The teachers & student should be prepared as explained mentioned in the previous chapters .

- Teachers needs to be educated for the best utilization of the DBS (The selected technology).
- The requirement to integrate the education technology in the curriculum.
  (Prepare the instruction material, Lesson, Plan …..etc)

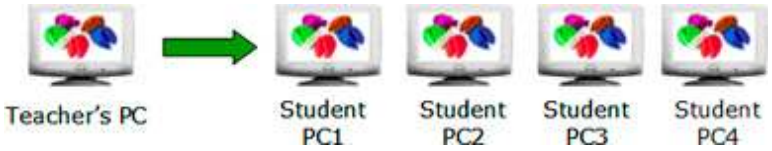
The technology that I used is

The Digital Interactive Multimedia Broadcasting System (DBS)

The main function of this education technology is class management with following features:

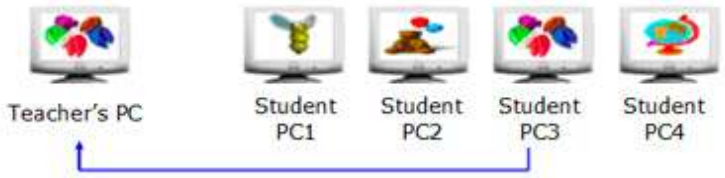
Broadcast

The teacher can broadcast either teacher or student's audio, video and microphone to all or selected students.



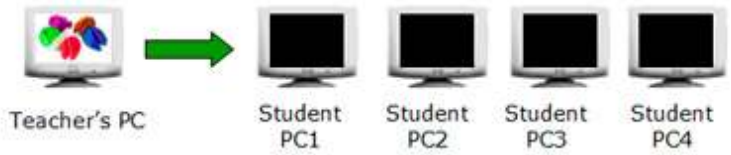
Observe

The teacher can monitor student's PC rotationally or respectively.



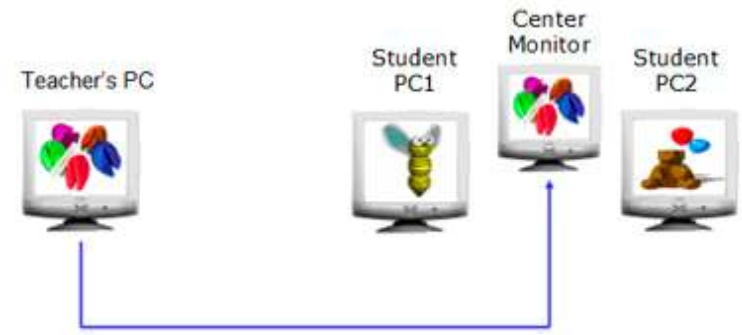
Darken

The teacher can darken all or selected screens of students' PC.



Center Monitor

Teacher can broadcast his/her screen on the center monitor in order to comply with teaching method.

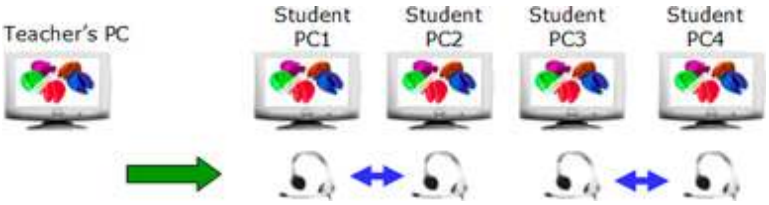


Dialog

With headsets and among any function executed, all/the selected students can dialog with each other.

Talk II

Student on the same student unit can talk to each other



Help

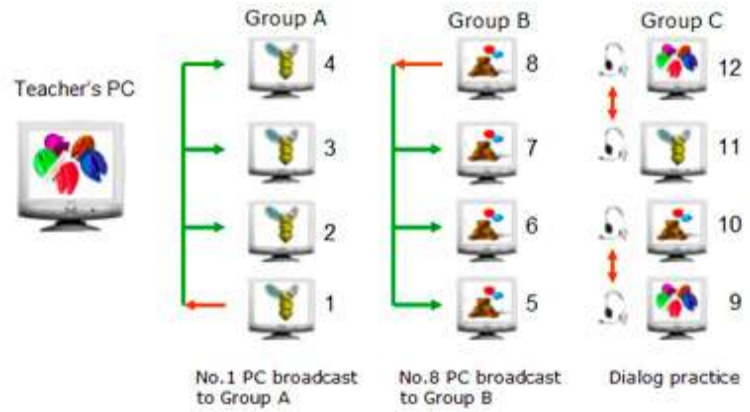
If the students need aid, they can push the help button for teacher's help.

Group

The teacher can group all students by booster port. Teacher can join any group at any time.

Audio/ Video/ Mic

Either of the broadcast source audio/ video/ microphone can be disabled.



KBM Control function

Teacher & Student's PC Remote Control, Keyboard and Mouse control

Support USB / PS2 interface Keyboard & Mouse

10-1 Evaluation and Results

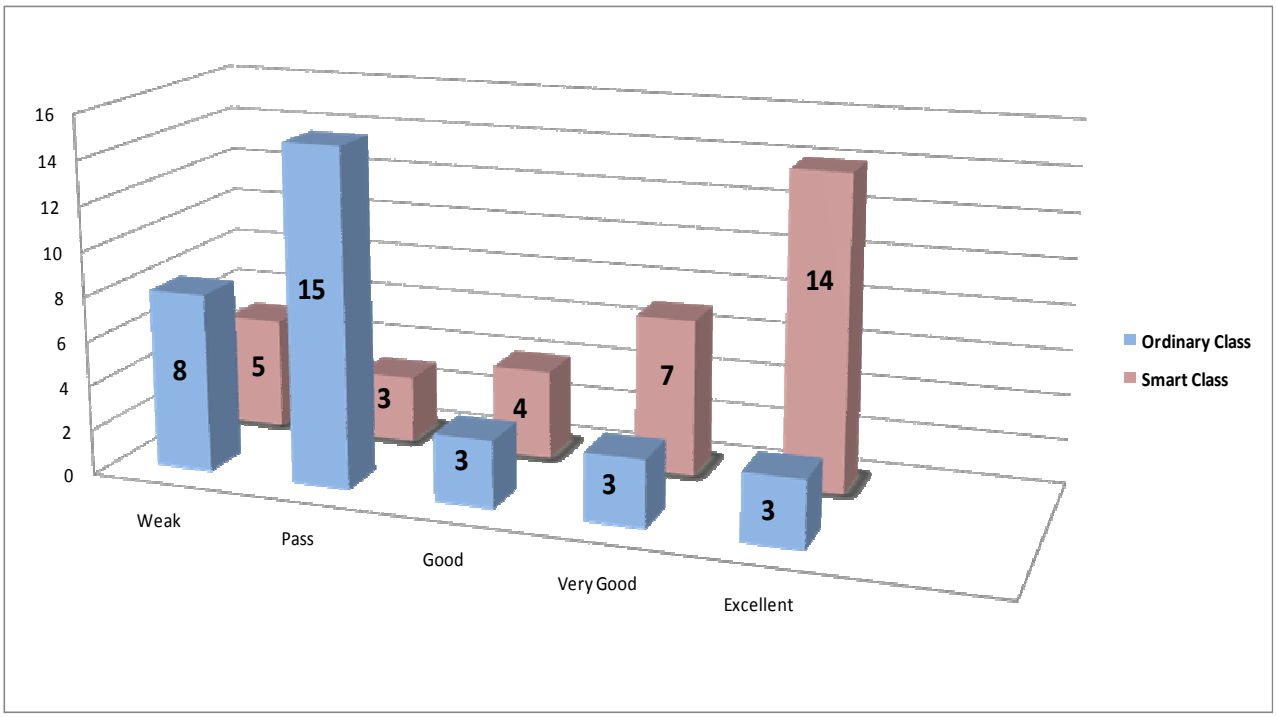
An independent team was assigned to follow up and evaluate the project

Their Observations :

- 80% More attractive the student than the traditional class.
- More student contribution during the class (solving examples, …….)
- 75% more assurance of the student understanding
- Saved 8 minutes of covering the required material, which is used to solving examples

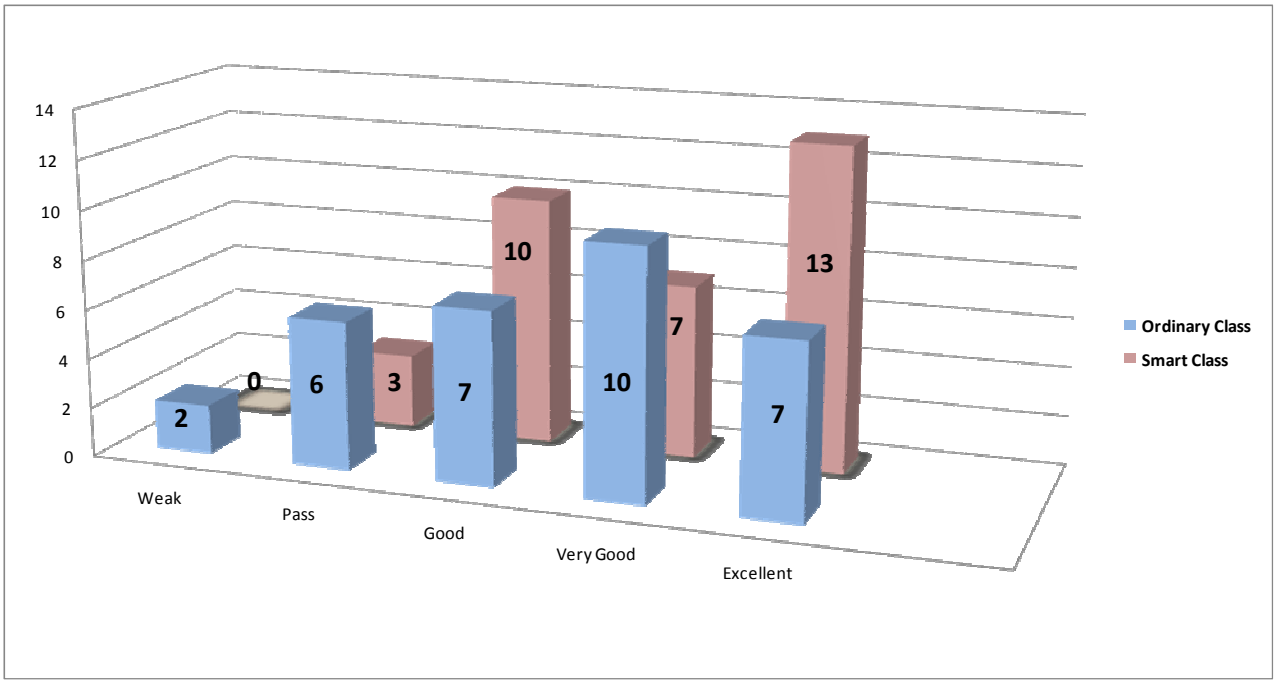
A comparison to the accumulative results

The result of mathematics of the first semester for the first intermediate



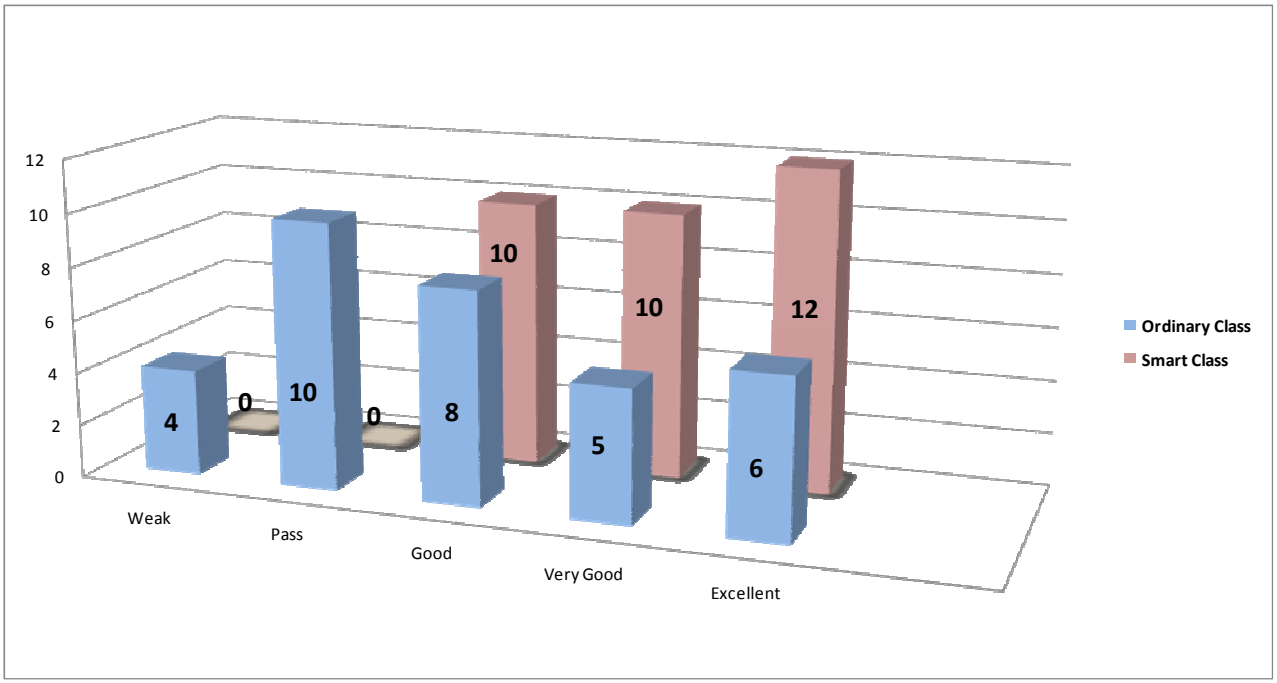
Average of success in the smart classes (Mathematics 100%)

The result of English of the first semester for the second intermediate



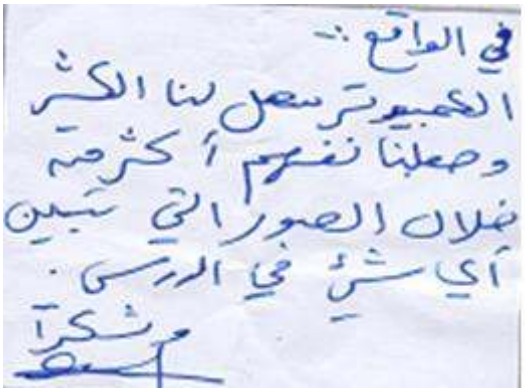
Average of success in the smart classes (English 97%)

The result of science of the first semester for the third intermediate

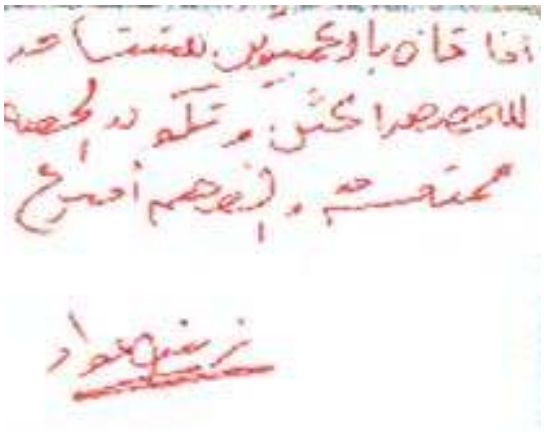


Average of success in the smart classes Science 100%

Some Students' point of view



Actually the computer has made everything easy for us through viewing the entire lesson with pictures.



