APPLIED EDUCATIONAL AND LEARNING

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Preface

Applied educational and learning approaches encompass a spectrum of strategies and methodologies aimed at translating educational theory into practical application within real-world educational settings. This field is deeply concerned with optimizing teaching and learning experiences to enhance student outcomes and address the diverse needs of learners.

One fundamental aspect of applied educational and learning approaches is their emphasis on evidence-based practices. Educators draw upon empirical research from various fields, including psychology, cognitive science, and educational neuroscience, to inform their instructional decisions and interventions. By grounding their practice in scientific evidence, educators can make informed choices about teaching strategies, curriculum design, and classroom management techniques.

Moreover, applied educational and learning approaches prioritize the development of practical skills and competencies in learners. Educators seek to create learning experiences that are relevant, engaging, and directly applicable to students' lives and future aspirations. This may involve integrating hands-on activities, real-world projects, and authentic assessments into the curriculum to enhance student engagement and retention of knowledge.

Furthermore, applied educational and learning approaches emphasize the importance of individualized instruction and differentiated learning experiences. Educators recognize that learners come from diverse backgrounds and possess unique strengths, weaknesses, and learning styles. As such, they strive to tailor their instruction to meet the specific needs of each learner, providing personalized support and accommodations as necessary.

In addition to addressing the academic needs of students, applied educational and learning approaches also prioritize the socio-emotional development and well-being of learners. Educators promote a positive classroom climate characterized by mutual respect, empathy, and inclusivity, fostering a supportive learning environment where students feel safe to take risks, ask questions, and express themselves authentically.

Furthermore, applied educational and learning approaches emphasize the importance of collaboration and partnership among educators, students, families, and community stakeholders. By working together, stakeholders can leverage their collective expertise and resources to support student success and address systemic barriers to learning.

Ultimately, applied educational and learning approaches are guided by a commitment to continuous improvement and innovation. Educators engage in ongoing reflection, assessment, and professional development to refine their practice and stay abreast of emerging research and best practices in the field. Through this process of continuous learning and adaptation, educators can enhance their effectiveness as practitioners and positively impact student learning outcomes.

–Author

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Theories of Learning in Technology Education

Three influences in technology education have been the behavioural, cognitive, and constructivist philosophies, and it is apparent that technology education has been shaped by these three philosophies and retains characteristics of each one as described as follows: "*Behaviourism* has deeply rooted connections with technology education's approach to instruction. In general, within the United States, teachers are the locus of control in the classroom. Historically, this instructional approach has been similar within technology education". *Cognitive* learning theory also has close connections with technology education. Problem solving is a process or cognitive skill, and this suggests that a cognitive approach to learning, as manifested in the problem-solving tradition of technology education, is a core value of educational theory in technology education. *Constructivist* theory frames learning as an active and continuous process whereby the learner takes information from the environment. Learning takes place as students discuss and share problems and solutions in meaningful contexts through collaboration by developing unique solutions and participating in thoughtful reflection. Based on survey and focus group data, Vannatta and Beyerbach have reported that "an important characteristic of a progressive technology-using educator is a dynamic, constructivist vision of technology integration"; and "higher education faculty is a crucial component to developing technology-using preservice teachers…higher education faculty need opportunities to observe technologyrich classrooms and to converse and collaborate with technology-using educators".

FORMS OF EDUCATIONAL TECHNOLOGY

TEACHING TECHNOLOGY

We've all said it. "Technology is the wave of the future." There's no denying that. It's actually the wave of the present. I know that every teacher in academe today has heard that the need to use technology in the classroom is imperative now. If we are going to engage our students in the class discussions and the lectures, we need to be doing this engagement with the technologies they are familiar with. Just last month, The National Council of Teachers of English (NCTE) said the same thing. In their recent reconstruction of the definition of literacy in the 21st century, NCTE focused more on the technologies that are becoming imperative to literacy education. Their definition states:

- Because technology has increased the intensity and complexity of literate environments, the twenty-first century demands that a literate person possess a wide range of abilities and competencies, many literacies. These literacies—from reading online newspapers to participating in virtual classrooms—are multiple, dynamic, and malleable. As in the past, they are inextricably linked with particular histories, life possibilities and social trajectories of individuals and groups. Twenty-first century readers and writers need to:
  - Develop proficiency with the tools of technology
  - Build relationships with others to pose and solve problems collaboratively and cross-culturally
  - Design and share information for global communities to meet a variety of purposes
  - Manage, analyze and synthesize multiple streams of simultaneous information
  - Create, critique, analyze, and evaluate multi-media texts
  - Attend to the ethical responsibilities required by these complex environments

INSTRUCTIONAL TECHNOLOGY

Teachers and schools are under increased pressure to incorporate technology more directly in the classroom, and schools handle a wider range of student abilities than ever before.

While instructional technology tools promise to help enhance what teachers can do, many teachers are not well prepared to use them.

Our certificate and master's degree programmes are targeted towards people from varied backgrounds who want to learn to incorporate technology more effectively in educational settings.

The master's degree in instructional technology is aimed at those interested in the systematic planning and use of technology, particularly in school settings. We also offer a certificate programme designed to help teachers and other school professionals learn how to integrate instructional technologies into

effective teaching and learning. Our doctoral programmes focus on best practices in teaching and learning, including the design, development and integration of instructional technologies. The programme uses a scientist-practitioner model that unites research with application.

Students concentrate in teaching, learning and instructional technology in school-based and non-formal and online learning environments.

In addition, students work with faculty on a variety of scholarly projects in areas such as learner motivation and engagement, teacher professional development, technology integration in the schools and the design and development of instructional technologies. They regularly publish in the field's leading journals and also present their research findings at national and international conferences.

BEHAVIOURAL TECHNOLOGY

Psychology is the science of behaviour. It studies the nature and structure of behaviour of the organisms. The learning is the modification of behaviour through activities and experiences.

The educational activities are designed to bring desirable changes in the behaviour of the students. The psychology deals with every type of human behaviour. Thus, the behavioural technology has wider scope.

It covers the area of industry, defence, commerce, communication, administration, health, motivation, training education, teaching and instruction.

The teaching and instruction activities are organised to achieve specific learning objectives by bringing desirable behavioural change among the students. Thus, teaching and instructional technology are two forms of behavioural technology. But in the field of education it refers mainly to the teacher behaviour.

The behavioural technology is the application of scientific knowledge in modifying the teacher behaviour. Thus it is also termed as training technology.

The behavioural technology is based on the following assumptions:

- Teacher behaviour is observable.
- Teacher behaviour is measurable and quantifiable.
- Teacher behaviour is relative.
- Teacher behaviour is social and psychological.
- Teacher behaviour is modifiable.

Characteristics of Behavioural Technology

- The specific teaching skills can be developed.
- It helps in developing the theory of teaching.
- The achievement of teaching can be evaluated objectively and in a systematic manner.
- Feedback devices can be used for the improvement of communication skills.
- The individual differences of pupils and teacher can be tackled.
- The knowledge and practice of behavioural technology may be an important instrument for training colleges to produce effective teachers.

- In class-room, behaviour technology concentrates on elements of behaviour.
- In behavioural technology the theory and practice of class-room teacher behaviour are included.
- In it mechanism of feedback devices for modification of teacher behaviour are also employed for developing teaching skills.

TRANSACTIONAL USAGE OF EDUCATIONAL TECHNOLOGY

Recent research on learning in complex environments (Suchman 1991; Cervero 1990; Rogoff 1990) has underscored the necessity of understanding the influence of the context in which learning takes place. Context is an important consideration in social-cognitive perspectives (Resnick, Levine, and Teas]ey 1991) and constructivist (Duffey and Jonassen 1992) views of learning. The socia] context of learning has been examined by researchers interested in cooperative learning (S]avin 1991; Johnson and Johnson 1979), situated cognition (Brown, Collins, and Duguid 1989), peer learning (Damon and Phelps 1989; Damon 1984), collaborative development of critical thinking skills (Thayer- Bacon 1993), and the development of communities of enquiry (Lipman 1991; Christensen 1991). A]though these studies of learning in a socia] context provide interesting clues to learning at a distance, they have focused on face-to-face instruction and interaction. A great deal of theoretical and empirical research is necessary to understand and appropriately apply these educational theories and techniques in a distance context.

The purpose of this study was to explore the influence of teacher-student and student-student communication in terms of developing a community of enquiry and critical thinking ability. More specifically, instruments and research questions were used to explore students' perceptions of learning in an audio teleconferencing context.

Literature Review

This study is grounded in the practice of distance education, especially in that type of distance education that makes use of interactive telecommunications technology. The review of the literature that follows centers I) on the effect of telecommunications technologies on the defining characteristics of distance education and 2) on the effect of instructional design on the perceptions of learning in mediated contexts. *Distance Education and Interaction.* Traditionally, distance education has been characterized as an individual form of learning (Holmberg 1986) lacking opportunities for socially shared learning. The emphasis on individual students studying alone at their own pace creates unique challenges to educators attempting to assist learners in cognitive development, especially that associated with social cognition. Keegan (1986) argues that non-interactive distance education must attempt to compensate for the following characteristics:

- No heard language
- Absence of non—language communication
- Absence of feed-back processes student-to-teacher
- Absence of feed-back processes teacher-to-student
- Delayed reinforcement
- Absence of student-to-student communication
- Change in role of non-cognitive learning processes.

INTEGRATED

Technology integration is the use of technology tools in general content areas in education in order to allow students to apply computer and technology skills to learning and problem-solving. Generally speaking, the curriculum drives the use of technology and not vice versa. Technology integration is defined as the use of technology to enhance and support the educational environment. Technology integration in the classroom can also support classroom instruction by creating opportunities for students to complete assignments on the computer rather than the normal pencil and paper. Technology integration in class would help students to explore more.

The International Society for Technology in Education (ISTE) has established technology standards for students, teachers and administrators in K-12 classrooms.

The ISTE, a leader in helping teachers become more effective users of technology, offers this definition of technology integration:

- "Curriculum integration with the use of technology involves the infusion of technology as a tool to enhance the learning in a content area or multidisciplinary setting... Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information, and present it professionally. The technology should become an integral part of how the classroom functions—as accessible as all other classroom tools. The focus in each lesson or unit is the curriculum outcome, not the technology."