With the computer the class becomes more interesting and we understand easily.

10-1-2 Report and Comments during Smart Class Visit

The homework and the review were wonderful and crystal clear on the computer.

The lesson was very organized on the computer and was going step by step with the objectives.

It was interesting it linked the two senses of hearing and vision and with mind.

تقرير

زيارة صفية للفصول الذكية

اليوم التاريخ الحصة المعلمة

المادة الدرس عدد الطالبات

مقدمة الدرس :-

التهيئة :-

عرض الدرس ومميزات عرضه بالحاسب :-

مدى تفاعل الطالبات مع عروض الدرس بالحاسب :-

نوعية الأسئلة وما يميزها عبر الحاسب :-

مدى التشويق في عرض الدرس :-

التطبيقات والتأكد من الفهم :-

مميزاته عبر الحاسب الآلي :-

10-2 My Zero Defect Education Technology Bench Mark Theory

From my experience and research I could not find a Bench Mark for measuring the application of education technology in the educational institutes, so depending upon my long period of experience in applying the education technology in different institutes and supervising the application of it in many schools, I have designed a Pyramid for measuring the usage and applying the education technology.

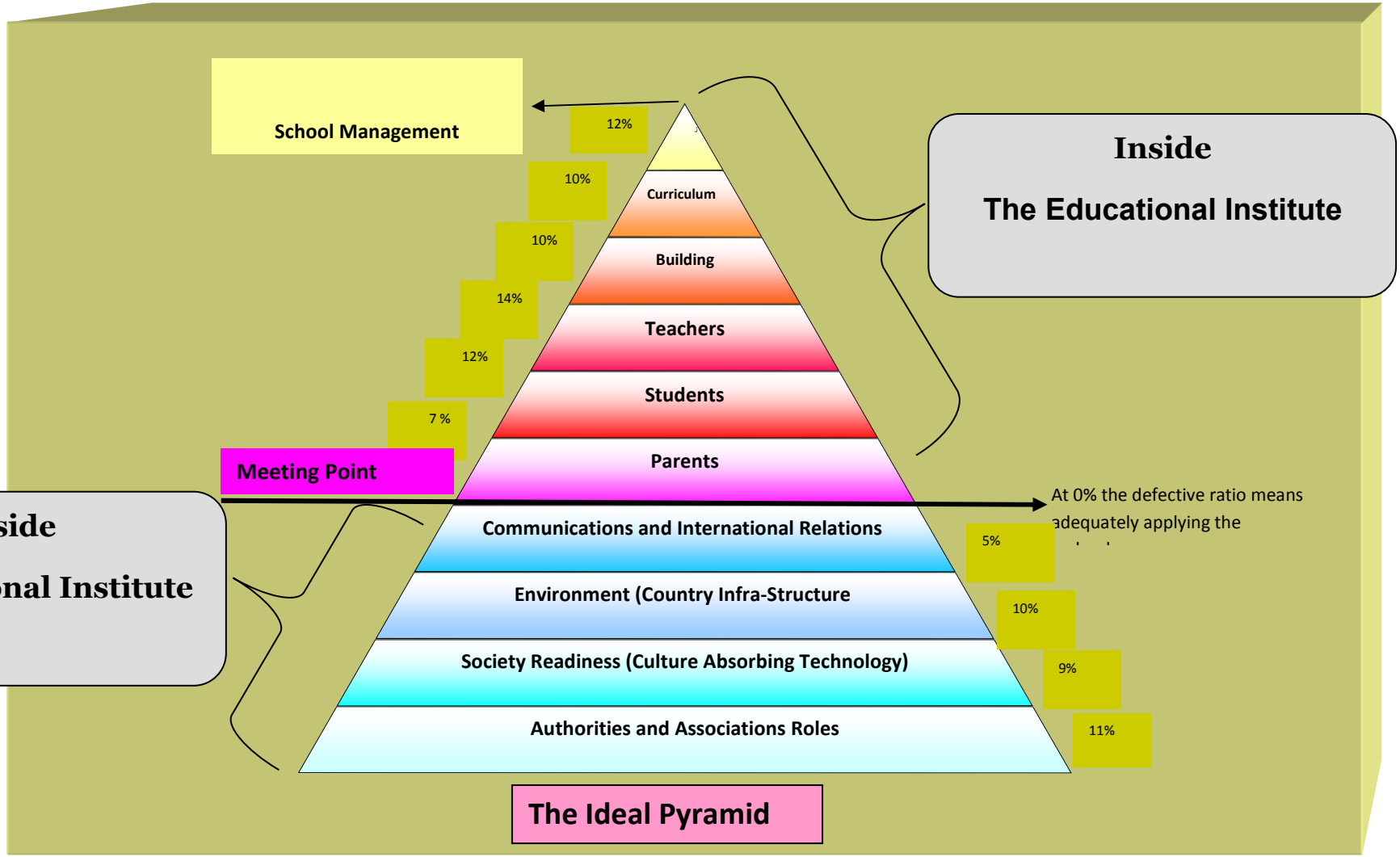
The following two figures below, you can notice that the first figure (figure 1), is the ideal pyramid which means that the education technology is applied perfectly.

You can also notice the factors which affect the bench mark. Inside factors which are directly contacted inside the schools, and outside factors which are outside the schools, but they are important to fulfill the education technology performance.

As you can notice in the ideal example that the percentages are distributed according to the effect of each factor on the process of the education technology application. These percentages are resulted in my survey through four schools and two government authorities of two countries(Saudi Arabia and Jordan)

In the top of the pyramid you notice that the management (school leaders) is a key factor for applying the technology in the schools, and without the school leader's interest to apply the education technology nothing could be done.

The meeting point of the outside and the inside will determine the percentage (the bench mark) of applying the technology. If all factors are perfectly done the meeting point will be zero, which means it is a zero defect, this means the education technology is perfectly applied. In figure 2 you can notice the meeting point is 30% which means that some factors are not fulfilled, that means there is a defect in some factors which made a gap at the meeting point, consequently means that the education technology is 70% used in the school only.

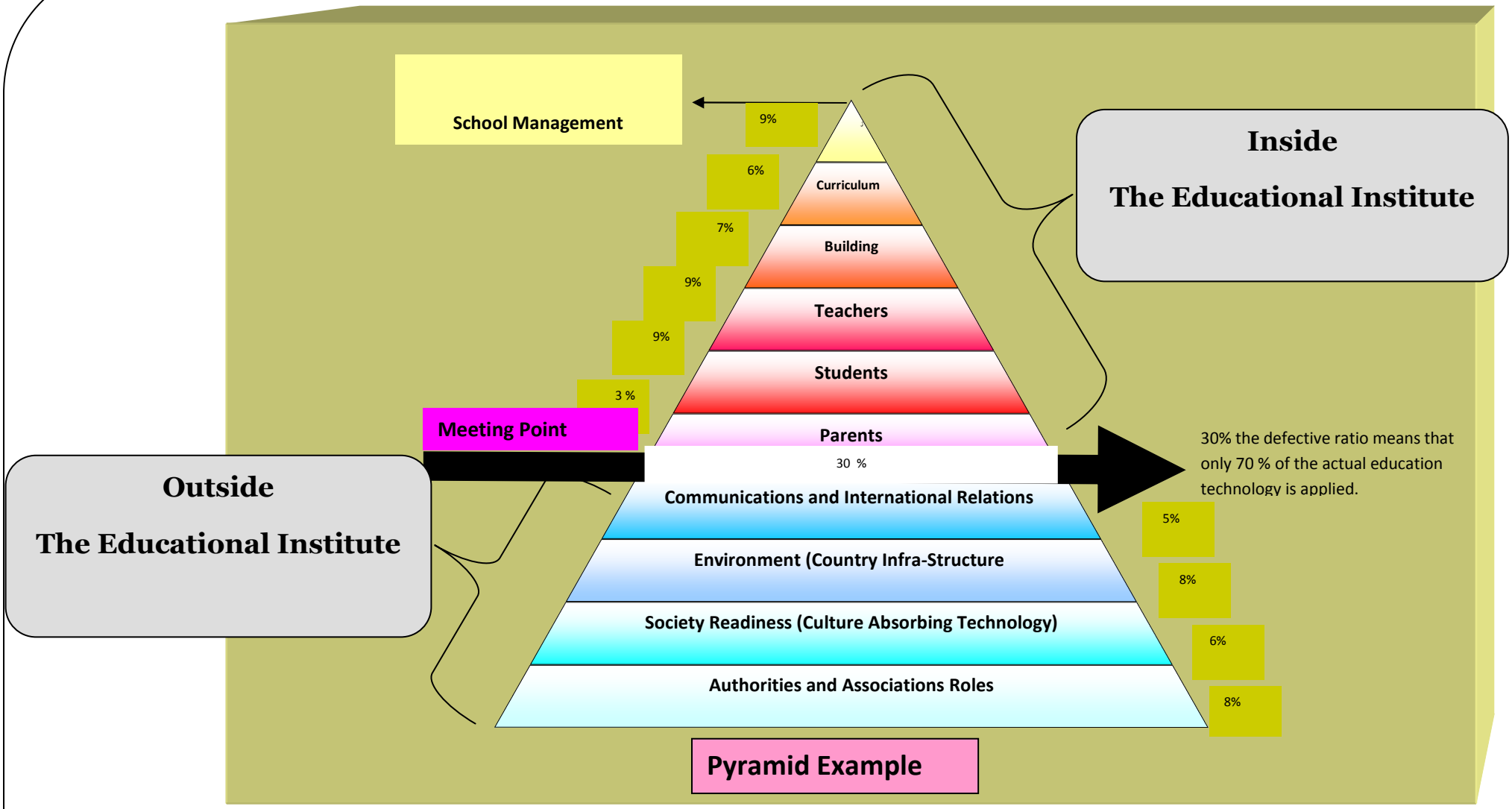


RATIOS OF THE LEARNING PROCESS ELEMENTS

Management (Mgt.): 12% Curriculum: 10 % Infrastructure: 10 % Teachers: 14% Students: 12% Parents: 7% Communications and International Relations: 5% Environment: 10% Authorities: 11% Society: 9%.

Zero Defect Education Technology Pyramid Theory

Applying Technology Bench Mark fig. 1



RATIOS OF THE LEARNING PROCESS ELEMENTS

Management (Mgt.): 12% Curriculum: 10 % Infrastructure: 10 % Teachers: 14% Students: 12% Parents: 7% Communications and International Relations: 5% Environment: 10% Authorities: 11% Society: 9%.

Zero Defect Education Technology Pyramid Theory

Applying Technology Bench Mark fig . 2

* This percentage is obtained through investigations and researches depending on international standards.

Chapter 11

Technology and Multiple Intelligences

> *"An intelligence is the ability to solve problems, or to create products, that are valued within one or more cultural settings."*
>
> — Howard Gardner
> FRAMES OF MIND (1983)

Howard Gardner claims that all human beings have multiple intelligences. These multiple intelligences can be nurtured and strengthened, or ignored and weakened. He believes each individual has nine intelligences:

- Verbal-Linguistic Intelligence -- well-developed verbal skills and sensitivity to the sounds, meanings and rhythms of words
- Mathematical-Logical Intelligence , ability to think conceptually and abstractly, and capacity to discern logical or numerical patterns
- Musical Intelligence -- ability to produce and appreciate rhythm, pitch and timber
- Visual-Spatial Intelligence , capacity to think in images and pictures, to visualize accurately and abstractly
- Bodily-Kinesthetic Intelligence , ability to control one's body movements and to handle objects skillfully
- Interpersonal Intelligence , capacity to detect and respond appropriately to the moods, motivations and desires of others.
- Intrapersonal Intelligence -- capacity to be self-aware and in tune with inner feelings, values, beliefs and thinking processes
- Naturalist Intelligence , ability to recognize and categorize plants, animals and other objects in nature
- Existential Intelligence , sensitivity and capacity to tackle deep questions about human existence, such as the meaning of life, why do we die, and how did we get here.

Originally, Gardner developed the list as a theoretical model about the psychology of the mind, rather than a practical way to address individual differences. However, by understanding a student's

strengths and weaknesses in each intelligence, we can help students become more successful. He also notes that integrating multiple intelligences into the classroom involves changing our idea about teaching and learning. It requires addressing individual differences and providing a range of activities and experiences to facilitate learning.

Technology can be used to facilitate learning in each intelligence area. There is no "right way" to integrate intelligences or technology into the classroom. The key is to provide the most effective learning environment for students.

11-1 What is the theory of multiple intelligences (M.I.)?

Based on his study of many people from many different walks of life in everyday circumstances and professions, Gardner developed the theory of multiple intelligences. He performed interviews with and brain research on hundreds of people, including stroke victims, prodigies, autistic individuals, and so-called "idiot savants."

According to Gardner,

- All human beings possess all nine intelligences in varying amounts.
- Each person has a different intellectual composition.
- We can improve education by addressing the multiple intelligences of our students.
- These intelligences are located in different areas of the brain and can either work independently or together.
- These intelligences may define the human species.

To help understand how you learn best, take this short Multiple Intelligences Self-Inventory. There are just a few questions to answer, which should take approximately five minutes to complete.

11-1-2 How does this Theory Differ from the Traditional Definition of Intelligence?

Gardner's multiple intelligences theory challenged traditional beliefs in the fields of education and cognitive science.
According to a traditional definition, intelligence is a uniform cognitive capacity people are born with. This capacity can be easily measured by short-answer tests.
According to Howard Gardner, intelligence is: The ability to create an effective product or offer a service that is valued in a culture;

- A set of skills that make it possible for a person to solve problems in life;
- The potential for finding or creating solutions for problems, which involves gathering new knowledge.

Traditional view of "Intelligence"	"Multiple Intelligences" Theory
Intelligence can be measured by short-answer tests: Stanford-Binet Intelligence Quotient Wechsler Intelligence Scale for Children (WISCIV) Woodcock Johnson test of Cognitive Ability Scholastic Aptitude Test	Assessment of an individual's multiple intelligences can foster learning and problem-solving styles. Short answer tests are not used because they do not measure disciplinary mastery or deep understanding. They only measure rote memorization skills and one's ability to do well on short answer tests. Some countries have developed tests that value process over the final answer, such as PAM (Performance Assessment in Math) and PAL (Performance Assessment in Language)
People are born with a fixed amount of intelligence.	Human beings have all of the intelligences, but each person has a unique combination, or profile.
Intelligence level does not change over a lifetime.	We can all improve each of the intelligences, though some people will improve more readily in one intelligence area than in others.
Intelligence consists of ability in logic and language.	There are many more types of intelligence which reflect different ways of interacting with the world
In traditional practice, teachers teach the same material to everyone.	M.I. pedagogy implies that teachers teach and assess differently based on individual intellectual strengths and weaknesses.
Teachers teach a topic or "subject."	Teachers structure learning activities around an issue or question and connect subjects. Teachers develop strategies that allow for students to demonstrate multiple ways of understanding and value their uniqueness.

11-1-3 What do Multiple Intelligences Have to Do with the Classroom?

There are numerous ways to express oneself, and probably even more ways to gain knowledge and understand the universe. Individuals are capable, the theory of multiple intelligences advocates, of deep understanding and mastery in the most profound areas of human experience. Even long before the theory emerged and was named in 1983 by Howard Gardner, numerous teachers fostered the intelligences of their students.

11-1-4 How has M.I. theory developed since it was introduced in 1983?

Multiple intelligence theory has evolved and been embraced widely. After the publication of FRAMES OF MIND in 1983. Howard Gardner became a celebrity among many teachers and school administrators. In addition to writing many more books and articles on multiple intelligences theory, Gardner has served as a consultant to a variety of school districts. The multiple intelligences movement now includes publishers, symposiums, Web sites, "how-to" manuals, educational consultants who consider themselves "M.I. specialists", as well as a number of critics.

Howard Gardner and others have revised and expanded the theory

Howard Gardner, formulator of the theory, continues to be its chief spokesperson. He has been acclaimed as the most influential educational theorist since John Dewey

Gardner has written and published 18 books and hundreds of articles. Chief among them are:

- FRAMES OF MIND (1983) introduced the theory of multiple intelligences.
- THE DISCIPLINED MIND: WHAT ALL STUDENTS SHOULD UNDERSTAND (1999) proposes a pedagogical approach centered around profoundly important topics and shows how they might be taught with a "multiple intelligence" approach.
- INTELLIGENCE REFRAMED: MULTIPLE INTELLIGENCE FOR THE 21st CENTURY (1999) reports on the evolution of and revisions to the theory of multiple intelligences.

Countless educators have incorporated multiple intelligence theory into their work.

The multiple intelligences approach encourages teachers to regard intellectual ability more broadly. Teachers are able to see that visual arts, music and dance can be just as valuable to students' understanding of the world they live in as traditional academic subjects. Numerous teachers and administrators have applied aspects of multiple intelligence theory in their classrooms and schools.

Through the serious and in-depth study of just a few subjects, rather than a minimal amount of attention to many subjects, Howard Gardner believes that students will develop a passion for exploring truly profound ideas.

11-1-5 What are some benefits of using the multiple intelligences approach in school?

Benefit

You may come to regard intellectual ability more broadly. Drawing a picture, composing, or listening to music, watching a performance -- these activities can be a vital door to learning -- as important as writing and mathematics. Studies show that many students who perform poorly on traditional tests are turned on to learning when classroom experiences incorporate artistic, athletic, and musical activities.

Take music, for example. As educator, David Thornburg of the Thornburg Institute notes,

"The mood of a piece of music might communicate, clearer than words, the feeling of an era being studied in history. The exploration of rhythm can help some students understand fractions. The exploration of the sounds of an organ can lead to an understanding of vibrational modes in physics. What caused the great scientist Kepler to think of the motions of planets in musical terms? Astronomy students could program a synthesizer to play Kepler's 'music of the spheres' and explore history, science, math and music all at once."

Benefit

You will provide opportunities for authentic learning based on your students' needs, interests and talents. The multiple intelligence classroom acts like the "real" world: the author and the illustrator of a book are equally valuable creators. Students become more active, involved learners.

Benefit

Parent and community involvement in your school may increase. This happens as students demonstrate work before panels and audiences. Activities involving apprenticeship learning bring members of the community into the learning process.

Benefit

Students will be able to demonstrate and share their strengths. Building strengths gives a student the motivation to be a "specialist." This can in turn lead to increased self-esteem.

Benefit

When you "teach for understanding," your students accumulate positive educational experiences and the capability for creating solutions to problems in life.

11-1-6 How can applying M.I. theory help students learn better?

Students begin to understand how they are intelligent. In Gardner's view, learning is both a social and psychological process. When students understand the balance of their own multiple intelligences they begin

- To manage their own learning
- To value their individual strengths

Teachers understand how students are intelligent as well as how intelligent they are. Knowing which students have the potential for strong interpersonal intelligence, for example, will help you create opportunities where the strength can be fostered in others. However, multiple intelligence theory is not intended to provide teachers with new IQ-like labels for their students.

Students approach understanding from different angles. The problem, "What is sand?" has scientific, poetic, artistic, musical, and geographic points of entry.

Students become balanced individuals who can function as members of their culture. Classroom activities that teach to the intelligences foster deep understanding about the essential questions of life, such as: Where do we come from? What's the world made of? What have humans achieved? What can we achieve? How does one lead a good life?

11-1-7 How Technology Enhances Howard Gardner's Eight Intelligences

Technology That Enhances:

1. Verbal-Linguistic Intelligence
2. Logical-Mathematical Intelligence
3. Kinesthetic Intelligence
4. Visual-Spatial Intelligence
5. Musical Intelligence
6. Interpersonal Intelligence
7. Intrapersonal Intelligence
8. Naturalist Intelligence

1- Technology That Enhances Verbal-Linguistic Intelligence

Just as the printing press revolutionized learning and thinking in the 15th century; so the computer has created a similar revolution today. Through worldwide databases and computer networks students have direct access to current information. In every field of knowledge, educational systems are transforming as both teachers and students learn to use multimedia technology. Children who cannot yet read are writing stories on the computer with software that in some cases reads back to the students what they have written. New programs allow children to write and insert graphics in rebus-like texts such as "Wings for Learning"/ Sunburst's "Muppet Slate." Other programs, such as Microsoft's "Pine Artist and Creative Writer," make it possible to format writing projects in different shapes, write words in unusual forms and sizes, add accompanying sound effects, and wrap illustrations around the text. Such programs are highly motivating for both beginning and more accomplished writers.

Today's computer banks filled with information on every conceivable subject, plus on-line experts including university professors, researchers, and scientists, offer students an inexhaustible supply of information. Course content in any subject can be enriched and updated from such sources, and it is frequently the students themselves who access and share the information.

A high school student talks about "surfing the Net" one evening and coming across the Magna Carta. He had never seen the document even though he had read about it in many of his history

books. Excitedly he printed it out and took it to school the next day with a strong sense of ownership. Such discoveries make learning personal and exciting as students make knowledge their own.

Increasingly user-friendly computer programs are making it possible to combine information in different forms, including words, images, and sounds. Students can store, sort, and cross-reference information, notes, bibliographies, and create multimedia reports to make an adventure of learning. Teachers are able to develop their own courseware, create databases linking documents, present preprogrammed slide presentations from videodiscs, and enrich their courses with a wealth of the technology described in the chapters on each of the other intelligences.

The computer encourages students to revise and rewrite compositions and thus develop greater fluency and a more effective style. Recopying by hand or typewriter often inhibits ongoing correction and revision, but the computer facilitates these processes and gives students a greater sense of control over their writing. When students see their work in professional-looking formats they become more interested in studying and mastering the mechanics that will give it final polish. Some of the most popular word processing programs include Microsoft Word, Word Perfect, and Ami Pro for Windows.

Learning keyboarding in early elementary school today is as important as learning to write with a pencil, and learning to use a word processor is as important for students as learning to type. Children are encouraged to use these skills in communicating and collaborating with distant students on a variety of projects, through an increasing number of electronic networks. Telephones and modems essential to this process should be standard equipment in every classroom.

Electronic technology is having an enormous impact on the development of speaking skills, as children find it possible to communicate with new friends around the country and world. Most school districts have access to projects such as the National Geographic Kids Network. Just as the computer has enhanced writing skills, so audiotape-recording, video-taping, and video-conferencing are having positive effects on oral fluency. When students observe and hear themselves speaking, they learn to express themselves effectively.

Technology offers new communication and learning opportunities to students with multiple handicaps and "different abilities." For example, students who are physically unable to move can talk into a computer that writes as they speak. Others who are able to move but not speak can write on computers that then "say" what was written. Specific examples include:

- for deaf students; Microflip's "Full Talk," LTJ Design's "Wee Talk."

- for physically-handicapped students: "Smart Keyboards" fit the body shape of their users and are developed by Arjan Khalsa for Unicorn.
- for blind students: Eduquest's "talking mouse"
- for hearing-impaired students EduQuest's "Speech Viewer" and "Phone Communicator.
- for visually-impaired students: EduQuest's "Screen Reader" and "Voice Type"

The development of linguistic skills for all populations can be catalyzed by remarkable new electronic tools for accessing and managing information and communicating, learning, and developing intelligence in unprecedented ways. classroom.

2- Technology That Enhances Logical-Mathematical Intelligence

Logical-Mathematical intelligence can be exercised and developed through many challenging and innovative kinds of multimedia technology- Students of every ability level can learn effectively through interesting software programs that offer immediate feedback and go far beyond drill and practice and "workbooks on computers." Many of them offer challenging opportunities to exercise and develop higher order thinking skills that are essential in problem-solving. Following are a few examples of the many outstanding programs that are now available.

Edmark's "Millie's Mathhouse" is a delightful and successful computer program that introduces number and math concepts to preschool and early elementary children. It is alive with color, sounds, and graphics and works with a touch screen. Children are introduced to essential math concepts as they build animated bugs, operate a cookie machine, count wiggling critters, and make patterns with talking animals and shapes. As they explore and discover, children learn about numbers, shapes, sizes, patterns, and problem-solving.

For primary students, IBM's "Math and More" programs introduce students to patterns and relationships, geometry, probability, and statistics through highly motivating video, manipulative, and printed materials.

Wings for Learning/Sunburst's "King's Rule" and "Safari Search" for older children develop sequencing abilities and logical-mathematical thinking through visual-spatial, manipulative tasks that are in the form of thought-provoking and challenging games.

Broderbund's "Geometry, Physics and Calculus" software make abstract and sometimes difficult subjects more concrete and easily understandable as students manipulate colorful graphics. Videodiscovery's multimedia videodiscs, "The Physics of Auto Collisions" and "The

Tacoma Narrows Bridge Collapse," use real events to relate physics to practical applications. As students analyze real world events in scientific and mathematical terms, the principles of physics become more meaningful and relevant.

"The Adventures of Jasper Woodbury," developed by Vanderbilt University's Cognition and Technology Group, provides additional rich contexts for developing mathematical thinking and problem solving about real-world situations through what is being called "anchored instruction." At the present time, there are six dramatic episodes on videodisk (with six more to come), that present complex mathematical problems for students to solve.

One of the first adventures, 'Rescue at Boone's Meadow," presents the task of transporting a critically wounded eagle to a veterinary 65 miles away as quickly as possible. Because of the difficult terrain, students must figure out optimal combinations of using a truck, ultralight aircraft, and hiking, taking into consideration fuel, payload, weight, and different starting points. The students use a combination of the random-access videodisk, maps, and computers to generate alternative solutions. Fifth-grade students of average ability have been fascinated with the task, and have been motivated to solve it with solutions that require over 15 steps.

In many of these new "authentic learning" projects, learners become contributors to the collaborative knowledge base of the community. In the Global Lab project organized by the Technical Education Research Centers (TERC), an international group of teachers, high school students, and global-change researchers are collaborating in studying local and world ecological change using instruments such as ozonometers, ion-selective probes for soil and water monitoring, and field data loggers. Students learn to collect, analyze, and report data that is used by the scientists. And in the MicroObservatory project at Harvard University, secondary school students are using remote computer-controlled optical telescopes to do their own research projects in astronomy.

Increasing numbers of multimedia software programs are focused on developing the critical and creative thinking skills of students. IBM's "Modern Solutions" and "Wrinkers" (combination of thinking and writing) offer challenging projects that utilize logic, analysis, synthesis, and evaluation in creating and problem-solving. Seymore Papert's "Lego Logo" program also offers an opportunity for students to develop the skills of analysis and logic as

they learn to use a new computer programming language and apply it to controlling the movement of Lego "machines" that they create.

"Learn Smart" is a new software program developed by Key Technologies that is based on Guilford/Meeker's Structure of Intellect methods of developing intellectual skills. The program assesses individual strengths and weaknesses in cognition and offers strategies to strengthen intellectual powers. It is appropriate for students at all ability levels.

Stanley Pogrow's "HOTS" (Higher Order Thinking Skills) program combines Socratic thinking in small groups with activities utilizing computer technology- This program- focused on learning how to understand and problem-solve, demonstrates clearly that most students, including the "at risk" and "learning disabled," are capable not only of learning the basic skills, but of developing and applying higher order thinking skills in the process.

A number of recreational games also have much to offer in the way of new intellectual challenges. For example, Sierra's "Lost Mind of Dr. Brain" exercises all of the intelligences in challenging puzzles and problem-solving activities. Logical and mathematical skills, anticipatory thinking and quick decision-making, symbolic thinking, effective reasoning, and other higher order thinking processes are exercised as players meet a variety of unexpected challenges. As they unscramble Inverted melodies, break codes, navigate through mazes, use different retrieval systems to find scrambled files, and manipulate and rotate mental images, players get a "total brain workout." They have options of playing on several levels of difficulty, and can access helpful "scaffolding" hints from Dr. Brain's lab assistant. When used in classrooms, teachers may wish to follow with related activities to assure that transfer of skills will occur and persist.

Many of the programs described above are consistent with the current recommendations of the National Council of Teachers of Mathematics and with current research on "situated cognition." The focus of this research is on demonstrating that learning and thinking are always situated in a context, that knowing and doing are strongly linked, and, as a result, that authentic learning activities and direct experience provide rich opportunities for successful learning.

3- Technology that Enhances Kinesthetic Intelligence

Learning through technology is a highly active and interactive process when used appropriately. Computers rely mostly on eye-hand coordination for their operation--keyboarding and the use of the mouse or touch-screen. This kinesthetic activity reinforces learning and makes the student an active participant in the learning process.

The popularity of video games is due to the total engagement of the player and skillful physical response to the challenges. Games such as "Pong" and "Breakout" were among the first to demonstrate the appeal of this kind of technology. Later, "Tetris" was designed by Alexey Pajitnov, a Russian mathematician, researcher in artificial intelligence, and member of the USSR Academy of Sciences; it is now published in Apple software. It demands fast decision-making and hand-eye coordination, along with quick testing of hypotheses. Undoubtedly, it is these action-packed challenges which engage students who might otherwise be bored in conventional math classes even though they call for the same kind of spatial and logical thinking.