Integrating technology with standard curriculum can not only give students a sense of power, but also allows for more advanced learning among broad topics. However, these technologies require infrastructure, continual maintenance and repair – one determining element, among many, in how these technologies can be used for curricula purposes and whether or not they will be successful. Examples of the infrastructure required to operate and support technology integration in schools include at the basic level electricity, Internet service providers, routers, modems, and personnel to maintain the network, beyond the initial cost of the hardware and software.

Technology integration alongside standard education curriculum can provide tools for advanced learning among a broad range of topics. Integration of information and communication technology is often closely monitored and evaluated due to the current climate of accountability, outcome based education, and standardization in assessment.

Technology integration can in some instances be problematic. A high ratio of students to technological device has been shown to impede or slow learning and task completion. In some, instances dyadic peer interaction centered on integrated technology has proven to develop a more cooperative sense of social relations. Success or failure of technology integration is largely dependent on factors beyond the technology. The availability of appropriate software for the technology being integrated is also problematic in terms of software accessibility to students and educators. Another issue identified with technology integration is the lack of long-range planning for these tools within the educative districts they are being used.

Technology contributes to global development and diversity in classrooms and helps develop upon the fundamental building blocks needed for students to achieve more complex ideas. In order for technology to make an impact within the educational system, teachers and students must access to technology in a contextual matter that is culturally relevant, responsive and meaningful to their educational practice and that promotes quality teaching and active student learning. Following the moment when educators realize their students are capable, independent technology users who can create inspiring digital masterpieces. In the former mindset of teaching with technology, the teacher was the focal point of the classroom, creating (often time-consuming) interactive and multimedia presentations to add shock and awe to his or her lessons and capture the attention of the 21st century child. A new mindset of teaching through technology must emerge, which depends on a vital shift in teacher/student roles. This helps both student and teacher simultaneously. The four Cs are at the heart of the International Society for Technology in Education's National Educational Technology Standards (NETS) for Students, providing a substantial framework for defining the focus of technology objectives for K-12 students. For example, in implementing these standards we have found that even our youngest 21st century learners are capable of independently creating digital storybooks, artwork, presentations, and movies.

History

The term 'educational technology' was used during the post World War II era in the United States for the integration of implements such as film strips, slide projectors, language laboratories, audio tapes, and television. Presently, the computers, tablets, and mobile devices integrated into classroom settings for educational purposes are most often referred to as 'current' educational technologies. It is important to note that educational technologies continually change, and once referred to slate chalkboards used by students in early schoolhouses in the late nineteenth and early twentieth centuries. The phrase 'educational technology', a composite meaning of technology + education, is used to refer to the most advanced technologies that are available for both teaching and learning in a particular era. In 1994 federal legislation for both the Educate America Act and the Improving America's School's Act (IASA)

authorized funds for state and federal educational technology planning. One of the principal goals listed in the Educate America Act is to promote the research, consensus building, and systemic changes needed to ensure equitable educational opportunities and high levels of educational achievement for all students (Public Law 103-227). In 1996 the Telecommunications Act provided a systematic change necessary to ensure equitable educational opportunities of bringing new technology into the education sector. The Telecomm Act requires affordable access and service to advanced telecom services for public schools and libraries. Many of the computers, tablets, and mobile devices currently used in classrooms operate through Internet connectivity; particularly those that are application based such as tablets. Schools in high-cost areas and disadvantaged schools were to receive higher discounts in telecom services such as Internet, cable, satellite television, and the management component.

A chart of "Technology Penetration in U.S., Public Schools" report states 98% percent of schools reported having computers in the 1995-1996 school year, with 64% Internet access, and 38% working via networked systems. The ratio of students to computers in the United States in 1984 stood at 15 students per 1 computer, it now stands at an average all-time low of 10 students to computer. From the 1980s on into the 2000s, the most substantial issue to examine in educational technology was school access to technologies according to the 1997 Policy Information Report for Computers and Classrooms: The Status of Technology in U.S., Schools. These technologies included computers, multimedia computers, the Internet, networks, cable TV, and satellite technology amongst other technology-based resources.

More recently ubiquitous computing devices, such as computers and tablets, are being used as networked collaborative technologies in the classroom. Computers, tablets and mobile devices may be used in educational settings within groups, between people and for collaborative tasks. These devices provide teachers and students access to the World Wide Web in addition to a variety of software applications.

Technology Education Standards

National Educational Technology Standards (NETS) served as a roadmap since 1998 for improved teaching and learning by educators. As stated above, these standards are used by teachers, students, and administrators to measure competency and set higher goals to be skillful. The Partnership for 21st Century Skills is a national organization that advocates for 21st century readiness for every student. Their most recent Technology plan was released in 2010, "Transforming American Education: Learning Powered by Technology". This plan outlines a vision "to leverage the learning sciences and modern technology to create engaging, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures. In contrast to traditional classroom instruction, this requires that students be put at the center and encouraged to take control of their own learning by providing

flexibility on several dimensions." Although tools have changed dramatically since the beginnings of educational technology, this vision of using technology for empowered, self-directed learning has remained consistent.

Pedagogy

The integration of electronic devices into classrooms has been cited as a possible solution to bridge access for students, to close achievement gaps, that are subject to the digital divide, based on social class, economic inequality, or gender where and a potential user does not have enough cultural capital required to have access to information and communication technologies. Several motivations or arguments have been cited for integrating high-tech hardware and software into school, such as (1) making schools more efficient and productive than they currently are, (2) if this goal is achieved, teaching and learning will be transformed into an engaging and active process connected to real life, and (3) is to prepare the current generation of young people for the future workplace. The computer has access to graphics and other functions students can use to express their creativity. Technology integration does not always have to do with the computer. It can be the use of the overhead projector, student response clickers, *etc.* Enhancing how the student learns is very important in technology integration. Technology will always help students to learn and explore more.

Paradigms

Most research in technology integration has been criticized for being atheoretical and ad hoc, driven more by the affordances of the technology rather than the demands of pedagogy and subject matter. Armstrong (2012) argued that multimedia transmission turns to limit the learning into simple content, because it is difficult to deliver complicated content through multimedia.

One approach that attempts to address this concern is a framework aimed at describing the nature of teacher knowledge for successful technology integration. The technological pedagogical content knowledge or TPACK framework has recently received some positive attention.

Another model that has been used to analyze tech integration is the SAMR framework, developed by Ruben Puentedura. This model attempts to measure the level of tech integration with 4 the levels that go from Enhancement to Transformation: Substitution, Augmentation, Modification, Redefinition.

Constructivism

Constructivism is a crucial component of technology integration. It is a learning theory that describes the process of students constructing their own knowledge through collaboration and enquiry-based learning. According to this theory, students learn more deeply and retain information longer when they have a say in what and how they will learn. Enquiry-based learning, thus, is researching a question that is personally relevant and purposeful because of its direct correlation to the one investigating the knowledge. As stated by Jean

Piaget, constructivist learning is based on four stages of cognitive development. In these stages, children must take an active role in their own learning and produce meaningful works in order to develop a clear understanding. These works are a reflection of the knowledge that has been achieved through active self-guided learning. Students are active leaders in their learning and the learning is student-led rather than teacher–directed.

Many teachers use a constructivist approach in their classrooms assuming one or more of the following roles: facilitator, collaborator, curriculum developer, team member, community builder, educational leader, or information producer.

Counter Argument to Computers in the Classroom

Is technology in the classroom needed, or does it hinder students' social development? We've all seen a table of teenagers on their phones, all texting, not really socializing or talking to each other.

How do they develop social and communication skills? Neil Postman (1993) concludes:

- The role of the school is to help students learn how to ignore and discard information so that they can achieve a sense of coherence in their lives; to help students cultivate a sense of social responsibility; to help students think critically, historically, and humanely; to help students understand the ways in which technology shapes their consciousness; to help students learn that their own needs sometimes are subordinate to the needs of the group. I could go on for another three pages in this vein without any reference to how machinery can give students access to information. Instead, let me summarize in two ways what I mean. First, I'll cite a remark made repeatedly by my friend Alan Kay, who is sometimes called "the father of the personal computer." Alan likes to remind us that any problems the schools cannot solve without machines, they cannot solve with them. Second, and with this I shall come to a close: If a nuclear holocaust should occur some place in the world, it will not happen because of insufficient information; if children are starving in Somalia, it's not because of insufficient information; if crime terrorizes our cities, marriages are breaking up, mental disorders are increasing, and children are being abused, none of this happens because of a lack of information. These things happen because we lack something else. It is the "something else" that is now the business of schools.

Tools

Various tools have or are being used in technology integration. Some examples of such tools are:

Interactive Whiteboards

Interactive whiteboards are used in many schools as replacements for standard whiteboards and provide a way to allow students to interact with material on

the computer. In addition, some interactive whiteboards software allow teachers to record their instruction and post the material for review by students at a later time.

- 3D virtual environments are also used with interactive whiteboards as a way for students to interact with 3D virtual learning objects employing kinetics and haptic touch the classroom. An example of the use of this technique is the open-source project Edusim.
- Research has been carried out to track the worldwide Interactive Whiteboard market by Decision Tree Consulting (DTC), a worldwide research company. According to the results, interactive Whiteboards continue to be the biggest technology revolution in classrooms, across the world there are over 1.2 million boards installed, over 5 million classrooms are forecast to have Interactive Whiteboards installed by 2011, Americas are the biggest region closely followed by EMEA, and Mexico's Enciclomedia project to equip 145,000 classrooms is worth $1.8 billion and is the largest education technology project in the world.
- Interactive whiteboards can accommodate different learning styles, such as visual, tactile, and audio.

Interactive Whiteboards are another way that technology is expanding in schools. By assisting the teacher to helping students more kinestically as well as finding different ways to process there information throughout the entire classroom.