Programs such as "Lego Logo" offer ways to connect the computer to external manipulatives, such as Lego blocks with gears, wheels, and motors. Starting with these, students can invent innumerable kinds of machines to control through computer programs they develop themselves.

Other kinds of programs that combine kinesthetic activity with the development of analytical thinking are Broderbund's "Science Toolkit" and IBM's "Personal Science Lab." The student creates physical or scientific experiments, the results of which are analyzed and displayed on a computer screen. These are just the beginning of a whole new series of computer programs that are connected to physical activities.

Some computer simulations enable students to experience events seldom encountered in everyday life. Observing and responding to nuclear plant malfunctions, emergence of new life forms, operation of different vehicles or machines, or the passage of geological epochs provide students with enriched classroom experiences.

"Electronic field trips." may not involve the physical body, yet students feel as if they are actually exploring the depths of the sea or the inside of a volcano as they accompany researchers in areas where very few can go. Recently, classrooms of students, linked electronically to explorers investigating the tectonic plates in the depths of the Mediterranean, were able to communicate with the scientists, ask questions, or request the viewing of areas or objects more closely. The students were almost there.

For teachers interested in learning about microcomputer simulations, software reviews can be found in The Computing Teacher and Electronic Learning. Additionally, the Northwest Regional Educational Laboratory located in Portland, Oregon publishes a review entitled Microsift that contains software ratings generated by teachers who have used the programs.

Multi-media technology also involves much actual physical activity as information is gathered from databanks, books, and photos, as new information is generated by camcorders, and finally as all of it is pieced together electronically through hypermedia programs such as HyperCard or LinkWay.

4- Technology That Enhances Visual-Spatial Intelligence

Today's students have grown up watching television and are highly oriented to visual learning. Slides, overhead transparencies, filmstrips, and movies are important adjuncts to their learning. Copy-machines and computer- printers are also essential support systems for any kind of academic work. When interactive systems are also part of the learning process, students move from passive observers to active thinkers.

For example the VCR, which is available to most teachers, lends itself to active learning in numbers of ways. Rather than running a program from beginning to end, teachers can take advantage of the opportunity to stop, rewind, and replay. Frequent opportunities to discuss what students have already seen and what they are about to see next make possible the anticipatory and participatory learning that are critical to the educational process.

In presenting dramatic productions, teachers may wish to preview a film to make note of the location of various segments that can be played out of context ahead of time for the purposes of comparison and contrast. Or the film may be stopped before the ending, allowing students to guess what occurs next. The VCR is a flexible and adaptable tool that can be utilized for innumerable educational purposes.

It is a logical next step to use a newer form of technology, the interactive videodisc (IVD). The IVD combines into one system all the different media and delivery options, including lectures, slides, films, video, and computer-based instruction. The disc can hold 54,000 frames or slides on each side, 30 minutes of video, and two 30-minute audiotracks. It can randomly access from a menu any video or audio segment in 3.5 seconds, when the user presses a button or "mouse" or moves a wand over a bar graph.

Operated through a videodisc player, a television monitor or two, and a personal computer, the system is easy to learn and operate. It is flexible enough to incorporate other emerging technologies such as compact disc-read only memory (CD-ROM), digital video interactive (DVI), compact disc interactive (CDI), and artificial intelligence.

In a 1986 study of a number of IVD classrooms, IBM reported a 30-to-50% increase in learning scores and a 300% increase in the number of students reaching mastery level.

Geographic Television (GTV) is currently one of the most recent developments in interactive video for the classroom. It has been developed by the National Geographic Society in association with Lucasfilm Ltd., and combines the interactive capabilities of the computer with instant access of the videodisc composed of National Geographic pictures. The subject of the first program is U.S. history with an emphasis on geography; other subjects in the proposed series are under way at this writing.

Another pioneering educational effort is The National Geographic Kids Network, a telecommunications system that links students throughout the world. Students share information with each other about geography and experiments in science using computer-generated maps and charts.

The availability of camcorders makes it possible for students to produce their own videos as an alternative to written reports. Teachers may also produce videos as lesson presentations, this is one way for teachers to clone themselves and reduce class size for portions of the day!

Students with special needs can also be helped in new ways through visual media. For example, those with speech difficulties can actually see their speaking patterns through IBM's SpeechViewer; from this visual feedback, they learn to make appropriate changes. Students, who cannot move, may talk into the computer and it will print out what they say; others who can move but cannot speak may work with computers that say back what they have written on the screen. Children with delayed speech may be helped by using a "Wolf" board with overlays of pictures or words that "say" what they are when touched.

Computers allow visually oriented students to learn through their strengths as they interact with the technology. They can take advantage of opportunities to see and manipulate the material they are accessing or creating in many different forms before they make final copies of a written project. Such publications as Stanley's Exploring Graphic Design: A Short Course in Desktop Publishing offer helpful information on the essential principles of design and how to apply them to the preparation of publications.

By using HyperCard or LinkWay software, students can create multimedia reports. Or, they may create a report totally in visual form, combining film clips, slides, photographs, and other illustrations. These multimedia productions make learning a fascinating process, as students

work with knowledge in many forms. Scholastic "HyperScreen" is one example of a software program that contains built-in fonts, clip art, and drawing tools. Each screen can contain up to 15 "hotspots," or buttons, that make it possible for users to interact with the lesson or report.

Scholastic "Slide Shop is a program for creating computerized slide shows, producing audiovisual aids for talks, video title and credit screens, or for creating illustrated pages in student-produced books. Students can design their own screens using clip art, backgrounds, borders, fonts, music, and sound effects from this program.

An increasing number of graphics programs, such as "IPMNT" or "SuperPaint," offer a wide range of experiences that can enhance artistic creativity and fluency by facilitating the technical processes involved in graphic design. Students can create their own works of art or modify existing ones as they explore such com- positional devices such as perspective, balance, and color.

Interactive videodiscs are also becoming more available in the classroom as costs for equipment and software decrease. Valuable information for teachers using this technology is available through The International Society for Technology in Education Hyper/multimedia Special Interest Group and the HyperNEXUS... Journal of HyperMedia and MultiMedia Studies published by ISTE.

An interactive disc on Picasso's painting "Guernica" produced by EduQuest is one means for exploring art. In this random-access database, the viewer can learn about the technical creation of the painting, biographical information on Picasso, images drawn from the Spanish war, and historical and mythological sources of the subject matter. The viewer can ask questions that are answered not only in visual images but also in text and voice.

Visual peripherals that reinforce topics and skills to be learned are an important part of accelerated learning classrooms, and needless to say the task of changing them frequently can be made easier through technological "teaching walls." In some newer schools, entire electronic walls may be available; in others, large screens or monitors perform this function. Teachers and students alike can be involved in creating the visuals for such displays, using material, for example, from documentary files of CNN or from live newscasts accessible through computer networks.

And on the horizon, is Virtual Reality technology-which will make all other simulations pale by comparison. Still in its infancy, this computer~generated world, offers memorable learning in new dimensions. A student dons a helmet or goggles, which contain miniature television monitors, earphones, and an electronic glove. This equipment is linked to a computer that coordinates sensory input with physical movement. The computer monitors the location of the

gloved hand, and will create "real" experiences. One of the first programs allowed the participant to "walk" down a street in Aspen, observe the surroundings, and even change seasons of the year. When the participant reaches the corner by directing the electronic glove, he or she can turn right or left to continue the tour, and explore the inside of some buildings. It takes little imagination to project what such learning experiences might offer to students of physics, chemistry, biology; architecture) or medicine.

Although these visual-spatial tools are not essential for the learning process, they do offer exciting and motivating ways to engage the learner through exercising visual-spatial intelligence and make any subject more accessible to a variety of students. They will surely be of major value to students with physical disabilities or other special needs. They will, in fact, move what might otherwise, for many, remain meaningless abstractions into understandable, visible reality.

5- Technology that Enhances Interpersonal Intelligence

Students frequently use technology alone, and for purposes such as remediation or personal exploration, this is often preferable. Current research indicates, however, that when students use computers in pairs or small groups, comprehension and learning are facilitated and accelerated. Positive learning experiences can result as students share discoveries, support each other in solving problems, and work collaboratively on projects. In today's workplace, such skills are increasingly important.

There are many ways that technology can be used in the classroom to enhance interpersonal skills. For example, students can be videotaped as they give a presentation or performance. They can then observe their facial expressions and body movements to see whether these enhance or detract from what they wish to communicate. Groups of students can discuss their observations of each other, understanding that they should begin and end with a positive observation and that criticism is only to be offered in a constructive manner.

Interpersonal skills can be enhanced through small technology groups in the classroom, as well as through computer networking with students in other classrooms, schools, or countries. Even more dramatic is the increasing frequency of teleconferencing through satellite transmission. The face-to-face contact with children who can see and hear each other via technology is a highly motivating way to develop communication skills as students in different parts of the country or the world join together in problem-solving environmental, economical, or political issues.

Among the large numbers of other networks are National Geographic's Kidsnet, ATT's Learning Network, and Peacenet. The Internet, which is a network of computer networks, includes thousands of networks used by millions of people of all ages. For educators, telecommunications networks offer an important resource and support system. Growing numbers of networks have been created to link educators with each other, and offer up-to-the minute educational news and resources on educational innovations and restructuring.

Airplane pilots have for some time been learning to handle emergencies and to use new equipment through virtual reality. Medical students can now perform their first surgeries virtually. At Children's Hospital in Tokyo virtual reality is used to scaffold the learning of disabled and developmentally delayed children. They may, for example, experience for the first time real sports, such as playing soccer, or experience other physical skills. It takes little imagination to project what virtual learning experiences might one day offer in schools to students of physics, chemistry, biology, or architecture.

Distance Learning facilitates communication between teachers and students in different parts of the community, country, or world. This interactive technology develops expanded and enhanced interpersonal skills and breaks through cultural barriers as students and teachers learn to communicate in new ways appropriate to this medium.

6- Technology That Enhances Intrapersonal Intelligence

The development of intrapersonal intelligence can be facilitated through the use of technology to explore and expand the human mind. Technology offers the means to pursue a line of thought in great depth as well as to have random access to divergent ideas. The opportunity for students to make such choices is at the heart of giving them control over their own learning and intellectual development.

> Although the most common use of technology in the classroom today is still for drill and practice, many teachers are finding successful applications of computer technology to develop higher-order thinking skills. Classrooms that use computer technology in this way become centers for inquiry~ Students learn not only to use databases, but to create their own. Technology can be used to explore and expand intelligence, as students build "mental models" with which they can visualize connections between ideas on any topic.

Bob Olson, senior Associate of the Institute for Alternative Futures in Alexandria, VA., notes that "hypermedia may thus expand the ability to think holistically-to be able to jump back and forth from detail to overview and to see the 'big picture.'" Hypermedia presents multimedia material in a way that is similar to how the human brain works-making connections between ideas and images-just as hypertext does with words.

Computer programs such as Ceres' "Inspiration" are thought processors that make it possible to capture ideas and visualize the relationships between them by combining graphics with text. The programs facilitate individual brainstorming, and as ideas are generated, they can be clustered into mindmaps or into traditional outlines. Mainstay's "Think'n'Time" uses visual outlining to help structure and develop ideas at the same time as other applications are being used. Such programs allow students to manipulate ideas in whatever form best suits their thinking, and they encourage personal ownership of the educational enterprise as students become more active in developing their own learning and understanding.

Individual student learning or personal growth plans, developed collaboratively by student and teacher, encourage the development of intrapersonal intelligence. They can be well facilitated through computer programs that make possible on-going modifications or revisions, as well as the recording of accomplishments in the form of electronic or multimedia portfolios of student work. Research by Allen Tough at the Ontario Institute for Studies in Education indicates that individual learning projects account for around 80 percent of all learning during a lifetime. Thus, learning-to-learn is an essential part of preparation for lifelong learning.

Intelligent tutoring systems are very different from earlier models of computer-assisted learning in that they offer students choices in how to learn any topic, keep track of the students' preferred ways of learning, and eventually offer information in forms that make it possible for students to learn through their strengths as well as to exercise and improve less well-developed skills.

John Sculley, Chief Executive Officer of Apple, suggests that "within a few decades people will look back and wonder how anyone in the past could keep up with knowledge without the assistance of such 'knowbots' or 'knowledge navigators.'" These are powerful tools that can become an extension of the human brain and facilitate the exploration and expansion of intrapersonal intelligence when used in appropriate, interactive ways that are sensitive to the needs of the student.

7- Technology that Enhances Naturalist Intelligence

A symposium was held recently in Japan on the effects of multimedia technology on human development. During the first day, presentations were given on learning through new technologies, edutainment, designing and utilizing new kinds of learning spaces to accommodate technology, using the Internet, virtual reality projects, science education in the Internet Age, growing up in a multimedia environment, and the future of "cyber-child" research. At the end of the day, a Japanese lady in the audience asked to speak. She said, "Last week we had a big snow in Tokyo It was very beautiful, and I remembered as a child being so excited about playing in the snow, feeling snowflakes on my face, making snow people, and tossing snow balls. I looked out of my window, and there were no footprints in the snow."

As electronic technologies become increasingly available and part of our lives, it is essential to recognize that they do not replace human interaction and experience in the natural world. They are, however, excellent tools that facilitate scientific investigation, exploration, and other naturalist activities. Telecommunications technologies help students to understand the world beyond their own environments, and help them to see how their actions can actually affect their world. As you will see in the examples that follow, these tools make it possible for students to understand real experiences in greater detail and depth.

The "Wireless Coyote," a joint project of Apple Classrooms of Tomorrow and the Orange Grove Middle School in Tucson, Arizona involved middle school students in using electronic technology to learn more about the ecology of Sabina Canyon in Tucson. Twenty-one sixth grade students used a variety of scientific instruments to measure soil and water temperature, wind speed, and soil composition. They also used mobile computers connected to a wireless local area network and walkie-talkies to collaborate with each other and communicate the data they collected.

The students, teachers, and technicians were divided into three groups to gather data in different locations. They communicated the data to another base- camp group that provided equipment, coordinated the activities, and transmitted the findings to yet another group in the school fifteen miles away where students built a database of the results. A naturalist worked with this group to increase their understanding and offer further information, which they communicated, back to students in the field.

Often it is not possible for students to actually explore some sites such as the depths of the Mediterranean Ocean, the cones of active volcanoes, the Galapagos Islands, or Iceland. Through the JASON Project, students all over the country can actually interact with explorers at such sites.