Student Response Systems

Student response systems consist of handheld remote control units, or response pads, which are operated by individual students. An infrared or radio frequency receiver attached to the teacher's computer collects the data submitted by students. The CPS (Classroom Performance System), once set, allows the teacher to pose a question to students in several formats. Students then use the response pad to send their answer to the infrared sensor. Data collected from these systems is available to the teacher in real time and can be presented to the students in a graph form on an LCD projector. The teacher can also access a variety of reports to collect and analyze student data. These systems have been used in higher education science courses since the 1970s and have become popular in K-12 classrooms beginning in the early 21st century.

Audience response systems (ARS) can help teachers analyze, and act upon student feedback more efficiently. For example, with polleverywhere.com, students text in answers via mobile devices to warm-up or quiz questions. The class can quickly view collective responses to the multiple-choice questions electronically, allowing the teacher to differentiate instruction and learn where students need help most. Research supports that technology has the potential to improve quantitative assessment performance in core subjects, as well as overall GPA. However, there is also mounting evidence that technology not only has a quantitative advantage over traditional methods, but also leads to qualitative

improvements; resulting in higher-quality student work. The Harvest Park Middle school found that "students who use computers when learning to write are not only more engaged and motivated in their writing, but also produce work that is of greater length and higher quality, especially at the secondary level" (Gulek, 2005, pg. 29).

Combining ARS with peer learning via collaborative discussions has also been proven to be particularly effective. When students answer an in-class conceptual question individually, then discuss it with their neighbours, and then vote again on the same or a conceptually similar question, the percentage of correct student responses usually increases, even in groups where no student had given the correct answer previously.

Among other tools that have been noted as being effective as a way of technology integration are podcasts, digital cameras, smart phones, tablets, digital media, and blogs.

Mobile Learning

Mobile learning is defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices". A mobile device is essentially any device that is portable and has internet access and includes tablets, smart phones, cell phones, e-book readers, and MP3 players. As mobile devices become increasingly common personal devices of K-12 students, some educators seek to utilize downloadable applications and interactive games to help facilitate learning. This practice can be controversial because many parents and educators are concerned that students would be off-task because teachers cannot monitor their activity. This is currently being troubleshooted by forms of mobile learning that require a log-in, acting as a way to track engagement of students.

Benefits

According to findings from four meta analyses, blending technology with face-to-face teacher time generally produces better outcomes than face-to-face or online learning alone. Research is currently limited on the specific features of technology integration that improve learning. Meanwhile, the marketplace of learning technologies continues to grow and vary widely in content, quality, implementation, and context of use.

Research shows that adding technology to K-12 environments, alone, does not necessarily improve learning. What matters most to implementing mobile learning is how students and teachers use technology to develop knowledge and skills and that requires training. Successful technology integration for learning goes hand in hand with changes in teacher training, curricula, and assessment practices. Many research studies have found that most students prefer learning with technology, which in turn leads to a better attitude towards learning as well as giving them more At risk students are not the only ones that respond positively to the use of technology in confidence. In the cognitive tutor study,

students were found to be more likely to say that mathematics is useful outside the academic context and to feel more confident in mathematics than students in traditional classes (Morgan, 2002). Students in the Freedom to Benefits of Technology in Education 6 Learn study were found to believe that education "made it easier to do school work, made them more interested in learning, and would help them get better jobs in the future" (Lowther, 2007). The students with special needs in the Fast Forward study, similarly, felt that they did better on computer based tests and nearly all recommended the programme for other students (Dolan, 2005).

An example of teacher professional development is profiled in Edutopia's Schools That Work series on eMints, a programme that offers teachers 200 hours of coaching and training in technology integration over a two-year span. In these workshops teachers are trained in practices such as using interactive whiteboards and the latest web tools to facilitate active learning. In a 2010 publication of Learning Point Associates, statistics showed that students of teachers who had participated in eMints had significantly higher standardized test scores than those attained by their peers.

It can keep students focused for longer periods of time. The use of computers to look up information/data is a tremendous time saver, especially when used to access a comprehensive resource like the Internet to conduct research. This time-saving aspect can keep students focused on a project much longer than they would with books and paper resources, and it helps them develop better learning through exploration and research. It is a part of the modern world, and is becoming more and more ubiquitous in our lives every year. It is also a proven method for improving learning. There is strong evidence pointing towards technology leading to better results on standardized tests; however the real emphasis should not be on how it improves test scores, but on how it benefits student learning; how it enables those who are not able to perform at their peak in traditional classrooms to do better; how it motivates students to learn and gives them a more positive attitude towards education; how it can individualize learning by giving feedback; how it can act as a catalyst for change towards more student centered learning; and how it better prepares the youth of today with technical, communicative, interpersonal and creative skills. The question we should be asking is not whether or not technology should be in education, but what can we do to remove barriers so as to further the integration of technology into our schools. Hence, one area in which more research must be done is on how to best move towards more student centered learning with technology and how to best overcome barriers to doing so. Another suggested area for research is on how to provide students with special needs and students who are at-risk with more access to technology since they in particular benefit from using technology.

Project-based Activities

It is the method of teaching were the students gain knowledge and skills by involving themselves for the more period of time to research and respond to the

engaging and complex questions, problems, or challenges. the students will work in groups to solve the problems which are challenging. The students will work in groups to solve the problems which are challenging, real, curriculum based and frequently relating to more than one branch of knowledge. Therefore, a well designed project based learning activity is one which addresses different student learning styles and which does not assume that all students can demonstrate their knowledge in a single standard way.

Elements

The project based learning activities involves four basic elements.

1. An extended time frame.
2. Collaboration.
3. Enquiry, investigation and research.
4. The construction of an artifact or performance of a consequential task.

Examples of Activities

CyberHunt

The term "hunt" refers to finding or searching for something. "CyberHunt" means an online activity which learners use the internet as tool to find answers to the question's based upon the topics which are assigned by someone else. Hence learners also can design the CyberHunt on some specific topics. a CyberHunt, or internet scavenger hunt, is a project-based activity which helps students gain experience in exploring and browsing the internet. A CyberHunt may ask students to interact with the site (*i.e.,*: play a game or watch a video), record short answers to teacher questions, as well as read and write about a topic in depth.

There are basically two types of CyberHunt:

- A simple task, in which the teacher develops a series of questions and gives the students a hypertext link to the URL that will give them the answer.
- A more complex task, intended for increasing and improving student internet search skills. Teachers ask questions for students to answer using a search engine.

WebQuests

It is an enquiry oriented activity in which most or all of the information used by the learners which are drawn out by the internet/web. It is designed to use learner 'time well', to focus on using information rather than on looking for it and to support the learners to think at the level of analysis, synthesis, and evaluation. It is the wonderful way of capturing student's imagination and allowing them to explore in a guided, meaningful manner. It allow the students to explore issues and find their own answers.

There are six building blocks of webQuests:

1. The introduction – capturing the student's interest.
2. The task-describing the activities end product.
3. The resources-web sites, students will use to complete the task.
4. The evaluation-measuring the result of the activity.
5. The conclusion-summing up of the activity.

WebQuests are student-centered, web-based curricular units that are interactive and use Internet resources. The purpose of a webQuest is to use information on the web to support the instruction taught in the classroom. A webQuest consists of an introduction, a task (or final project that students complete at the end of the webQuest), processes (or instructional activities), web-based resources, evaluation of learning, reflection about learning, and a conclusion.

WISE

The Web-based Enquiry Science Environment (WISE) provides a platform for creating enquiry science projects for middle school and high school students using evidence and resources from the Web. Funded by the U.S., National Science Foundation, WISE has been developed at the University of California, Berkeley from 1996 until the present. WISE enquiry projects include diverse elements such as online discussions, data collection, drawing, argument creation, resource sharing, concept mapping and other built-in tools, as well as links to relevant web resources. It is the research-focused, open-source enquiry-based learning management system that includes the student- learning environment project authoring environment, grading tool, and tool and user/course/content management tools.

Virtual Field Trip

A virtual field trip is a web site that allows the students to experience places, ideas, or objects beyond the constraints of the classroom. A virtual field trip is a great way to allow the students to explore and experience new information. This format is especially helpful and beneficial in allowing schools to keep the cost down. Virtual field trips may also be more practical for children in the younger grades, due to the fact that there is not a demand for chaperones and supervision.

Although, a virtual field trip does not allow the children to have the hands on experiences and the social interactions that can and do take place on an actual field trip.

An educator should incorporate the use of hands on material to further their understanding of the material that is presented and experienced in a virtual field trip. It is a guided exploration through the www that organizes a collection of pre- screened, its thematically based web pages into a structure online learning experience

ePortfolio

An ePortfolio is a collection of student work that exhibits the student's achievements in one or more areas over time. Components in a typical student ePortfolio might contain creative writings, paintings, photography, math explorations, music, and videos. And it is a collection of work developed across varied contexts over time. The portfolio can advance learning by providing students and/or faculty with a way to organize, archive and display pieces of work.

PROGRAMMED LEARNING STAGES

The term educational technology has a wide range of application at present. The examples of educational technology include both hardware and software learning sequences. In the hardware, we find the teaching machines, the computer-assisted instruction, the learner- controlled instruction and the CCTV. The examples of software instructional sequences are programmed learning material either in the book form or in a teaching machine form and various types of self- instructional materials.

Programmed learning is the most appropriate example of the latest concept of instructional technology. It is educational innovation and auto-instructional device. It is not only a technique for effective learning but also a successful mechanism of feedback device for the modification of teacher-behaviour.

Programmed learning has arrived on the educational scene mainly due to the laboratory experiments of Prof B.F Skinner. Prior to Skinner the concept of "Conditioning" as presented by pavlov and Watson and the 'Law of effect' as formulated by Thorndike are the main historical links in the developing chain of important events.

The procedure for shaping behaviour as developed by Skinner was called 'operant conditioning' and this finally becomes the basis for programmed learning technology. Now it has become an established form of technology of teaching.

According to Prof. Gagne, programmed Learning consists of making teaching models which take into account the initial and terminal response of the student, are graded in accordance with a detailed schedule and permit intermediate assessment of the strategies employed.

There are three key words in this definition:

- The accounting of the initial and terminal response of the learner.
- Gradation of the teaching models.
- Evaluation of the instructional strategies used for shaping of terminal behaviour.

Thus, it may be seen that programmed learning has the following three important ingredients.

1. The terminal behaviour is presented step by step using the principle of successive approximation.
2. At every step the learner has to make a response.
3. The response of the learner is reinforced by the knowledge of result.

From the above discussion, it may be noted that, programmed learning is a practice of breaking down a body of subject matter into its constituent elements and requiring the pupil to master one step before proceeding to the next It allows for more pupil involvement in the learning process.

Since it is a self-institutional device, it is mostly individualised. In this technique learning is more rapid as well as interesting. It is directed towards specific objectives.

Basic Concepts of Programmed -Learning:

- Programmed learning is based on certain basic concepts which have been derived from experimental work of Operant Conditioning.
- Stimuli and Responses: A stimulus is that aspect of an environment which guides or controls the behaviour of an individual. It is any condition, event, or change in environment of an individual which produces a changing behaviour. For example, a question is asked by a teacher, is a very familiar stimulus in the class-room teaching. A response is a part of, or a change in a part of behaviour. The example of a response is the' answer' given by students when faced with a question.
- The Transfer of Stimulus Control: When the learner's responses from the stimuli of initial behaviour, get transferred to the appropriate stimuli, this is called transfer of stimulus control.
- Prompting: A prompt is a supplementary stimulus added to the another stimulus for facilitating an errorless response.
- Gradual Progression: It means step presentation of material in a logical sequence.
- Reinforcement: Generalisation means responding to similar elements in different leaning situations. Discrimination is differentiating between two or more stimuli and making an appropriate response.
- Extinction: Extinction means weakening of a response. When a response occurs and remains unreinforced, the response does not become firmly connected to the stimuli present
- Concept Formation: It is a process of generalization within certain specific limits and discrimination of one stimulus from another within that limit
- Successive Approximation: It means approaching the terminal behaviour in a step by step sequence by a cumulative effort on the part of the learner.
- A frame or a Didule: It is a unit of subject matter which the learner handles at one time. It has three parts: stimulus (stimule), response (respule) and feed-back (corrule).
- Operant Span: It is the number of responses that a student can handle in one frame or didule.
- Terminal behaviour: The behaviour that the student is expected to have acquired at the end of a programme sequence is called terminal behaviour.

Principles of Programme- Learning

The principles of programming imply the rules and systems by which a programme is constructed.

The following principles are considered to be the basic ones for programmed learning:

- *Objective specification:* Which means identifying the terminal behaviours that the learner will be able to perform when he has completed the programme.
- *Small Step Size:* Which involves dividing the information to be communicated into small units.
- *Overt Responding:* It means that pupils must act on each unit of information by means of exercises provided to assimilate it.
- *Success or Minimal Error:* This means that error and failure must be avoided at all costs because they are construed as obstacles to learning.
- *Immediate feedback:* In order to ensure success and satisfaction, the pupil must know that his action is correct.
- *Logical, graded progress:* It implies two things-relevance of content and its graded presentation.
- *Self Pacing:* It is used for programme development and validation.

Types of Programmed – Learning

Various forms of programmed learning modules have been reported. This includes software which is mainly represented by linear, branching and mathetics. The other form is hardware which is represented by Learner Controlled Instruction (LCI) Computer Assisted Instruction (CAI) and teaching machines.

Linear programme is one in which every learner follows the identical sequence, that is, the frames or didules are encountered in a single, pre-arranged order. The proponent of this type of programme style is B.E Skinner (1958).

Branching programme is one where the particular response emitted on a frame or didule determines the alternative frame/frames, the learner proceeds to next. The proponent of this programme type is Norman Crowder (1960)

Mathetics is one in which there is the systematic application of reinforcement theory to the analysis and construction of complex repertoires. This also represents mastery of subject matter.

In it, the behaviour is generally classified as in involving discrimination, generalisation, and chaining. This style is considered to be an extension of the linear model of programming. The exponent of this style is Thomas E Gilbert (1962).

Computer-assisted Instruction is one where use of the Computer as a highly adaptive teaching machine weakens the distinction between software and hardware. This type of instructional module was developed by Stolurow and Davis (1965).

Steps in Programming

- *Topic Selection:* The programmes should select the most familiar topic; otherwise he has to take the help of a subject expert.
- *Content Outline:* After topic selection, its outline may be prepared which cover all the materials, one plans, to teach. For this programme one has to refer to examine relevant books and materials.
- *Instructional Objectives:* Instructional Objectives must be formulated which involve both task description and task analysis. The former is the description of terminal behaviours which the learner is expected to achieve and the latter is the series of component behaviours that he is required to acquire in the process of achieving terminal behaviour.
- *Entry Skill:* The learner should have some prereqisite ability and skill to understand properly the new programme. This background experience is called the entry skill and a suitable programme cannot ne prepared without proper assessment of the entry skill.
- *Presentation of the Material:* Suitable format is to be decided for presenting the material from the educational point of view. Then the programmed material should be presented in a sequence of frames arranged as steps towards terminal behaviour.
- *Student Participation:* On analysis of the terminal behaviour one will find the critical responses of the students.
- *Terminal Behaviour Test:* The effect of programme can be ascertained by administering the terminal behaviour test. It is also known as performance assessment. This provides feedback to the programme and shows the effectiveness of the instructional materials.
- *Revision:* Lastly the programme may be revised on the basis of feedback. The instructional materials may be edited and modified according to the needs and requirements of the target audience.

Programmed Learning is a self-instructional device. A rapid learner can cover the material quickly and slow learner may proceed on his own pace. It helps the learner to teach himself at any place and pace according to his convenience. The analytical thinking and self-direction of learners are also promoted through the use of programmed learning materials.

MEDIA APPLICATION STAGE AND COMPUTER APPLICATION STAGE

The issue of computer technology integration in teacher education has reached the national level, resulting in standards for schools, colleges, and departments of education (SCDEs) that address the integration of computer technology as a tool to enhance student learning. As a result, to meet these standards faculty members at SCDEs are faced with the challenge of developing computer technology use and integration skills in preservice teachers. This study explored the practice of integrating computer technology into the curriculum of three

teacher preparation programmes. By studying the process of computer technology infusion, this research study focused on defining the developmental stages SCDEs experienced. As a result, a Five-Stage Model of computer technology integration was produced.

Theoretical Framework

Technological changes in the past quarter of a century have challenged professional educators to reevaluate their instructional skills and to reconstruct their delivery as they assist students in integrating new technology tools. This resulting phenomenon is described by change theorist Everett M. Rogers as the diffusion of an innovation and served as the theoretical framework for this study.

Rogers (1995) defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). An innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 11). Rogers' rate of adoption model, most applicable to this study, states that innovations are diffused over time in a pattern that resembles an S-shaped curve. An innovation goes through a period of slow, gradual growth before experiencing a period of relatively dramatic growth. Following this the innovation's rate of adoption gradually stabilizes and eventually declines. The rate of adoption is the culmination of the decision-making processes of users regarding their implementation of the innovation. Rogers established that individuals could be divided into innovation adopter types: innovators, early adopters, early majority, late majority, and laggards. He then specified that the early adopters are the key players in bringing the innovation to the point of being self-sustaining.

Gladhart (2001) developed a Levels of Adoption model by adapting the Apple Classrooms of Tomorrow (ACOT) study by Dwyer, Ringstaff, and Sandholtz (1992). Gladhart's model addressed the issues of teacher behaviour, student behaviour, and technology tools regarding computer integration. The teacher behaviour part of the model lists the following five levels of computer technology integration: entry, adoption, adaptation, appropriation, and invention.

Russell (1996) identified six stages that learners move through as they learn to use technology: awareness, learning the process, understanding the application of the process, familiarity and confidence, adaptation to other contexts, and creative applications to new contexts. Russell's action research specifically addressed the use of e-mail by over 400 teachers in postgraduate study. The students e-mailed metacognitive reflections regarding their experiences, resulting in the emergence of six categories "learners typically go through as they learn to use technology" (The Study section, ¶4).

The models of Rogers, Gladhart, and Russell show several similarities. Stage 1 for all three models involves the initial step of becoming aware of and acquainted with the innovation. All three authors alluded to the individualism of this stage; that is, the potential adopters' feelings, lack of communication with others about the innovation, and an overall attitude of observation rather than activity.

Stage 2 varies considerably among the three authors. Rogers' Stage 2 involves the forming of a positive or negative attitude about the innovation. Russell emphasized the use of the innovation and the development of new skills. In Stage 2, Gladhart saw users applying their new technology skills to their teaching.

In Stage 3, Gladhart and Russell stressed that the increase in skill levels allows the adopter to apply the use of this new technology to their teaching. In addition, with confidence in their skills, adopters are able to provide creative integration activities for their students. To Rogers this stage shows evidence of an individual involved in activities leading to the decision to adopt or reject the innovation.

For Rogers, Stage 4 was the action phase of the adoption of an innovation. Here the individual makes the decision to adopt or reject the innovation. Russell observed an increased adopter confidence in technology use and troubleshooting. Gladhart saw teachers shifting their instructional methods to use of technology to provide a learner-centered approach.

Stage 5 is the final stage for Rogers and Gladhart. Rogers simply stated that it is in this stage that the individual uses the innovation. Rogers added that users seek reinforcement for their decision. Gladhart noted that adopters change their instructional methods to include technology as an active, creative, and socially interactive approach. In Stage 5, Russell described the use of technology as applying to multiple circumstances relating to curriculum. She identified the transference of knowledge and experience as occurring at this stage.

Only Russell included a sixth stage in her model: this creative application of the technology and innovation beyond what has been done before.

These three models all dealt with individual adoption of an innovation and served as the context from which this study was developed. This researcher relied on the individual adoption foundation to assess a systemic level application of the adoption of an innovation; that is, the integration of computer technology into the teacher education curriculum.

Research Methods

This research used a descriptive case study design (Yin, 1989) to examine the three teacher education programmes. By using the case study method, this researcher was able to "retain the holistic and meaningful characteristics of real-life events [including] organizational and managerial processes" (Yin, 1989, p. 14).