Founded by Dr. Robert Ballard, who discovered the wreckage of the Titanic and who remains an active participant in the project, the project brings real excitement to science classes. Using technology, students participate in an annual scientific expedition over a two-week period tied to a yearlong curriculum. Each year, about 30 students and 6 teachers are chosen by application to accompany the JASON scientists at the expedition site and serve as peer role models during the live broadcasts and online. At the primary interactive sites, (PINS) students can access a network of museums, educational institutions, research organizations where students communicate via satellite links with scientists, operate robots and scientific equipment via live remote control, as well as see and participate in live, up-to-the minute coverage of expedition activities. Through the last eight expeditions, more than 2 million students at the PINS sites have been part of this program, and countless others are finding a "virtual window on the world" through a Web site using emerging Web technologies.

Schools and parents know the importance of technology in education. Teachers in schools and parents in homes use computers to enhance their children's education and to develop important computer skills. But we must consider if the technology meets the needs of different learning styles?

Technology does meet the needs of various learning styles. The multiple intelligences can be enhanced with the use of technology. Following Howard Gardner's theory of multiple intelligence, teachers can encourage development by providing enrichment opportunities in each of the areas of the intellect.

11-2 Integrating Technology in Multiple Intelligences:

Linguistic: Use of word processing programs can help teach language, writing, editing, and rewriting skills. Also the Internet is an invaluable tool in learning. Through e-mail children can improve their language skills as well.

Other applications children may benefit from are:

- Word processors with voice annotations.
- Desktop publishing programs.
- Programs that allow children to create stories, poems, essays, etc.
- Multimedia authoring.
- Videodiscs to create presentations.
- Using tape recorders.

Logical-Mathematical: Computer programs that teach logic and critical thinking skills. These are also in game formats that could motivate children. Math programs that allows drilling and practicing. Database programs that help explore and organize data and information.

Other applications children may benefit from:

- Problem solving software
- Computer Aided design programs
- Strategy game software
- Graphing calculators
- Multimedia authoring programs
- Spreadsheet programs

Visual/Spatial: Graphics programs that help develop creativity and visual skills. Also browsing the Internet, organizing files, folders will develop some spatial understanding.

Other applications children may benefit from are:

- Draw programs (CorelDraw)
- Image composing programs (image composer)
- Paint programs (Photopaint, Microsoft paint)
- Reading programs with visual clues
- Web page programs
- 3D software
- Software games
- Spreadsheet programs which allow children to see charts, maps or diagrams
- Multimedia authoring programs

Bodily-Kinesthetic: Using computers will help develop hand-eye coordination. Working with a computer will allow children to become involved in their learning, actively.

Other applications children may benefit from are:

- Software games that allow contact with the keyboard, mouse, joystick and other devices.
- Programs that allow children to move objects around the screen.
- Word processing programs
- Animation programs

Interpersonal: Students can work in groups of two to four on the computers. Working in groups will strengthen children's communication and cooperation skills.

Applications children may benefit from are:

- Computer games which requires two or more persons
- Programs that allow to create group presentations (PowerPoint)
- Telecommunication programs
- E-mail
- Distance education
- Chat to discuss ideas
- Help others with any programs

Intrapersonal: The computer can help children build up individual skills. It allows for differences in children's learning styles and abilities. Children may work on their own pace with computers.

Applications children may benefit from are:

- Any programs which allow children to work independently.
- Games involving only one person.
- Brainstorming or problem solving software.
- Instructional games
- Word processors for journaling and recording feelings
- Developing multimedia portfolio
- Video editing (Adobe Premier)

We all learn in different ways. Educators need to try to meet the needs of all children by providing a variety of lessons using various teaching methods. When integrating technology in lessons, teachers have to make sure to remember the needs of all the learners and use various methods and techniques. Using software can develop the potential of all children.

MI & Technology: A Winning Combination!

The signs are all there, and the picture is becoming clearer. Children are engaged in learning; Teachers, old and new, are excited about learning new ways to reach their students. What is the driving force behind this electric charge of educational energy? Technology! Furthermore, when it

is used in conjunction with curricula that incorporates the Multiple Intelligences, all students young and old, find that it taps into and sustains their attention. Digital content is one of four "pillars" of school technology, along with hardware, connectivity, and professional development. When teachers implement both the theory of multiple intelligences and technology, they along with their students, find that their classroom experiences become more stimulating.

11-3 Creating a State of "Flow"

Integrating technology and M.I. is what educators are doing to help their students reach a state of "flow." Flow can best be described as a state of high, relaxed concentration where an individual is actively engaged in learning something new, but not to the point of frustration. It is a mental state where one is so involved in their learning experience that they reach a point where they seem to pay no attention to anything outside of what they are doing.

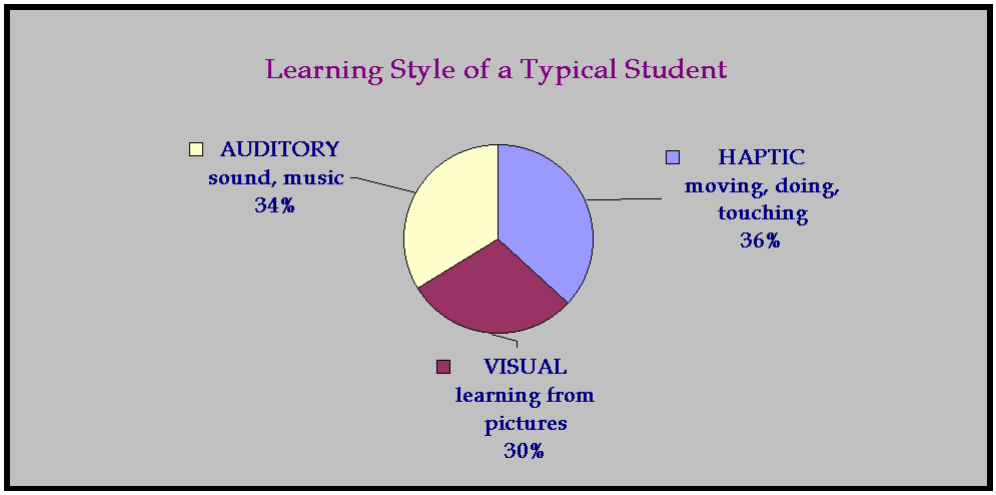
11-4 Effective Learning through M.I. means "Triple Coding" Content

One of the reasons M.I. and technology work so well together is because researchers now know that when an individual wants to deeply understand something complex in nature, they should triple code their learning experiences. This means if you are exposed to new ideas that are presented to you through a minimum of three different intelligences, you will have a better chance of remembering the information.

If a teacher weaves together several teaching strategies to present information about one topic, then we can say that he is triple coding the educational experience. As an example, let's take a look at a class learning about simple machines. The teacher may introduce the topic first by showing a demonstration (using a simple machine) on how a simple machine can perform work. Next, he may introduce new terminology to the class via vocabulary words, reading in the content area, or through similar (verbal) activities. A third method of introducing the topic might include showing the students how to create a mind-map of their chapter on "Simple Machines."

A Mind-Map is a visual record of either a piece of written material or an oral presentation. Mind-maps are created by representing key words from the content being covered, and giving them pictorial images to help an individual grasp the information quickly and rapidly with pictures, colors, and new vocabulary. The mind-map could be hand drawn, in color, created with computer add-ons like the CrossPad, or it could be created with a computer graphic program such as "Inspiration." In any event, the students would then have a visual representation of all the information they need to understand, and in this format, it may tap into several of their intelligences

just by the nature of its design. i.e. The logical intelligence is "turned on" by the order involved in the process of making the mind map flow; The visual/spatial intelligence is activated by the color and images represented; and the verbal intelligence is stimulated by the terms associated with this topic). Therefore, information is now stored in the brain both verbally and non verbally. Cognitive retention is even stronger when the mind-map is created by the individual himself. According to Tony Buzan (author of "The Mind map Book"), 95% of the value of mind mapping lies in the making of the map. Mind maps are highly individualized and can reveal the thought processes a person has gone through as they absorb new information.



11-5 Classroom Experiences

Through the integration of computers into the daily curriculum of my students, I have come to firmly believe that if you want students to understand information, they have to feel it is of value to them. The most motivated students are obviously those who find the topic of study interesting. We all can't like everything, but if something we don't like is presented to us in a way that is appealing (in this case through one of our strength intelligences) then we will be far more receptive to learning more about the topic.

Technological tools and software used in conjunction with a curriculum based on the multiple intelligences can lure students into topics they may have previously disliked. For example, students who may have disliked social studies in the past may be turned on to the topic when the information is presented through a variety of intelligences. One way this could be accomplished would be by incorporating the following strategies:

- Logical/Mathematical - Teachers and or students use charts, graphs, populations statistics, timelines, etc.
- Bodily/Kinesthetic - Students and/or the teacher watch or participate in a dramatic role-play of a period in history.
- Verbal/Linguistic and Visual/Spatial - Students may hear and see famous historical leaders speak via the Internet or CD-ROM).

When students are involved in actively creating their own knowledge, they retain the content more easily because they have "lived through" the processes necessary for its development. They have to know their subject matter very well before they can produce a product that will teach others about their topic of research.

11-6 The Impact of Technology on Basic Skills Acquisition

All of the above provide support for a Holistic Approach to education. Computers linked to interactive videodiscs, for example, let students learn according to their individual needs and skills. The staff at Saturn are convinced that effective and equitable use of technology leverages school reform. Once students, faculty and support personnel decide to make meaningful uses of technology, learning is never the same again. Technology changes the way we look at the old familiar Chinese proverb on learning, for it allows educators to move the act of learning from hearing (and forgetting), from seeing (and remembering), to doing (and understanding). It acts as a catalyst for active learning which educators support, but find difficult to incorporate.

Recently, David Dwyer, former Director of Apple's Classroom of Tomorrow (ACOT), was asked about his findings over the past ten years with regard to the impact technology has had on the acquisition of basic skills for students. One of ACOT sites where this was a high priority was in Memphis, Tennessee. The results showed significant gains in mathematics and language arts. For example, the average third grader word processed at 29 wpm, compared to third graders using pencil and paper that wrote between 9 and 11 words per minute. Teachers reported that, since it was easier for the students to type, they wrote more. Their research also showed that as students became more fluent at writing there was also change in the types and numbers of different words used and their vocabulary became more descriptive over time. Technology can help address new learning standards that are more authentic, project-based and outcome-driven.

11-7 Integrating MI and Technology Encourages Alternative Assessments

Educators who have already integrated technology successfully into their daily classroom experiences know how necessary it is to have alternative forms of assessment, which may be dramatically different than past methods of evaluation and/or standardized tests. Extra preparation time is devoted to the development of content-based rubrics for their ever-changing, technology-rich curriculum. In order for these changes to become widely accepted, their problem becomes, "How do we get the public as well as our own educational leaders to see and accept these newly designed more individualized assessment tools that more clearly demonstrate a student's acquisition of knowledge?"

The impact of technology is too multi-faceted to answer the question, "Does it Work?" in a simplistic manner. Considerations must be taken to examine its impact on areas such as student learning and motivation; teachers, and the technology; levels and types of instruction; and schools as formal organizations. Technology offers us new opportunities to assess students using a more well-rounded academic evaluation. It facilitates the integration of multiple assessments.

Authentic Assessment in a technology-rich educational environment which includes performance assessment based on countrywide and or national standards requires by its nature, a curriculum-based rubric that is student-specific. Successful curriculum units are those which are developed not only by teachers, but by the students as well. When they are asked to contribute to the development of the rubrics, they assume a sense of ownership, thus they become more actively involved in the educational process and can more easily see the purpose of learning the designated skills. When these rubrics include technology standards and creativity (in addition to demonstrating a deep understanding of the content) students have the freedom to develop highly personalized interpretations that incorporate their strength intelligences.

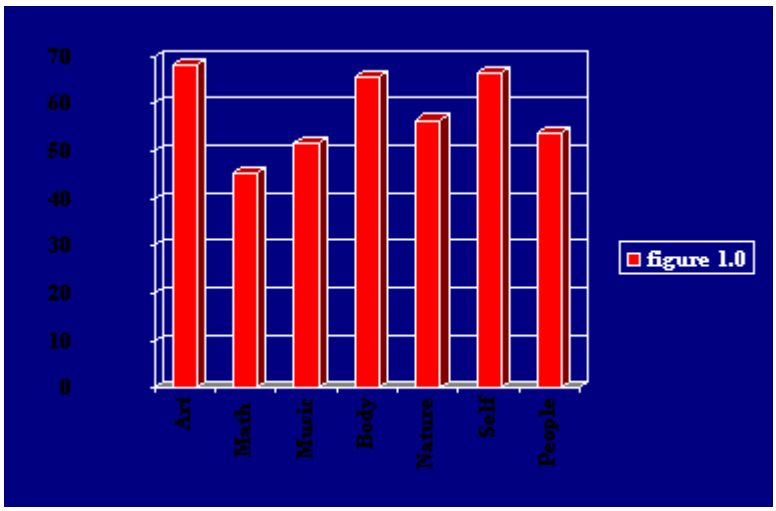
While observing their presentations, students (and especially teachers) are exposed to the theme in ways they have never dreamed. For one individual can not possibly explore the topic as thoroughly as when many individuals incorporate their multiple intelligences! Teachers will be amazed at the overwhelming variety of exciting demonstrations, role-plays, multi-media presentations, etc. that their students have developed. Furthermore, students usually state that they had fun learning and preparing for their exhibition. Through observation alone, teachers can get a multi-sensory display of how well the class has not only learned the subject matter, but has incorporated higher order thinking through the application and synthesis of the content. This is a far more exciting way to

determine what students have learned than always having each individual evaluated in the same manner. A written evaluation is not necessarily the best way to evaluate a student's achievement.

11-8 Positive Effects

Teachers and students alike are finding technology to be a stimulating part of their daily lessons. The enthusiasm I have observed from teachers and their students, as they explore the options technology has to offer them, never ceases to amaze me.. Technology's captivating qualities lure students and teachers alike. It appears that everyone seems to find an area within their brain (an intelligence/talent perhaps), that becomes activated with computer integration. These changes have caused a number of positive effects within the classroom:

- A shift from classroom lectures to computer networked access to educational resources, giving students more control over their educational experiences (Intrapersonal intelligence)
- A shift from student as a passive recipient of education to a self-directed student learning. (Intrapersonal intelligence)
- A shift from individual learning to team learning and group discussions (interpersonal intelligence)
- A shift towards new forms of creative and artistic expression
- A shift towards a fully integrated digital curriculum



Student thoughts about M.I. and Technology

In May of 1999, 200 third and fourth grade students from the Chariho Regional School District were given a survey asking for their input as to whether or not they believed technology helped them become better learners because it tapped many of their strength intelligences. Figure 1.0

clearly shows which intelligences students believed were activated by lessons incorporating MI & Technology.

The students reflected upon the following statements.

A review of technologies and student learning styles shows that no one technology is suited for all students and all curricula. Technologies should be chosen to support a diverse student population and their unique learning styles. It is inappropriate for teachers to assume that all students can learn in the same way and can be force-fitted to one method of delivery. The chosen technologies should also support the type of content to be shared with students and the expected learning outcomes.