The participating programmes were chosen based on their use of the computer technology infusion model, rather than the stand-alone course model. The infusion model refers to the inclusion and utilization of computer technology by faculty members and students throughout the teacher education coursework. In the stand-alone course model one required course provides instruction for preservice teachers on computer technology literacy and integration skills. The three teacher education programmes were determined to be at different levels of the infusion process by an analysis of their documentation and the results of

the School Technology and Readiness (STaR) Chart (CEO Forum, nd). The participating programmes are from private institutions in northern and southern California, with enrollments ranging from 1,250 to 7,000 students. The two schools with enrollments of 7,000 are located in urban settings; the third, with an enrollment of 1,250, is in rural northern California. All three institutions are accredited by the Western Association of Schools and Colleges.

A well-rounded description was developed by triangulating data sources from the three programmes. Evidence was gathered from existing documents, survey instruments, key informant interviews, and focus group interviews to answer the research question: What are the processes that occur as departments of education move towards the infusion of computer technology into the teacher education curriculum?

Existing Documents

In an attempt to bring teacher credentialing requirements into compliance with national trends and standards, several California State Assembly and Senate bills addressed the issue. Standard 20.5 – Use of Computer-Based Technology in the Classroom, adopted in 1998, required that "candidates are able to use appropriate computer-based technology to facilitate the teaching and learning process" (Swofford, 2000). To meet Credential Standard 20.5, each university teacher education department submitted an implementation plan to the California Commission on Teacher Credentialing (CCTC). The CCTC evaluated, accepted or rejected, and oversaw each university's plan. For this study, the Standard 20.5 proposals were secured from 11 teacher education programmes. Three programmes met the study design criteria and were accommodating to participation in the research.

Survey Instruments

Four survey instruments were used in this research: The STaR Chart, a faculty demographic survey, the Stages of Adoption survey (Stages), and the Levels of Use (LoU) survey.

The STaR Chart (CEO Forum, nd) is a self-assessment tool which assists SCDEs in determining the level of technology integration in the teacher education programme. The Chart provides a matrix defined by three levels of technology integration and eight categories involving administration, faculty, students, and alumni. The tool can be used to assess an institution's current technology integration status and assist in planning for the future. The STaR Chart was used to determine the level of computer technology integration of each participating teacher education programme and was completed by the key informants on the CEO Forum Web site. Key informants e-mailed the results to the researcher. The STaR Chart findings classified one programme in each of the following stages: Early Technology Level, Developing Technology Level, and Advanced Technology Level. The demographic questionnaire collected information from the teacher education faculty members in each programme.

Personal information such as age, gender, education level, and position status were compiled. The following items regarding computer technology use were collected: computer access; computer, software, and e-mail use; training; and Web site authoring. The mean scores of each of the items were used in the triangulation procedure to provide a thorough understanding of the characteristics of the teacher education faculty.

The Stages survey (adapted from Christensen, 1997) is a self-assessment measure that describes the adoption behaviours of an innovation user on one of eight progressive levels. Users select a single level that best describes their position along the continuum of adopting computer use. The Stages survey was used in this study to indicate the stage of computer technology use of the teacher education faculty members in each programme. A mean score of the technology use levels of the faculty at each site was determined.

The LoU survey (adapted from Griffin and Christensen, 1999) is a self-assessment measure that describes the computer technology use behaviours on one of seven progressive levels. Respondents select a single level that best describes their levels of computer technology use. The LoU was used to indicate the computer technology use of the teacher education faculty in each programme. A mean score of the technology use levels of the faculty at each site was determined.

The teacher education faculty members from the participating institutions were contacted through the key informants and asked to complete the demographic questionnaire, the Stages survey, and the LoU survey. Information was gathered from faculty members who integrated and who did not integrate computer technology into their teaching. Faculty members were given the choice of completing the surveys online or by hard copy.

Key Informant Interviews

After initial telephone contact with the institutions, the key informants (those individuals with the most information about computer technology integration in their university teacher education programmes) were identified. Key informants at each institution participated in an in-depth interview.

Focus Group Interviews

The focus groups at each site were comprised of at least two teacher education faculty members, one department of education administrator, one support staff individual, and one teacher education student. Key informants at each site assisted in identifying focus group members.

Data Analysis

Documents

Implementation Plans for the California Credential Standard 20.5 were assessed to determine the method for developing computer technology skills in preservice teachers. Those universities indicating in their plan the use of the

infusion model were considered for the study. From these institutions, one Early Technology site, one Developing Technology site, and one Advanced Technology site were identified. The 20.5 Plan from the Early Technology programme indicated they were using a stand-alone model. However, the Department Chair indicated they were in the process of adopting the infusion model.

Surveys

The 19-item STaR Chart report, completed by the key informant at each site, identified the stage of technology integration of each participating teacher education programme. As stated previously, one of the participating programmes was found to be in each of the categories, Early, Developing, and Advanced Technology.

The demographic questionnaire and each of the three surveys completed by the faculty participants were scored, compiled, and analyzed individually and corporately. Thirty teacher education faculty members completed the survey process, with a 100% response rate. Demographic information was used in the triangulation procedure to provide a thorough understanding of the characteristics of the teacher education faculty at the three sites.

The LoU and Stages self-report, single-item surveys do not require statistical interpretation. Mean scores on each survey for each participant and mean scores for each site were determined.

Interviews

Key Informant

In-person interviews with the key informant at each site were recorded and the text transcribed verbatim. Each informant was asked a standard set of open-ended questions. A qualitative assessment procedure was applied to the key informants' answers. The text was read and an interpretive statement was written that captured the essence of the key informant's quote. Those interpretive statements were sorted into categories. In each of the categories, themes were identified and then paired with corresponding quotations from the key informant.

Focus Group

A focus group, consisting of four to six teacher education stakeholders, was interviewed to explain further stages and processes of infusing computer technology into the teacher education curriculum. The focus group participants were asked a standard set of open-ended questions. The focus group interviews were recorded and the text transcribed verbatim. The text was analyzed with the same approach used with the key informant interviews.

The existing documents, survey instruments, key informant interviews, and focus group interviews provided this researcher with a wide range of data from which to address the research question.

Results and Discussion

As a result of the data analysis, defining characteristics for each programme were identified. These revolved around themes of leadership, support, resources, and faculty and student computer technology use and integration. A five-stage developmental model of computer technology integration emerged. The stages are as follows:

- *Stage 1: Pre-integration*
- *Stage 2: Transition*
- *Stage 3: Development*
- *Stage 4: Expansion*
- *Stage 5: Systemwide Integration*

Each stage in the model consists of distinctive characteristics, tasks, and actions that occur as SCDEs move towards the system-wide integration of computer technology into the teacher education curriculum.

Stage 1, Pre-Integration, is marked by a need for university leadership at all levels to support integration, both monetarily and organizationally. At this level, faculty members show limited professional and personal computer technology use. In addition, standalone classes are the only means used to meet credentialing requirements. Last, no infrastructure has been developed to provide funding, support, and resources.

In the second stage, Transition, major changes regarding administrative support at the university, school, and/or departmental levels occur. There is an increased interest and vision for the use and integration of computer technology on the part of teacher educators. Increased use and integration of computer technology is happening in this stage due to the requirements of external standards at state and national levels. Administrators are using the requirement to meet the standards to assist in the procurement of funding and additional technical support.

In the third stage, Development, SCDEs begin to complete the tasks that enable them to integrate computer technology throughout the curriculum. They acquire technical resources such as computers for faculty and computer labs, and they hire education technology faculty and specialists to assist faculty members in beginning the infusion process. In addition, the planning and implementation of faculty development programmes for integration training emerge in this stage.

Expansion, the fourth stage, is marked by further movement towards providing the needed technology hardware, educational software, and faculty training leading to proficiency in computer technology integration. The development and deepening of the relationships between the support personnel and the faculty can also be seen in this stage. The quality of these relationships can positively impact faculty levels of use and integration. This occurs with the creation of an environment in which faculty members dare to risk experimentation with new technologies and methodologies. At the Developing and Advanced Technology Levels, the existing supportive relationships were striking. Strong ties had been

established between the support personnel and the faculty, enabling the faculty members to attain higher skill levels and a better understanding of the place of computer technology in their teaching. Faculty members reported the importance of this one-on-one availability of a personal resource to assist them in their use and integration of computer technology. This need for individualized support for faculty was mentioned at the Early Technology Level, although it had not been made available for the entire faculty.

In Stage 5, Systemwide Integration, evidences of the integration of the state and International Society for Technology in Education (ISTE) standards proficiencies for students are evident, and computer technology is imbedded into every teacher education course.

A systematic approach to faculty development through supportive relationship-based mentoring comes to fruition in this stage, as both faculty members and students are enthusiastically involved in the infusion process.

It was found that the Early Technology site was working through Stage 3 – Development; the Developing Technology site was in the beginning of Stage 5 – Systemwide Integration; and the Advanced Technology site set the benchmarks for Stage 5.

Conclusions

Pressures from both the society at large and the standards movement are increasing the need for SCDEs to ensure that the teachers they are training are capable of integrating computer technology into the K-12 curriculum. This Five-Stage Model provides a template for teacher education programmes seeking to meet that goal.

The use of this model with the most potential for impact is for SCDEs to identify their current stage position and then to develop a plan to move through the remaining stages. This type of application of the model can result in a reduction of time, the maximization of resources, and the creation of effective faculty development programmes.

It is important to note that each of the participating programmes in this study varied in their movement through the stages, leading to the conclusion that the stages are not necessarily linear nor are they interdependent. While many of the tasks are completed in succession, there are factors that influence programme movement through the stages; for example, the provision of substantial funding will assist programmes in bypassing lower level tasks that are funding dependent.

To meet the integration goal, teacher education faculty members are called upon to explore, evaluate, and create teaching strategies that enable preservice teachers to use technology in K-12 classrooms. As shown through this model, success is dependent upon supportive leaders who provide assistance in funding, access to adequate facilities, and systematic faculty development. In addition, many students are entering their teacher education programmes with increased levels of computer use and with the expectation of the use and integration of computer technology by their instructors. When combined with strong

administrative support, this top-down/bottom-up phenomenon can be the most effective method in the push towards systemwide integration. As students are asking for more computer technology integration and administrators are providing access and training, teacher education faculty members must seize every opportunity to ready their preservice teachers for computer technology integration into their future classrooms.

Obviously, the choice not to use computer technology in classrooms is no longer an option. Instead, the issue is how to best prepare future teacher educators to meet the demands of teaching and learning in a technology rich world. SCDEs must employ the most effective method for assisting future generations in meeting these demands. The Five-Stage Model provides SCDEs with a detailed description of how to move to the system-wide integration of computer technology into the teacher education curriculum. As shown by the Advanced Technology programme, this goal can be accomplished with sound leadership, a dedicated faculty, and a definitive plan.

EDUCATORS' PERCEPTIONS OF TECHNOLOGY INTEGRATION

Brown's questionnaire research explored technology educators' perceptions about the use of the learning theory-based concepts such as schemata and metacognition. The participants ranked orders of importance from most important to least important:

- *Visualization:* Graphic organizers could be of particular interest to technology educators
- *Situated Cognition:* Transfer of learning to usefulness outside the class is a goal of technology education
- *Cognitive Modeling:* Involves conscious verbalization by the instructor of those internal cognitive strategies used by experts when solving problems and analyzing connections to existing knowledge
- *Reflection and Debriefing:* Process of looking back over the experience and performance to assess
- *Concept Mapping:* Graphically simplifying the display of concepts and the relationships between those concepts as a means of communicating, and analyzing relationships of a system of knowledge
- *Cognitive Apprenticeship:* A metaphor for the modifying of classroom instructional techniques to incorporate aspects of traditional apprenticeship training approaches
- *Metacognition:* Includes monitoring, questioning, predicting, generating, and evaluating alternatives
- *Scaffolding:* The management of intensity of instructional guidance provided by the instructor
- *Schema Theory:* Schemata of connected facts that help the individual perform efficiently

Teacher education programmes must prepare teachers capable of integrating technology in meaningful ways; the need for teachers capable of integrating

technology in ways that foster student learning has been heralded by the Federal government, national professional organizations, and teacher education accreditation agencies for over a decade.

INSTRUCTIONAL DESIGNS AND LEARNING THEORIES

Moallem describes the process of designing a Web-based course, *Instructional Design and Classroom Evaluation*, for an undergraduate teacher education programme. This course expects prospective teachers to acquire knowledge and skills related to designing a course, a unit of instruction, and a lesson. A Web-based course management tool for instructors (course database, forum database, library database, and test database) was used to develop the course. According to Moallem, in addition to developing the course Web page (consisting of syllabus, course calendar, assignments, and readings), the course database tools are utilized to present students with the Web page. The Web page describes the overall project that students are expected to design and develop at the conclusion of the course, and a concept map of how the project is related to the course units and lessons, or the knowledge domains.

Web-based instruction will have a major impact on classroom design over the next decade. College students already have constant online access to course syllabi, lecture notes, and other materials; digital course content is becoming richer, deeper, and more interactive; and an increasing number of studies indicate no significant difference in the amount of factual information learned when comparing traditional lectures with electronic information delivery. Graetz and Goliber emphasize that IT is opening the following three "new frontiers" for collaborative learning by pushing traditional lectures out of college classrooms:

- The pace of technology adoption can be expected to quicken as universities invest in collaboration technology and as instructors gain more expertise in facilitating online collaboration;
- A scientific understanding of the human-centered design of online collaborative workspaces is only beginning to emerge; and
- Instructors need to upload information developed during class to online, collaborative applications— the integration of virtual and face-to-face collaborative environments.

Although the roots of traditional, instructional design models can be found in behaviourism, human performance has to be treated at a higher level of abstraction, with a focus on the application of complex sets of knowledge and skills rather than the acquisition of knowledge and skills in isolation. Based on the fact that cognitive approach to instructional design has begun to be adopted more widely recently in terms of learning, cognition, and knowledge, Silber emphasizes two types of knowledge. One is *declarative* knowledge, which is divided into facts (a simple association among a set of verbal and visual propositions), concepts (a category of objects, actions, or abstract ideas), and principles and mental models (a cause-effect relationship). The other is

procedural knowledge, which is the ability to string together a series of mental and physical actions to achieve a goal, usually to solve problems. Therefore, cognition has been defined as "coming to know".

Merrill (2002) states that the most effective learning products or environments are those that are problem-centered and involve the student in four distinct phases of learning: *activation* of prior experience, *demonstration* of skills, *application* of skills, and *integration* of these skills into real-world activities. In the problem-centered instruction, learning is promoted:

- When learners are engaged in solving real-world problems,
- When existing knowledge is activated as a foundation for new knowledge,
- When new knowledge is demonstrated to the learner,
- When the learner applies new knowledge, and
- When new knowledge is integrated into the learner's world.

THEORIES OF EDUCATIONAL LEARNING

Learning is based on philosophical and psychological ideas and principles about human nature which have given rise to various learning theories. The prominent learning theories we intend to discuss in this unit are behaviourism, cognitivism and the possible synthesis of the two.

BEHAVIOURIST VIEWS OF LEARNING

Behaviourism is one of the most dominant among the modern theories of learning. The behaviourist school is very comprehensive and it includes a variety of thoughts. However, all these thoughts suggest a common approach to learning in terms of the development of connections in the organism between stimuli(S) and response(R). Based on laboratory experiments with animals, behaviourists concluded that learning is a process by which stimulus and response bonds are established when a successful response immediately and frequently follows a stimulus. They assumed that people are similar to machines, and considered any reference to the rule of mind irrelevant. Behaviourism holds that the subject matter of human psychology is the behaviour or activities of human beings. The behaviourists have put forward three main laws of learning: Law of Effect, Law of Readiness and Law of Exercise. The Law of Effect stresses the importance of the effect of a response. Satisfying results reinforce the response while annoying results weaken it. Reward and punishment are, therefore, important ingredients of learning. The law of readiness indicates the student's willingness to make S-R connection while the law of exercise relates to strengthening the connection through practice. Behaviourists consider learning a formation of habit through conditioning which links desired responses to stimuli. The prominent theorist among them is B.F. Skinner who propagated the idea of operant conditioning.

EDUCATIONAL IMPLICATIONS

The Behaviourist approach to learning has significantly influenced modern educational practices. Behaviourists have conceived teaching as manipulation of environment to produce desired behavioural changes in learners and thus make education more effective.

They suggest the adoption of the following three principles in the teaching-learning process:

- Knowledge of result and use of positive reinforcement,
- Minimum delay in reinforcement, and
- Elaboration of complex behaviour by dividing learning into a series of small steps.

One of the major contributions of behaviourists to education is their emphasis on defining *teaching objectives in behavioural terms*. They have stressed the need for stating objectives in the form of overt behaviour which can be observed and measured. The role of teachers becomes very crucial in deciding the changes of behaviour in their students when they learn and teaching in such a way that can students make attain those behavioural changes.

Behaviourist principles have influenced the contemporary approaches to evaluation also. For instance, based on the hierarchy of learning outcomes, Bloom has suggested a model of 'taxonomy of educational objectives'. Another educational implication of the behaviourist approach is individualising instruction such as 'Personalised System Instruction (PSI)' based on the reinforcement theory that has been widely used in education.

Skinner's Theory of Operant Conditioning

Skinner propagated the theory related to stimulus-response behaviour and reinforcement. In his view, learning is a change in behaviour. As the student learns, his responses in terms of changed behaviour increase. He therefore, formally defines learning as a change in the likelihood or probability of a response. The operant conditioning is a learning force which effects desired response more frequently by providing reinforcing stimulus immediately following the response. The most important principle of this type of learning is that behaviour changes according to its immediate consequences. Pleasurable consequences strengthen behaviour while unpleasant consequences weaken it.

In operant conditioning, learning objectives are divided into many small steps/tasks and reinforced one by one for teaching purpose. The operant — the response behaviour of act — is strengthened so as to increase the probability of its reoccurrence in the future. Three external conditions — reinforcement, contiguity and practice — must be provided in operant conditioning.

Reinforcement

The most important aspect of Skinner's theory of learning relates to the role of reinforcement. An organism is presented with a particular stimulus — a reinforcer — after it makes a response. In given situation, the organism will tend to repeat responses for which it is reinforced.

Skinner distinguished between positive and negative reinforcements. Positive reinforcement is a stimulus, which increases the probability of desired response. The positive reinforcement is a positive reward. Praise, smiles, prize money, a funny television programme, *etc.*, are the examples of positive reinforcement.

In negative reinforcement, the desired behaviour is more likely to occur if such stimulus reinforcement is removed. For example, we can close windows and doors to avoid hearing loud noise; we can avoid wrong answers by giving right answers. Here 'noise' and 'wrong answers' are negative reinforcers. Thus a negative reinforcer is a negative reward the avoidance of which gives us relief from unpleasant state of affairs. Skinner did not equate negative reinforcement with punishment.

Educational Implications

The basic implication of operant conditioning to teaching/instructional activities is dependency on observable behaviour. For Skinner, reinforcement facilitates learning. Further, he thinks that the most effective control on human learning requires instrumental aids/teaching aids.

Broadly, Skinner's theory has made the following contribution to the practice of education in teaching:

- *Teaching Machine*: Teaching machine, in the sense of a systematic approach to teaching with the help of machines, deserves attention as it has strongly influenced education both in theory and practice. In this approach, machines present the individual students with programmes containing a set of questions to be answered, problems to be solved, or exercises to be done. In addition, they provide automatic feedback to the students. Teaching through machines and electronic gadgets encourages students to take an active part in the instruction process. Use of mechanical teaching devices has the following advantages:
  - Right answer is immediately reinforced. Machines encourage and force the students to come up with right answers.
  - Mere manipulation of the machines probably, will reinforce sufficiently to keep an average student busy at a task for a prescribed period.
  - Any student who is forced to leave a learning activity for a period of time may return at any time and continue from where he left off.
  - Each student may proceed with his learning task on an individual basis at his own pace.
  - The teacher is forced to arrange and design the course content carefully in a hierarchical order.
  - There is constant interaction between the teaching material and the student, thus sustaining activities.
  - After knowing about the progress of the student, the teacher can supply necessary supplementary reinforcement. Thus, machines make it compulsory that a given material be thoroughly understood before the student moves on to the next set of material.
- *Programmed instruction*: Programmed instruction is a self-learning system in which the subject matter is broken into small bits of information

and presented in a logical sequences. Each step builds deliberately upon the preceding one.A student progresses through the theme that is being taught through the programme. At the end of each step there is a question to be answered by the learner. After the question is answered, the learner is expected to check his/her answer with the correct answer supplied in the programme. This is an inbuilt feature of programmed material.