Technology is a valuable tool. It has the power to support students and teachers in gathering, organizing, manipulating and presenting information. When both are encouraged to use their innate intelligences creatively, computers may extend and enhance what the individuals are able to produce, whether the task is to write a report, graph data, create a drawing/design, etc. It levels the playing field for those who may be otherwise limited due to disabilities.

For our students to find a place of value in today's society, they must acquire new technological skills on a day to day basis. As educators, we must continue to investigate how students learn best; which testing methods reflect authentic learning; and which instructional media enhance their intelligences, motivation, inquiry and a commitment to lifelong learning.

Chapter 12

Education Technology & Disabilities

(Assistive Technology)

Despite adequate cognitive ability, learning disabled students' difficulties with basic skills such as reading and writing can prevent full participation in the classroom and later in critical adult life activities. Computer technology provides the answer for many of these students.

Recent advances in computer technology have much to offer students with learning disabilities, both as tools for instruction in school and as tools for life that can be used to compensate for specific impairments. For years, teachers of the learning disabled have searched for means to help students compensate for their inability to master certain skills. Despite adequate cognitive ability, learning disabled students' difficulties with basic skills such as reading and writing can prevent full participation in the classroom and later in critical adult life activities. Computer technology provides the answer for many of these students. A student with dysgraphia (i.e., inability to produce legible handwriting) can use a computer with a word-processing program to alleviate much of this problem. Students with severe problems in spelling can functionally compensate using spell checkers and on-line thesauruses. Word prediction programs that can anticipate words from a few letters can increase both accuracy and speed of input. Students who have severe reading problems can use a computer in much the same way students with visual impairment do-through enlarged print size or voice synthesis. Computer technology can provide the kind of drill and practice that many students with learning disabilities need to help them develop fluency in such areas as mathematics facts and reading decoding. Additionally, software programs provide the multisensory and interactive experiences that can be so important for students who are easily distracted. Another kind of software that can help a student who has writing problems is organizational software. These programs help users through processes such as outlining and concept mapping. Although not necessarily developed for students with learning disabilities, the programs can be very helpful for students who have difficulty organizing and synthesizing information.

I will start showing the different types of disabilities then specifically focus on the education of visually impaired students.

12-1 Technology in the Lives of People with Disabilities:

121-1 Introduction:

Technology in general has had an enormous impact on the lives of humans in this century and has reached to all aspects of their lives. While some of what the technology does is sometimes seen as luxury, Assistive technologies (AT) played a life changing rule in the lives of people with disabilities. The following will try to highlight the answer to the question: What is the rule of modern assistive technologies in the lives of people with disabilities?

But first, what is meant by assistive technology? Assistive technology (AT) is a generic term that includes assistive, adaptive, and rehabilitative devices for people with disabilities and includes the process used in selecting, locating, and using them. AT promotes greater independence by enabling people to perform tasks that they were formerly unable to accomplish, or had great difficulty accomplishing, by providing enhancements to or changed methods of interacting with the technology to accomplish such tasks.

12-1-2 Technologies for the Hearing impaired

Accommodations and assistive devices are required by students with hearing impairment to access the educational programming in a classroom setting. Each learner's needs must be individually evaluated, but following is a generic introduction to the main types of assistive technology for hearing impaired people.

Assistive listening devices are usually used by people who have hearing difficulties or people with hearing impairment. Some people use cochlear implants, also known as FM units, which help reduce background noises. The speaker's voice transmits through the microphone to a receiver that is connected to the hearing aid or cochlear implant worn by the person who is deaf or hearing impaired is wearing.

1-Closed captioning

Closed captioning is the text that goes on the bottom of the television screen to inform deaf people of what is being said. Look for a small box with letters ‘CC’ inside or a small box with a cartoon balloon dialogue marker, to verify if the programs are closed captioned.

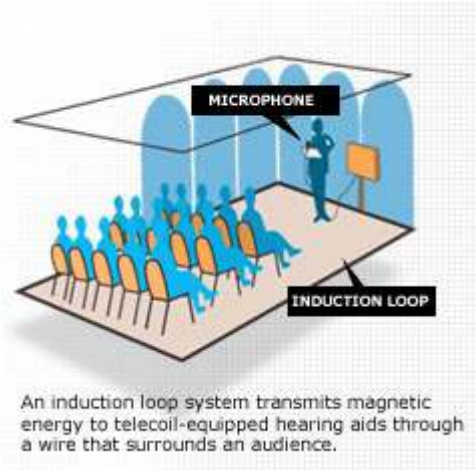
2- Cochlear implants

A cochlear implant is used in people with severe to profound hearing loss or those who show little or no benefit from hearing aids. It is a controversial device, especially when it is implanted in young children.

3- Earring Aids

Hearing aids amplify sounds for the persons with hearing loss. The can come in different sizes and shapes and may vary in position from behind the ear to in-the-ear. Depending upon the type of hearing loss the person may have, the sounds may be distorted and be too loud.

4- Hearing loop



An induction loop system transmits magnetic energy to telecoil-equipped hearing aids through a wire that surrounds an audience.

A Hearing Loop is a coil of wire that amplifies sound and reduces background noise. Users of hearing aids with a loop can set their aids to a certain setting to receive the transmission. Hearing loops can be permanently installed or portable.

5- Text Telephones

Text Telephones (TTYs) are the telephones that deaf people use to communicate with others on the telephone. These look like small typewriters and come with an LCD screen and a cradle for the telephone. In order for a deaf person to call on the TTY, the person on the other end must also have a TTY. There is a national relay system that the deaf person on the TTY can use to call anyone who does not have a TTY.

6- Visual alert signalers

Visual Alert Signalers are devices that use flashing lights to alert the deaf person to the ringing of a phone or fire alarm. Mobile phones and pagers also allow deaf users to send emails, faxes, pages and call people who have TTY and through relay.

12-1-3 Technologies for Physical Disability

1. Gait Belts

Gait belts and lift vests help facilitate transfers and can help a caregiver balance a person's center of gravity. When moving a person from one position to another the belt can help the caregiver more safely lift or shift directions of the person being transferred.

2 Canes

Canes are certainly simple but effective walking aids. Designs include folding canes, adjustable canes, double-grip canes and three- and four-pronged canes.

12-1-4 Blind and Low Vision

1-Screen readers

A screen reader is a software application that attempts to identify and interpret what is being displayed on the screen (or, more accurately, sent to standard output, whether a video monitor is present or not). This interpretation is then re-presented to the user with text-to-speech, sound icons, or a Braille output device. Screen readers are a form of assistive technology (AT) potentially useful to people who are blind, visually impaired, illiterate or learning disabled, often in combination with other AT, such as screen magnifiers.

2-Screen magnifiers

A screen magnifier is software that interfaces with a computer's graphical output to present enlarged screen content. It is a type of assistive technology

suitable for visually impaired people with some functional vision; visually impaired people with little or no functional vision usually use a screen reader.

3- Braille embossers

A Braille embosser is a printer, necessarily an impact printer, that renders text as Braille. Using special translation software, a print document can be embossed with relative ease, making Braille production much more efficient and cost-effective.

As with ink printers and presses, embossers range from those intended for consumers to those used by large publishers. Thus, an embosser can cost roughly anywhere from US$2,000 to $80,000, depending on the user's needs.

12-2 Assistive Technology for Students Who are Blind or Visually Impaired

Screen Magnification: Screen magnification software is used by people with visual impairments to access information on computer screens. The software enlarges information on the screen by incremental factors (2x magnification, 3x up to 20x magnification). Screen magnification programs run simultaneously with the computer's operating system and applications. Most screen magnification programs have the flexibility to magnify the full screen, parts of the screen, or a magnifying glass view of the area around the cursor or pointer. These programs also allow for inverted colors, enhanced pointer viewing, and tracking options.

Product	Vendor	Website
MAGic	Freedom Scientific, Inc. Blind/Low Vision Group	www.freedomscientific.com
ZoomText	Ai Squared	www.aisquared.com
BigShot	Ai Squared	www.aisquared.com

Screen Readers: Screen reading software reads aloud everything on computer screens, including text, pull-down menus, icons, dialog boxes, and web pages. Screen readers run simultaneously with the computer's operating system and applications.

Product	Vendor	Website
JAWS	Freedom Scientific, Inc. Blind/Low Vision Group	www.freedomscientific.com
Windows-Eyes	GW Micro	www.gwmicro.com
ZoomText	Ai Squared	www.aisquared.com

Scan/Read Systems: Scan/read systems combine software and a flatbed scanner to read aloud any printed text. Textbook pages, class handouts, and tests can be scanned in and then read aloud by a computer.

Product	Vendor	Website
Kurzweil 1000	Kurzweil Educational Systems	www.kurzweiledu.com
OpenBook	Freedom Scientific, Inc., Blind/Low Vision Group	www.freedomscientific.com

Portable Notetakers: Lightweight, portable notetakers provide speech output without a visual display and can be connected to printers and computers for printing and uploading text. Braille keyboards and refreshable Braille displays are available for Braille users. A QWERTY keyboard version is available for people who prefer touch-typing.

Product	Vendor	Website
Braille Lite Series	Freedom Scientific, Inc. Blind/Low Vision Group	www.freedomscientific.com
Braille 'n Speak	Freedom Scientific, Inc. Blind/Low Vision Group	www.freedomscientific.com
Type 'n Speak	Freedom Scientific, Inc. Blind/Low Vision Group	www.freedomscientific.com
PacMATE Series	Freedom Scientific, Inc. Blind/Low Vision Group	www.freedomscientific.com
Type Lite	Freedom Scientific, Inc. Blind/Low Vision Group	www.freedomscientific.com
VoiceNote	Pulse Data	www.pulsedata.co.nz
BrailleNote	Pulse Data	www.pulsedata.co.nz

Video Magnifiers: Video magnifiers utilize closed circuit television technology to enlarge written materials and small objects for people with low vision. All printed material from textbook pages to mail can be magnified onto the CCTV for easier viewing.

Product	Vendor	Website
Prisma	Freedom Vision	www.freedomvision.net
Aladdin	Telesensory	www.telesensory.com
Clarity	Clarity Solutions	www.clarityaf.com
SmartView	Pulse Data	www.pulsedata.co.nz
Flipper	Enhanced Vision	www.enhancedvision.com

Digital Book Readers : Software playback systems are full-featured software packages designed to play RFB&D's AudioPlus CD books on a desktop or laptop computer. They are specially designed with the blind and visually impaired community in mind.

Product	Vendor	Website
eClipseReader	Innovative Rehabilitation Technology, Inc.	www.eclipsereader.com
Victor Reader Soft	VisuAide	www.visuaide.com
PlexTalk	Plextor	www.plextalk.com

12-3 Students with Disabilities through Assistive Technology

New developments-primarily in computer technology-have expanded the potential for improving interactions, independence, and quality of life for people with disabilities far beyond anything imagined before. In schools, technological advances may reduce the need for a substantially altered curriculum or teaching methods for some students. This could conceivably lead to a reduction in the number of students who need special instruction. Further, in some cases, students with severe disabilities may be able to participate more in mainstream schooling and interact with classmates and teachers in ways that were previously impossible. Most important, the use of appropriate assistive technology in the education process increases the potential for persons with disabilities to

succeed in independent living and to engage in productive employment, as well as to enjoy an improved quality of life.

Along with the positive aspects of assistive technology will come new issues and complicated questions. One important challenge posed by the growing use of assistive technology is the need for educators to stay abreast of new developments. This issue of SEEDS will attempt to encapsulate for the rural educator an overall perspective on the field of adaptive and assistive technology and issues related to its use in rural schools. The discussion will address devices available for students, the legal mandates related to the use of assistive technology in schools, funding for assistive technology devices and services, , implications for rural school administration, and resources to help educators who are planning and implementing assistive technology programs.

- Visual Impairments
- Hearing Impairments
- Physical/Mobility Impairments
- Cognitive Disabilities

The following will focus on current practice and future directions in special education technology for students with disabilities. It will highlight classroom application of adaptive and multimedia technology that assists these students to fully utilise their abilities to gain access to a broader and more balanced curriculum.

In discussion relating to special education technology I feel that it is useful to define technology as the process by which we change, control and enrich our environment through the use of objects or material aids. Therefore emphasis is placed on how we use a device such as a computer rather than on the device itself. We need to focus initially on the needs of those students identified as requiring special education provision to ensure that we develop effective strategies that incorporate appropriate access to relevant information through information technology for these students.

Students with physical disabilities may:

- experience limitations in mobility
- experience communication difficulties
- experience reduced control over their environment

Students with intellectual disabilities may:

- have difficulties with processing information
- have reduced attention spans
- experience problems with concept acquisition and retention
- have difficulties in basic academic skill development
- have problems developing necessary life skills

Students with hearing impairments may:

- experience reduced auditory stimulation
- require more visual information
- have problems with speech development
- have difficulty communicating generally
- subsequently have poor language development

Students with visual impairments may:

- experience reduced visual stimulation
- require more auditory and tactile information
- experience varying degrees of print disability
- require access to brailled text

Students with disabilities in communication and language may:

- experience delayed language acquisition
- have problems with processing information and expressing thoughts and feelings
- have short term memory and receptive language difficulties

While it is important to be aware of the problems faced by students with disabilities the benefits of special education technology are maximised when we focus on the abilities of these students. We need to focus on what they can do rather than what they cannot do. The availability of computer technology that addresses the needs of students with disabilities supports the inclusivity of the curriculum for them and offers the opportunity for success that they may not otherwise experience.

12-4 Matching Technology to Student Needs

In order for special educators to maximise the benefits of using computers to support learning programs for students with disabilities they need to be aware of available hardware/ software options and to develop strategies that ensure the most appropriate match between student needs and these options.

The most appropriate computer based support for some students may be hardware related. They may need to utilise adaptive hardware that provides an alternative input or output mode in order to access a broad range of programs. Other students may require an application that utilises specialised software. They may, for example, require non-text based software that incorporates speech output or symbolic screen presentation. Generally computer based support for students with disabilities is both software and hardware related (i.e. the combination of an alternative input or output device with a specialised software package)

Hardware

Access to computer based technology via adaptive hardware may incorporate the use of the following alternative input and output options:

Input options

- Standard QWERTY keyboard (with keyguard) - a standard input device for all computers. Software is available that modifies keyboard input and keyguards can also be used to facilitate keyboard access appropriate to the needs of students with disabilities.
- Expanded QWERTY keyboard - a keyboard with the same layout as the standard QWERTY keyboard but with larger keys that are spaced further apart. Basic individual and combined key actions can be modified to suit individual student needs
- expanded membrane keyboard - this device has a flat surface that is divided into a number of touch sensitive cells that, when pressed, provide input that is interpreted by the computer according to the user authored interfacing program. The input associated with each cell is displayed by an overlay placed on the expanded membrane keyboard.
- Mouse - a device equipped with one or more control buttons on the top surface of its palm size case that is designed to roll about on a small ball housed underneath the case. This is the standard device used in conjunction with the Graphical User Interface (GUI) now used on most computers (i.e. operating the computer by moving a pointer and activating software operations using icons presented on screen)
- Trackball (trackerball) - device that enables the user to move the mouse pointer on screen by rotating a ball housed on the top surface of a case adjacent to the keyboard (ie. like an upside down mouse). The ball can be rotated with one finger or by foot.
- Joystick - a cursor controlling device used in software focusing on directional skills (eg. games).
- switching - single/multiple devices that provide "on-off" input for basic "cause-effect", scanning and morse code applications.