Cognitive Approach

Cognitive approaches mainly deal with the psychological aspects of human behaviour. 'Cognitive psychology' has taken an important place in the psychology of learning over the last three decades. While conducting experimental investigations, cognitivism takes into consideration activities such as perception, concept formation, language use, thinking, understanding, problem solving, attention and memory. Thus, the cognitive approach is concerned with the individual's inner psychological functioning.

Cognitive theorists have investigated and shown that people learn by perceiving, comprehending and conceptualising the problem. The comprehension of concepts and rules, *etc.*, is transferable to the solution of new problems. The cognitive theorists argue that people grasp things as a whole, and therefore, oppose the Behaviourist approach to teaching which employed drills to memorise the information. They believe, learning is both a question of 'insight' formation and successful problem solving, and not a mechanical sequence of stimuli and responses. Thus, teaching according to cognitivists, should encourage understanding based on 'problem solving' and 'insight formation'.

Information Processing

The contemporary cognitivists equate human mental activities with the process that goes on in a 'computer' in operation. They conceptualise human beings as information processing system. The information processing system describes a psychological activity in terms of information being received by the senses and then information items being selected and passed on to short-term memory where encoding processes transfer them to the long-term memory. Long term memory provides a store room where information can be retrieved in order to make a response.

There are a number of elements, which are central to the cognitive theory of learning. To begin with, the individual is seen as one having active relationship with the environment. He has intentions and goals, and thinks of alternative strategies to achieve these goals. Thinking is essentially a purposive activity. Learning is, therefore, an intelligent and active process. Within this process, issues of perception are very important because perceptual activity is the first relationship between a person and his environment or situation. The individual interacts with the situation and this interaction leads to relativity in perception as he organises the stimulus into meaningful patterns. Thus an individual acquires knowledge through his interaction with the environment and stores it for using this in new situations.

LEARNING AS A COGNITIVE PROCESS

Learning has been conceived as a cognitive process. In the process of learning, certain changes in the cognitive structure take place that help the individual in development and understanding of the concept that is being learnt or taught. Thus, learning goals are not achieved simply by doing but by grasping the meaning of things in a way that can be transferred for finding the solution to new problems.

Feedback: One of the important elements of the cognitive approach is the notion of 'feedback'. The learning situation is seen as one in which an individual confronts a problem, develops a hypothesis based on his knowledge in his memory and then tries it out. The consequences of his action then provide him feedback so that the correct solutions are confirmed and the incorrect ones rejected.

Educational Implications

What is the relationship of this school of thought to educational practices especially teaching? Cognitive psychologists have investigated complex mental behaviours in a scientific way and their views are becoming increasingly important in their application to education and instruction. The major emphasis of this approach is on how to design educational activities to promote cognitive learning.

We describe below the major educational implications of the cognitive approach for classroom teaching:

- The most important aspect of the cognitive approach to education relates to promoting retention of knowledge acquired through learning. The ability to retain knowledge depends on how best it is understood. 'Understanding' can help us spreading mentally the information we store in our memory and create new cognitive structures to efficiently use long-term memory.
- Teaching materials should be planned on the basis of the theory of discovery. Instructional methods, therefore, should emphasise the spontaneous discovery competency of the learner. It indicates that active learning methods should be adopted to motivate the learner to rediscover the facts or find solutions to the problems.
- This approach emphasises, appropriate decisions regarding the instructional objectives, analysis of pre-requisite behaviour, and teaching methods.
- Besides, it stresses problem-oriented learning. It gives a detailed description of how to teach in a reflective way by raising problems and solving them.
- Lastly, it emphasises the study of learner character-istics, which can be used by the teacher to expand the quality and quantity of students' insights.

Gagne has identified nine phases of cognitive process that are essential to learning and which need to be executed in sequential order. The phases of learning are the typical series of external and internal conditions that constitute

a single learning act. The 'internal conditions' of learning include two factors — learner's psychological states and cognitive process required for learning. The internal process may be influenced by external events in the form of environmental stimulation.

A brief description of these conditions of learning are given below:

- *Contiguity*: One of the basic conditions of learning is contiguity — the almost simultaneous occurrence of the stimuli and responses. In teaching we are always interested in making the students build up associations between particular stimulus and responses.
- *Practice*: Practice is the repetition of a response in the presence of a stimulus. We usually need to practice or repeat S-R (stimulus — response) associations to retain them for relatively longer periods of time. For new stimuli and new responses, more practice is required. In all types of learning under S–R situations, practice is of crucial importance. However, in concept learning, principal learning and problem solving, it is of minor importance, if the other conditions of learning such as reinforcement are provided appropriately.
- *Reinforcement*: Reinforcement is a major condition for learning because of the complexity of the concept and because of its importance, it should be known extensively. We can use reinforcement in different ways to produce different effects. *i.e.*, to effect different types of learning in our students. In the process of reinforcement an organism is presented with a particular stimulus before and after it elicits desired respsonses. In a given situation, the organism will tend to repeat the responses for which it is reinforced and to discontinue responses for which it is not reinforced. We can distinguish a reinforcer from other stimuli because it has a particular effect on behaviour. A positive reinforcer is a positive reward while a negative reinforcer is a stimulus, which gives us relief from an unpleasant state of affairs.
- Feedback or knowledge of correct responses also functions as reinforcement to strengthen the responses to be learned. The term 'feedback' stresses the informative aspect of teacher's function. There are various ways in which feedback may be provided. The importance of providing feedback has sparked several technological innovations, including programmed instruction and computer-assisted instruction. Learning efficiency often increases when the student receives feedback before moving to new learning materials. Available evidences indicate that active responding with direct feedback is superior to passive responding with indirect feedback. Very weak reinforcement may sufficiently be effective in controlling one's behaviour if it is wisely used. We cannot say that a particular consequence is in fact a reinforcer until we have evidence that it has strengthened the behaviour of the individual concerned.
- *Generalisation and discrimination*: Both of these are closely associated with the basic conditions of contiguity, practice and reinforcement,

which are basic to all learning. The complex learning behaviour can be described in terms of stimulus generalisation and discrimination. In many situations, we observe that a child when confronted with a new stimulus makes a response he had previously learnt to make to similar types of stimulus. We call this behaviour 'generali-sation'. When a child is taught to call a particular colour 'red', he also learns to call similar hues 'red'. Under discrimination, the individual makes different responses to two or more stimuli. A child for example can learn to select red colour and not pink. To the extent he learns to pick up red and ignore pink, he has learnt to discriminate.

SYNTHESIS OF BEHAVIOURISM AND COGNITIVE APPROACH

The behaviourists concentrate on the external stimulus and conditions of environment for learning or bringing about changes in behaviour. The cognitive theories, on the other hand, stress the internal conditions of learning, *viz.*, perceptual reorganisation, insight, information processing and memory. But in reality, learning depends on both external and internal conditions.

Gagne's Views on Learning

Robern M. Gagne is a prominent educational psychologist whose 'conditions of learning' are generally employed in teaching-learning process. He identifies the factors that account for the complex nature of human learning. His viewpoints are often used to underpin the mechanistic instructional technology that is associated with behaviour modification and performance or competency-based education. For Gagne, 'learning is a change in human disposition or capability, which can be retained, and which is not simply ascribable to the process of growth'. Learning is a process that takes place inside an individual's brain. The most important aspect of learner is 'his senses, his central nervous system, and his muscles'. Gagne combines a basic behaviourist position with elements of cognitive thought and builds a hierarchical model of the different types of learning. Gagne shows the way in which a unifying theory may be able to explain how different kinds of learning relate to each other. He synthesises the existing learning theories and has tried to provide a consistent explanation for all types of learning.

THE QUALITY OF FUTURE ONLINE EDUCATION

Survey respondents generally agreed with recent Sloan reports that the quality of online education will improve in the future. Sixty per cent of respondents expected that the quality of online courses would be identical to traditional instruction by the year 2006. Also, a majority of the respondents predicted that the quality of online courses would be superior to (47 per cent) or the same as (39 per cent) that of traditional instruction by 2013. Only 8 per cent predicted that the quality of online courses would be inferior in 2013. Similarly, a large

majority of respondents predicted that learning outcomes of online students would be either the same as (39 per cent) or superior to (42 per cent) those of traditionally taught students by 2013. In effect, the trend is for course quality and learner outcomes to steadily and significantly improve during the coming decade. Although we did not ask about reasons for the increase in quality, such numbers should be interesting and valuable to administrators, instructors, students, and other online learning stakeholders. In terms of factors that can improve online learners' success, respondents said that training students to selfregulatetheir learning (22 per cent) was needed most, followed by better measures of student readiness (17 per cent), better evaluation of student achievement (17 per cent), and better CMSs to track student learning.

Nine per cent said additional technology training is needed. This concern about learner self-regulationis ironic in a world dominated and driven by learning management systems that are primarily used to manage students, as alluded to earlier. Follow-up surveys might address whether learners per- ceive this mixed message and whether they prefer to be managed online or engage in more self-directed online environments. As Carmean and Haefner argued, there is a need for CMS environments that foster deeper student learning and engagement. They noted that such environments might foster student choice among various activities, reflection, apprenticeship, synthesis, real-world problem solving, and rich, timely feedback. More recently, Weigel added to this argument by suggesting that the next-generation CMS should foster a more learner-centered environment that rich in critical thinking, student exploration, peer learning and knowledge construction, interdisciplinary experiences incorporating a community of educators (practitioners, business leaders, alumni, and others), and educational opportunities.

Online Teaching Skills

Instructors' abilities to teach online are critical to the quality of online education. Unlike our earlier study related to the state of online learning in 2001, which included many questions about online learning tools and features, the present study focused more on learning outcomes and pedagogical skills. For instance, this study found that the most important skills for an online instructor during the next few years will be how to moderate or facilitate learning and how to develop or plan for high-quality online courses. Being a subject-matter expert was the next most important skill. In effect, the results indicate that planning and moderating skills are perhaps more important than actual "teaching" or lecturing skills in online courses. As Salmon pointed out, online instructors are moderators or facilitators of student learning.