- Touch screen - a transparent membrane that attaches to the front of the VDU (computer screen) and communicates to the computer the location at which it is touched. This enables the student to provide simple input without looking away from the screen.
- mouth stick/headstick - a rod held by the mouth or mounted on the head that can be used for pointing or typing
- optical pointing device - a device usually worn on the head that reflects or detects signals from a box attached to the computer enabling hands free operation of the mouse pointer.
- Speech input device - a device capable of accepting (recognising) words spoken into a microphone as input. Software linked to such devices may "train" the computer to understand individual speech styles.

Output Options

Computers are able to provide students with visual, auditory or tactile information. Computer systems may also communicate with each other providing information via electronic communications. Visual information accessed via the computer monitor may be presented as text, programmed graphics or digitised images (still or video). Printers may also provide access to visual information from the computer in printed form.

Auditory information may be provided as synthesised (programmed) or digitised ("recorded") sound effects, speech or music. Tactile information may be accessed via a brailling or tactile imaging device.

Software

Software that effectively meets the educational needs of students with disabilities in the classroom context is characterised by the flexibility and adaptability to meet the changing needs of individual students as they develop and to meet the range of student needs and learning styles found within groups of students. It should provide user (ie. student/ teacher/parent) control over a variety of program features such as the level of difficulty, speed related to user response requirements and program presentation (eg. volume of sound output, text size, background colour etc.). Above all we must remember that effective use of computer hardware is reliant on the availability of software that is flexible, adaptable, appropriate, relevant, user friendly and motivational.

The increased flexibility and adaptability of non-specialised software is providing the special educator with a growing range of options that may be utilised to meet the needs of students with disabilities. For example, the availability of digitised speech output to accompany on screen text in mainstream software, particularly on CD-ROM, may provide the only means of access to program

information for students who are unable to read. Although software manufacturers may not consider the needs of students with disabilities as part of their program development process, these students still benefit as a result of such improved program presentation flexibility. We need to be creative in our use of software to meet the needs of students with disabilities and not to rely only on specialists to provide specialised software.

However, students with disabilities may need to use of specialised software that provides for alternative or assistive user access (ie. input/output). Specialised software may be designed as "standalone" software or as "transparent" software that adapts input and output associated with other non-specialised software. As the description implies, "standalone" specialised software provides both the application (eg. word processing, simulation etc.) and input/output adaptation. "Transparent" specialised software is active while other non-specialised software is running and adapts the associated input and output to meet the user needs without interfering with the normal operation of the non-specialised software. Examples of specialised software are:

- On screen "virtual" keyboards that superimpose a graphical representation of a standard or modified keyboard over the display of generic software. Input via the "virtual" keyboard is provided selecting "keys" (using switch input) when they are highlighted through a range of scanning techniques. Alternatively "keys" may be selected directly using a mouse or mouse emulating device (eg. head mounted infrared pointing device)
- Screen magnification software that enlarges the display to several times its normal size and adapts the computer display to function as a window that the student can pan across the enlarged display using a range of techniques. This type of software may be described as an on screen "magnifying glass"
- Screen reading software may convert all on screen information into synthesised speech.
- Braille translating software that converts on screen text from word processing to data accepted by a Braille embosser.
- Word predicting software that reduces keystrokes by presenting lists of text entry options relate to the initial letter(s) of the desired entry. Examples of such software adapt to the frequency of student entries.
- Speech recognising software that allows the student to control computer operation, particularly word processing, with spoken directions. Examples of such software adapt to the speech style of individual users.
- Single input operated "cause and effect" software with in built options relating to program presentation (ie. visual/auditory stimuli and responses) and switch operation.

Combining Specialized Software with Adaptive Hardware

The following is a list that summarises a range of computer based options that combine specialised software and adaptive hardware and may be used to meet the educational needs of students. Computing for students with physical disabilities may involve:

- "transparent" scanning software that enables the use of a range of educational software
- predictive word processing software that minimises required keystrokes electronic augmentative communication
- mouse emulating software environmental control via adaptive technology

Computing for students with intellectual disabilities may involve:

- simple cause-effect software to develop attending skills
- basic literacy and numeracy software for older students that is both age and ability appropriate
- software that incorporates speech output
- speed modified programs to compensate for problems in processing information and providing responses
- simulation software that facilitates life skill development .

Computing for students with hearing impairments may involve:

- the use of telecommunications to motivate language development through visually based communication that is accessible to the general population
- voice activated software that encourages verbalisation and provides visual feedback

Computing for students with visual impairments may involve:

- screen magnifying software where reading assistance is required
- screen reading software that enables a speech synthesiser to provide spoken output relating to on screen information where an alternative to visual output is needed
- software that enables the production of materials with a braille embosser that may also be used in conjunction with screen reading software

Computing for students with disabilities in communication and language may involve:

- predictive word processing software where ongoing problems in word formation are holding back overall written output

- software that uses overlay (concept) keyboard for fixed vocabulary exercises

12-5 Interactive Multimedia for Students with Disabilities

Computers are able to present an infinite variety of visual/auditory stimuli and responses. They also have the flexibility to accept a range of input types and methods. These characteristics are significant factors in the success of computers in addressing individual student needs and interests. Software developed to meet the needs of students with disabilities can provide a range of methodologies and input options There are some excellent examples of such software available commercially. The use of these "off the rack" software packages has resulted in a reliance on the ability of programmers to address the needs of students with disabilities appropriately and effectively.

However non-programmers are now able to develop "tailor made" software through use of multimedia technology in combination with suitable authorware (eg. Hypercard (Apple), Magpie (Acorn), Linkway (IBM)). The term multimedia refers to the combination of information from a variety of sources (e.g. video camera, scanner, microphone) into one system that is controlled by the computer. The presentation of this information then combines a multitude of media (eg. animation, motion video, audio, graphics, text etc.). Hence the term multimedia.

The relevance of this development (multimedia) in computer technology to the education of students with disabilities can be seen in many areas. The use of multimedia technology in basic "cause and effect" applications will, for example, benefit these students with intellectual disabilities who generally have difficulty understanding the two dimensionality of traditional computer graphics and pictorial symbols. These images may be replaced by scanned photographs or video segment drawn from the student's own real life experience (eg. family members, home/ class/ school activities, etc.) and accompanied by more relevant sound (eg. speech, music) linked to these images. Communication software can focus on recognition skills (ie. the "real thing" on screen) rather than association skills (ie. representational block graphics, symbols, etc). Software aimed at language and reading development can be designed to reinforce an experiential approach. Computer assisted development of living skills can be made more effective and efficient because program content can be specific to the environment of each individual student. This, for example, avoids problems associated with using living skills software produced overseas.

Therefore program content can be individualized to meet the specific needs and interests of students with disabilities and improved learning outcomes for these students will result from the benefits related to improved:

- Motivation - software content (ie. audible and visual output) can be linked to the real life experience of students and motivators specific to their interests .
- Involvement - students will be able to determine how the curriculum is presented as software content will be governed by student feedback.
- Empowerment - in a manner which is relevant to their needs and abilities, students with disabilities will have control over their education (ie. their responses determine how the curriculum is presented).
- Access - the flexibility of multimedia based learning can take into account physical abilities and learning style and thus provide greater access to the curriculum for students with disabilities.
- Efficiency - teacher generated software that focuses on individual student needs ensures that the outcomes of teacher preparation time and student learning time are maximised.

Multimedia technology could be seen as the photocopier of the future and as such technology becomes more accessible it will result in the production of more teacher generated software. I feel that once special educators have developed the skills to utilise multimedia technology they will feel empowered and therefore more confident in there use of computers. Multimedia techniques will make computing more relevant to the individual needs of students with disabilities.

12-6 Selecting Appropriate Technology for Students with Disabilities

The process of selecting a computer appropriate to the educational needs of students with disabilities should involve the consideration of a range of questions including:

- What are the abilities and disabilities of the students who will use the computer?
- Which software will best meet student needs and teacher requirements and for which hardware is it available?
- Which alternative access (input/output) options will best meet student needs and which software/ hardware combination enables such access?
- How will the computer be incorporated into current classroom practice?
- What hardware/software support options (i.e. school based, system based, commercial etc.) are available?
- What are the costs of hardware/software options and do they meet budgetary requirements?

Therefore we need to focus on student needs, software, access, teaching strategies, support/ networking and cost.

12-7 Conclusion

Adaptive and assistive technology and interactive multimedia applications provide the special educator with powerful tools that can facilitate a more inclusive curriculum. However the power of these tools will only be harnessed effectively if we focus on the educational needs of student with disabilities first and subsequently the application of such technology to enabling improved access to the curriculum for these students .

Chapter 13

Summary and Recommended Education Technology Products

13-1 Summary and Conclusion:

To sum up, It is crystal clear as it is shown in the results of my experiment on chapter 10, research, and my long experience that if we utilize the technology in education considering all the stakeholders, as it explained in my dissertation chapters, we could enhance education through technology, but without implementing and developing all the education elements and factors during the reforming process of the education towards utilizing the education technology it will be a waste of time , money, and efforts.

Continuous process of evaluating and controlling the process of the reform is essential to assure of developing all people involved in the education process, by government role for setting up associations which will keep developing the standards, assessment of implementing the education technology, setting up incentives for the schools which will show more results of implementing the technology at their schools (see applying technology bench mark theory at chapter 10). These associations should precisely apply the technology and the follow up of process using the technology as they can't ask to implement the technology while they are not utilizing it. They should communicate and keep links with all the education stakeholders and make the assessment through the internet not only visiting the schools. They should show high standards of using the technology as an example for the schools.

In brief applying education technology requires a great and continuous efforts which are not understood by many people whom they think that using technology in education is just fun without realizing that soon if they will not utilize the education technology in education they will be left behind as history.

All the people involved in the educational process should be aware of the best utilization of education technology according to the roles they are involved with. They should learn how to integrate all the education process through technology not part by part, as a simple example if the school starts the transform and the principal has no idea of what and how the transform to Digital Pedagogy will be implemented and how it should be integrated with core academic contents in lesson plans and how to increase student participation in classrooms and increase the learning potential of the students with technology, the Web, interactive games, desktop publishing and

moviemaking, implement an innovative curricular framework to stimulate critical and creative thinking especially among young learners, motivate them with real-world learning activities that develop problem solving collaboration, and effective communication skills and engage them with school development, if all the above is not considered that means it is wasting of money efforts,...etc.

The process of transforming should include the following:

- School building infra structure to be able to install all the necessary networking and other educational technology.
- School management and staff (supervisors), should know how to link all the elements of the educational process, utilizing the education technology, and supervising the teachers for applying the best methods of blending education and technology with continuous improvement strategy and assessments, making sure of their qualification and competency.
- Teachers the core of the education process without preparing them for blending the pedagogy with ICT, it means, no development towards Digital Pedagogy, they should know how to use the software for class management like NetSupport school visit www.netsupportsoftware.com .

  The example of preparing the teacher for the digital pedagogy by implementing the EPICT (European Pedagogical Information, communication, and Technology) visit this web site www.epict.co.uk .
- Students, the outcomes of the whole process which is all about, should be part of the process; they should know the new concept of learning and studying with the multi resources environment, knowing how to use computers sufficiently and adequately and internet.
- Vital and effective Curriculum to be able to utilize the education technology and to help teachers to easily prepare their lesson plans.
- Parents whom they should be acquainted with the basics of computers and to be able to communicate through the internet with the above elements, and they should understand the new era in the education and the concept behind the transforming.
- Authority and government, without the support and help, providing the resources and by assigning qualified personnel through associations established for the purpose of transformation no development will be reflected.
- The availability of E-Content, multi resources educational learning media, and learning gateways.

- ICT services providers, for hardware and software which they will help on the know how and using of the technology, and the training institutes.
- Investors for the private schools should realize the importance of transforming to the Digital Pedagogy, otherwise they will lose their customers soon or later.

13-2 Education Transformation to the 21st century

Education Transformation to the 21st century digital age requires to consider and develop all the elements and factors involved in the education process which are explained in the previous 12 chapters, and without sufficient up- to - date tools and materials as required technologies in that means , we are driving without a vehicle.

The following pages will cover the up –to-date range of products which assist the process of education transformation be successful.

Educational Technology has been defined as the design, application evaluation and development of systems, methods, and materials to improve the process of human learning. Under this umbrella term (i.e., educational technology) lies the theoretical and practical base for the development of a marketable commodity.

Within the field of educational technology are the components of:

- instructional design,
- information technology resources and management,
- systems and curriculum development,
- cognitive and information processing,
- media production,
- research and evaluation of instructional products and processes.
- human resources development and management
- training and management of training systems and facilities
- instructional research and learning research

13-3 The Educational Technology Products

The product of Educational Technology might refer to any one of the numerous educational materials developed for instructional purposes. Systematic design is applied by educational technologists to the development of print, audio, still and motion visuals, computer instruction and any other technologies which might be applied to learning. These materials form an integral part of

education and instruction from primary through to tertiary education including apprenticeship, industrial and commercial training.

With the questions of ownership and copyright uppermost in the minds of those responsible for the selection, development and distribution of instructional technology and materials, the role of educational technology in providing adequate and appropriate instructional materials is obvious. Further the 'product' asset of Educational Technology is not merely concerned with the creation of singular goods. Rather it might refer to any one of the numerous projects undertaken by educational technologists and instructional design departments, within formal education (e.g., the universities, institutes) and in private enterprise. Interactive videodisc or computer software such illustrate the involvement of Educational Technology in the production of products requiring sophisticated organizational planning and execution.

The objectivity of the systems approach, including needs assessment, task analysis, planned development, production and evaluation allows the application of educational technology to problems within and beyond the realms of institutionalized education.

NetSupport School

NetSupport School is a class leading training software solution, providing Teachers with the ability to instruct, monitor and interact with their Students either individually, as a pre-defined group or to the overall class.

Combining advanced classroom PC monitoring, real-time Presentation and Annotation tools, with an innovative customized Testing suite, Internet and Application control, real-time audio monitoring, automated Lesson Plans, Printer Management, Instant Messenger control, Content Monitoring and Desktop Security, this latest version of NetSupport School rises to the challenge and requirements of today's modern classroom.

Below is a lucid explanation for those products

Net Support Protect

NetSupport Protect is the number one choice of IT administrators and technology coordinators to protect Windows operating systems and desktops from unwanted or malicious changes.

NetSupport Protect provides a secure, reliable and productive computer environment. With its extensive list of security features and intuitive format, IT administrators can use NetSupport Protect to guarantee that users are getting the most beneficial use of their computing experience, while safeguarding both the configuration and content on their systems.

NetSupport Protect prevents users from deleting critical files and applications, making unauthorized changes to the desktop, saving or using unauthorized programs and harming the operating system.

With NetSupport Protect, you can feel confident that unauthorized changes to a system, whether accidental or malicious, won’t become an issue or impact on the productivity of your office PCs or computer lab.

Digital Language Lab. (DLL)

1. Teaching/ Self-Learning Mode
2. Operation Status
3. Speed Control
4. Master Track Waveform
5. Bookmark
6. Playback & Recording Modes
7. Text Chat
8. Intercom
9. Video
10. Subtitle
11. Exercise & Quiz

DLL is the comprehensive 4-in-1 (Audio + Visual + Text + Quiz) multimedia language laboratory software system on the market. As a combination of pronunciation practice, video presentation, audio discussion and exercises, DLL creates a genuinely interactive teaching and learning environment.

Pronunciation practice, Listening practice, Presentation skills training, Interactive language learning activities

Interactive Whiteboard

Interactive whiteboard engages students with vivid images, video and audio. ActivBoards enable anything that can be seen or done on a computer screen to be projected onto an interactive

whiteboard – bringing every classroom to life. ActivBoards are the key components to all-in-one 21st century classroom solution: The ActivClassroom .

Interactive Slate

In the ActivClassroom, nothing is static—subjects, lessons and especially participants and participation fully come alive. And while students enjoy interacting by coming to the ActivBoard, teachers also want connection and freedom of movement—teaching from student desks, debating from the four corners of the room, directing the lesson from inside group discussions.

ActivSlate makes dynamic, interactive classroom experiences everyday occurrences by giving anyone who wishes to participate control of the ActivBoard from anywhere in the ActivClassroom. A wireless, fully integrated, notebook-sized tablet, ActivSlate uses the same ActivPens as our ActivBoard, is small enough to sit on a student desk, and is light enough to be carried into the heart of any discussion. The ActivClassroom supports as many as 16 ActivSlates, but gives teachers the last word with regard to control. Only one ActivSlate can be used at a time—instructors choose who has the floor and who waits patiently for their turn by activating and deactivating slates at will.

Interactive View

From the ActivClassroom, every view is spectacular. Educators the world over already jet across continents and traverse eons in full color and motion through our ActivBoard and ActivInspire software, but now learning journeys can become even more real—with our ActiView Visual Presenter.

Put any object under ActiView's gooseneck-mounted lens and lamp combination and your treasures, text, even flora and fauna are projected in vivid detail on the ActivBoard. Examine the smallest shell with automatic zoom and focus. Capture still-frames or the fluid motion of waving butterfly wings, then save to a computer for future inspiration. Share your work with the entire classroom or build an image library of everyday objects and extraordinary finds for use in your lessons. ActiView puts the whole wide world on display.

Digital Broadcasting System (DBS)

Multimedia Broadcast-Teaching system with user-friendly interface can broadcast signal of NB / DVD / projector from teacher resources to students' monitors.

It also can combine headsets to do discussion between students and teachers bringing more interactive and flexibility in teaching. They are powerful tool for multimedia lab, computer cram school, training lab, government and so on.

Support 3 way broadcasting: teacher to student, student to teacher, student to student

PC or non PC-based and supports up to 80 users.

Integrate multimedia devices such as DVD / VCR / NB/projectors to broadcast

Real time Broadcast Video/Audio/Mic at the same time.

KBM control function: mutual keyboard and mouse control between teacher and students (one by one).

Interactive discussion between teachers and learners

Group function: each group can choose a leader to do demo or group discussion.

Optical Mark Recognition Readers

is a method of entering data into a computer system Optical Mark Readers "read" pencil or pen marks made in pre-defined positions on paper forms as responses to questions or tick list prompts.

The OMR data entry system contains the information to convert the presence or absence of marks into a computer data file. OMR is a different technology from apparently similar automated data entry techniques, such as Optical Character Recognition (OCR) or barcodes, although in many cases these techniques may be used in conjunction with OMR.

Mobile Labs (COW Computers on Wheel)

There are many differences between a "Mobile Computer Lab" and a "laptop storage cart" – the main difference is that laptop storage carts simply store laptops, while wireless mobile computer labs empower teachers to teach and student to learn by allowing ALL DAY USE of their laptops.

EarthWalk is a pioneer of wireless mobile computer labs and a leader in "PowerSmart" Technology Solutions around the world. The evolution of these Eco-Friendly Solutions are a reflection of our continuous collaboration with K-12 school administrators and teachers, and a strong commitment to meeting the challenges they face when integrating technology into their classrooms.

EarthWalk has focused on the power needs of today's (and tomorrow's) classroom environment and developed integrated, high-efficiency, power system solutions that allow you to power as many computer labs without blowing a fuse!

Braille Sense

Powerful, slime and compact Braille notetaker. With the following features :

- Store thousands of media files , documents or other files without carrying extra cards .
- Build-in Bluetooth , high speed wired and wireless LAN .
- MP3 player/recorder , FM radio and DAISY player can be controlled by audio buttons .
- Information on the Braille display can be shown in the text on the LCD or external monitor via VGA port.
- Braille Sense is very easy for the beginners to use because it is designed with menu stature similar to Microsoft Windows.
- Navigation for the blind (Maps and GPS)

Index Braille Embosser

Basic-D combines experiences and creativity to form our most popular embosser. It offers stable, unmonitored embossing all day. Basic-D is a charming home embosser and an efficient office producer at the same time. D stand for double sided embossing, an Index Braille standard.

Behind the success of Basic-D is it's stability. You can feed the embosser a box of fan fold paper and it will emboss all day. Basic-D represents user friendly, high quality embossing

Newspaper production made easy. 4X4 PRO gives you complete books and magazines from cut sheet paper. The system offersfull flexibility

Braillo Norway Embosser

- Rugged construction for large volume production of Braille;
- Built-in Paper Cutter for 2 or 4 page per sheet format;
- Stacking unit designed for handling large format brailled sheets;
- Modular design, easy to service;

- High speed, 440 characters per second continuous printing;
- High braille quality. Each document is an original; and
- The printing system is based on Braillo 400 S with more than 15 years of experience

Screen Readers

Developed for blind computer users, Hal is a software screen reader that works by reading the screen interactively and communicating through a speech synthesiser or a refreshable Braille display.

Hal has been developed for blind computer users, at home, at work and in education.

- Hal talks as you type, announcing words or characters so you can check what you write.
- A single key allows you to read an entire document, email or web page.
- Fast and accurate multilingual Braille output for text at your fingertips*. (Grade 1 & 2 computer or literary Braille supported).
- Access complex websites with ease by choosing to list links, headings or frames.
- Read image labels, font styles, Windows menus and icons for easy navigation.
- Full support of popular applications including PDF documents, form filling, PowerPoint, Word & Email.
- Customise the speed and volume of the voice and control the level of detail and punctuation that is spoken or sent to Braille.
- Focus highlight and on-screen Braille assists those with residual vision, sighted teachers & helpers.

- True multi language support, choice of over 20 languages and different synthesiser languages.
- Quality synthesiser included, delivering clear speech and intelligent pronunciation even at high speeds.
- Automatic software updates via the Internet ensure you always use the latest version.
- Works with most applications from the box, others can usually be mapped.
- Includes SAM (Synthesiser Access Manager) for easy support of third-party synths and Braille displays.
- Runs on many operating systems, network installations, Terminal Server and Citrix support.
- Choice of control panel for accessing features and functions and user selectable range of hotkey shortcuts provide ease of use and requires minimal training.

References

- Bailey, G. (1995). Technology Leadership: Ten essential buttons for understanding technology integration in the 21st century.
- Bailey, Ross, & Griffin (1995). Barrier to curriculum-technology integration in education: Are you asking the right questions? Catalyst for Change 25 (1).
- Biggs, J. B. (1999). Teaching for quality learning at university: what the student does. Buckingham, UK: Open University Press.
- Booth, S. A. (1992). Learning to program: A phenomenographic perspective. (Göteborg Studies in Educational Sciences, 89). Göteborg: Acta Universitatis Gothoburgensis.
- Bowden, J. A. (1994). The nature of phenomenographic research. In J. A. Bowden & E. Walsh (Eds.), Phenomenographic research: Variations in method. Melbourne: RMIT, Educational Quality Assurance, Research and Development Unit (EQARD).
- Brown, JS, Collins, A and Duguid, P (1989) Situated cognition and the culture of learning, Educational Researcher.
- Bulach, C. (1994). The influence of the principal's leadership style on school climate and student achievement.
- Cafolla, R. & Knee R. (1995). Factors limiting technology integration in education
- Carr-Chellman, A. A., & Dyer, D. (2000). The pain and the ecstacy: Pre-service teacher perceptions on changing teacher roles and technology. Educational Technology and Society.
- Crawford, K., Gordon, S., Nicholas, J., & Prosser, M. (1994). Conceptions of mathematics and how it is learned: The perspectives of students entering university. Learning and Instruction.
- Cuban, L. (1998). Interview with Larry Cuban. Technology & Learning Online.
- Dale, E. (1946). Audio-visual methods in teaching. New York: Holt, Rinehart & Winston.
- Dempsey (Eds.), Trends and Issues in Instructional Design and Technology (2nd ed.), Columbus Ohio: Pearson Education, Inc.
- Dessinger, J. C., & Moseley, J. L. (2004). Conformative evaluation: Practical strategies for valuing continuous improvement. San Francisco: Pfeiffer.
- Dick, W., Carey, L., & Carey, J. (2005). The systematic design of instruction. (6th ed.). Boston: Allyn & Bacon
- DoE (Department of Education) (1998). Learning Technologies: Teacher Capabilities Guide. Melbourne, Australia: Community Information Service.
- Fullan (1982). Meaning of educational change. Toronto: OISE Press.
- Glaser, R. (1962). Pyschology and instructional technology, In R. Glaser (Ed.), Training research and education. Pittsburgh: University of Pittsburgh Press.
- Gardner, Howard. Frames of Mind: The Theory of Multiple Intelligences. (1983). New York. Basic Books, a Division of Harper Collins Publishers, Inc.

- Gardner, Howard. Intelligence Reframed: Multiple Intelligences for the 21st Century. (1999). Basic Books. New York, New York.
- Gardner, Howard. Multiple Intelligences: The Theory in Practice. (1993). Basic Books, a Division of Harper Collins Publishers, Inc.
- Gardner, Howard. The Disciplined Mind. (1999). Simon & Schuster. New York.
- Gardner, Howard. The Unschooled Mind: How Children Think and How Schools Should Teach. (1991). New York. Basic Books, a Division of Harper Collins Publishers, Inc.
- Goleman, Daniel. Emotional Intelligence. (1995). New York. Bantam Books.
- Gustafson, K. L. and Branch, R. (2007). What is instructional design. In R.A. Reiser and J. V. Dempsey (Eds.), Trends and Issues in Instructional Design and Technology (2nd ed.), Columbus Ohio: Pearson Education, Inc.
- Honey, M., Culp, K. M., & Carrigg, F. (2000). Perspectives on technology and education research: lessons from the past and present. Journal of Educational Computing Research.
- Howard Pitler, Elizabeth R. Hubbell, Matt Kuhn Using Technology with Classroom Instruction That Works. (2007).
- Jensen, E. (1998). Teaching with the brain in mind. Alexandria, VA: Association for Supervision and Curriculum Development.
- Jochems, W., Van Merrienboer, J. and Koper, R. (2005). Integrated e-learning: implications for pedagogy, technology and organization, London: RoutledgeFalmer
- Kennedy, G. (Ed) (1992). Computer Related Technologies and Special Needs. Australian Journal of Remedial Education.
- Kirkpatric, D. L. (1994). Evaluating training programs-The four levels. San Francisco: Barrett-Koehler
- Locatis, C. (2007). Performance, instruction, and technology in health care education, In R.A. Reiser and J. V.
- Marton, F. (1986). Phenomenography - a research approach to investigating different understandings of reality. Journal of Thought.
- Marra, R. M., & Carr-Chellman, A. A. (1999). Undergraduate education students' perspectives on classroom technologies: A qualitative analysis. Journal of Educational Computing Research.
- McCune, S.D. (1998) Restructuring Eduction. In D. Dickenson, Creating the future perspectives on educational change. Seattle, WA: New Horizons for Learning.
- McKenzie, J. (2000, March). Beyond technology. Electronic School, 20-23.
- Morrison, G., Ross, S. & Kemp, J. (2004). Designing effective instruction (4th. Ed.). Hoboken, NJ: J. Wiley & Sons.
- Oakely, J. (1998). Strategies for successful integration of information technology across the primary curriculum. Senge,

- Prensky, M. (2001). Digital Natives, Digital Immigrants. NCB University Press.
- Pring, R. (1973). Curriculum integration. In R. S. Peters (Ed.), The philosophy of education. London: Oxford University Press.
- Prosser, M., & Millar, R. (1989). The how and what of learning physics. European Journal of Psychology in Education.
- Pryce-Davies, P. (1987). Teaching Learning and Technology in Special Needs Classrooms: A National Information Statement.
- Ramsden, P. (1988). Studying learning: Improving teaching. In P. Ramsden (Ed.), Improving learning. New perspectives. London: Kogan Page.
- Reggie Kwan (Editor) , Robert Fox (Editor) , Philip Tsang (Editor) , F. T. Chan (Editor) Enhancing Learning Through Technology : Research on Emerging Technologies and Pedagogies. (2008).
- Reiser, R. A. (2007). What field did you say you were in? In R.A. Reiser and J. V. Dempsey (Eds.), Trends and Issues in Instructional Design and Technology (2nd ed.), Columbus Ohio: Pearson Education, Inc.
- Schrum, L. (1999). Technology professional development. Educational Technology Research and Development.
- Senge, P. (2000). Schools that learn. New York, NY: Doubleday.
- Smith, P. L, & Ragan, T. J. (2005). Instructional design (3rd ed.). Hoboken, NJ: John Wiley & Sons.
- Trigwell, K., Prosser, M., & Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning.
- Van Eck, R. (2006). Digital game-based learning. Educause Review Technology and Education Reform, Jossey-Bass.
- Vars, G. F. (1991). Integrated curriculum in historical perspective. Educational Leadership.
- Wood, R. (Ed) (1993). Special Needs IT. Northwest SEMERC.