Pedagogical Techniques

Over half of the survey respondents predicted that online collaboration, casebased learning, and problem-based learning (PBL) would be the preferred instructional methods for online instructors in the coming decade. In contrast, few respondents expected that instructors would rely on lectures, modeling, or

Socratic instruction for their online teaching in the future. In other words, survey respondents predicted that more learner-centered techniques would be used in the future, indicating a marked shift from traditional teacher-directed approaches. Existing research indicates that online instructors tend to use easy-toimplement tools, resources, and strategies rather than complex PBL, virtual teaming, cross-cultural collaboration, simulations, and other forms of rich interactive media.

If the prediction for more learner-centered pedagogies online is realised, it would be interesting to study whether those teaching online transfer such pedagogical skills to their face-to-face instructional activities. Our findings also indicated that, in general, respondents envisioned the Web in the next few years more as a tool for virtual teaming or collaboration, critical thinking, and enhanced student engagement than as an opportunity for student idea generation and expression of creativity. This is not surprising, given that most instruction in higher education is focused on consumption and evaluation of knowledge, not on the generation of it. Perhaps online training departments and units need to offer more examples of how to successfully embed creative and generative online tasks and activities.

EVALUATION AND ASSESSMENT OF ONLINE COURSES

Evaluation is an important part of ensuring the quality of online courses and programmes. When asked how the quality of online education will be most effectively measured during the coming decade, 44 per cent answered that a comparison of online student achievement with that of students in face-to-face classroom settings would be the most effective, followed by student performance in simulated tasks of real-world activities (15 per cent), calculations of return on investment (10 per cent), and student course evaluations (9 per cent).

Clearly, respondents believe that face-to-face instruction provides a valid benchmark for teaching and learning outcomes and that online performance should at least equal its effectiveness. Such views, while politically important, seem to forget that much of the learning that occurs online could not take place in a faceto- face delivery mode (for example, asynchronous online discussions or online mentoring). It also assumes that face-to-face instruction is superior. What if institutions took the opposite stance and measured face-to-face courses based on whether they could accomplish all that online instruction can?

As for the forms of evaluation that will be used during the next few years, respondents predicted that online practice quizzes and exams would be most highly used, followed by online surveying and polling, course evaluations, and online quizzes and exams. In particular, more than 90 per cent of the respondents predicted that online surveys would be used as an important student research tool or as a teaching device in addition to student assessment and course evaluation. This finding affirms our belief that online surveys offer the chance to be learner-centered because they allow students to collect, analyse, and report on real-world data and projects.

2

Discovery Learning in Special Needs Education

With the push for special needs students to take part in the general education curriculum, prominent researchers in the field doubt if general education classes rooted in discovery based learning can provide an adequate learning environment for special needs students. Kauffman has related his concerns over the use of discovery based learning as opposed to direct instruction. Kauffman comments,to be highly successful in learning the facts and skills they need, these facts and skills are taught directly rather than indirectly. That is the teacher is in control of instruction, not the student, and information is given to students (2002). This view is exceptionally strong when focusing on students with math disabilities and math instruction. Fuchs *et al.* (2008) comment,

Typically developing students profit from the general education mathematics programme, which relies, at least in part, on a constructivist, inductive instructional style. Students who accrue serious mathematics deficits, however, fail to profit from those programmes in a way that produces understanding of the structure, meaning, and operational requirements of mathematics… Effective intervention for students with a math disability requires an explicit, didactic form of instruction…

Fuchs *et al.* go on to note that explicit or direct instruction should be followed up with instruction that anticipates misunderstanding and counters it with precise explanations. It must be noted, however, that few studies focus on the long-term results for direct instruction. Long-term studies may find that direct instruction is not superior to other instructional methods. For instance, a study

found that in a group of fourth graders that were instructed for 10 weeks and measured for 17 weeks direct instruction did not lead to any stronger results in the long term than did practice alone (Dean & Kuhn, 2006). Other researchers note that there is promising work being done in the field to incorporate constructivism and cooperative grouping so that curriculum and pedagogy can meet the needs of diverse learners in an inclusion setting (Brantlinger, 1997). However, it is questionable how successful these developed strategies are for student outcomes both initially and in the long term.

Criticism of Pure Discovery Learning

A debate in the instructional community now questions the effectiveness of this model of instruction (Kirschner, Sweller, & Clark, 2006). Bruner (1961) suggested that students are more likely to remember concepts if they discover them on their own. This is as opposed to those they are taught directly. However, Kirschner, Sweller, and Clark (2006) report there is little empirical evidence to support discovery learning. Kirschner et al. suggest that fifty years of empirical data does not support those using these unguided methods of instruction. Several groups of educators have found evidence that pure discovery learning is a less effective as an instructional strategy for novices, than more direct forms of instruction (*e.g.*, Tuovinen & Sweller, 1999). Mayer (2004) points out that interest in discovery learning has waxed and waned since the 1960s.

He argues that in each case the empirical literature has shown that the use of pure discovery methods is not suggested, yet time and time again researchers have renamed their instructional methods only to be discredited again, to rename their movement again. Mayer asked the question "Should There Be a Three-Strikes Rule Against Pure Discovery Learning?" While discovery for oneself may be an engaging form of learning, it may also be frustrating. The main idea behind these critiques is that learners need guidance (Kirschner et al., 2006), but later as they gain confidence and become competent then they may learn through discovery.

DISCOVERY LEARNING

Discovery Learning is a method of inquiry-based instruction and is considered a constructivist based approach to education. It is supported by the work of learning theorists and psychologists Jean Piaget, Jerome Bruner, and Seymour Papert. Although this form of instruction has great popularity, there is some debate in the literature concerning its efficacy (Mayer, 2004). Jerome Bruner is often credited with originating discovery learning in the 1960s, but his ideas are very similar those of earlier writers (*e.g.*, John Dewey). Bruner argues that "Practice in discovering for oneself teaches one to acquire information in a way that makes that information more readily viable in problem solving" (Bruner, 1961, p. 26). This philosophy later became the discovery learning movement of the 1960s. The mantra of this philosophical movement suggests that we should 'learn by doing'. In 1991, The Grauer School, a private secondary school in

Encinitas, California, was founded with the motto, "Learn by Discovery," and integrated a series of world-wide expeditions into their programme for high school graduation. Discovery learning takes place in problem solving situations where the learner draws on his own experience and prior knowledge and is a method of instruction through which students interact with their environment by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments.

INQUIRY-BASED LEARNING

Open Learning

An important aspect of inquiry-based science is the use of open learning. Open learning is when there is no prescribed target or result which students have to achieve. In many conventional traditional science experiments, students are told what the outcome of an experiment will be, or is expected to be, and the student is simply expected to 'confirm' this. In open teaching, on the other hand, the student is either left to discover for themselves what the result of the experiment is, or the teacher guides them to the desired learning goal but without making it explicit what this is. Open teaching is an important but difficult skill for teachers to acquire. Open learning has many benefits. It means students do not simply perform experiments in a routine like fashion, but actually think about the results they collect and what they mean. With traditional non-open lessons there is a tendency for students to say that the experiment 'went wrong' when they collect results contrary to what they are told to expect. In open lessons there are no wrong results, and students have to evaluate the strengths and weaknesses of the results they collect themselves and decide their value. Because the path taken to a desired learning target is uncertain, open lessons are more dynamic and less predictable than traditional lessons.

Open learning has been developed by a number of science educators including the American John Dewey and the German Martin Wagenschein. Wagenschein's ideas particularly complement both open learning and inquiry teaching. He emphasized that students should not be taught bald facts, but should be made to understand and explain what they are learning. His most famous example of this was when he asked physics students to tell him what the speed of a falling object was. Nearly all students would produce an equation. But no students could explain what this equation meant. Wagenschien used this example to show the importance of understanding over knowledge. Inquiry-based learning has been of great influence in science education, where it is known as Inquiry-based science, especially since the publication of the U.S., National Science Educational Standards in 1996. Since this publication some educators have advocated a return to more traditional methods of teaching and assessment. Others feel inquiry is important in teaching students to research and learning (*e.g.*, see Constructivism (learning theory)).

Scientists use their background knowledge of principles, concepts and theories, along with the science process skills to construct new explanations to allow them to understand the natural world. This is known as "science inquiry". The National Science Education Standards call for students to do inquiry, and to know about inquiry. When students do inquiry, they use the same ideas as scientists do when they are conducting research. Students become 'mini-scientists.' When students are learning about inquiry, they should become familiar with the processes used by scientists, and the new knowledge that results.

Inquiry is a natural introduction to the branch of epistemology known as the Nature of Science, which deals with the characteristics of scientific knowledge. The National Science Education Standards were often misunderstood with regard to inquiry-based learning. As a result, the National Research Council put out a second volume, entitled 'Inquiry and the National Science Education Standards' in 2000. Inquiry-based learning (Enquiry-based learning in British English) or inquiry-based science describes a range of philosophical, curricular and pedagogical approaches to teaching. Inquiry-based learning is an instructional method developed during the discovery learning movement of the 1960s. It was developed in response to a perceived failure of more traditional forms of instruction, where students were required simply to memorize fact laden instructional materials (Bruner, 1961). Inquiry learning is a form of active learning, where progress is assessed by how well students develop experimental and analytical skills rather than how much knowledge they possess.

Inquiry-based Learning in Science Education

Heather Banchi and Randy Bell (2008) suggest that there are four levels of inquiry-based learning in science education: confirmation inquiry, structured inquiry, guided inquiry and open inquiry. With confirmation inquiry, students are provided with the question and procedure (method), and the results are known in advance.

Confirmation inquiry is useful when a teacher's goal is to reinforce a previously introduced idea; to introduce students to the experience of conducting investigations; or to have students practice a specific inquiry skill, such as collecting and recording data. In structured inquiry, the question and procedure are still provided by the teacher; however, students generate an explanation supported by the evidence they have collected. In guided inquiry, the teacher provides students with only the research question, and students design the procedure (method) to test their question and the resulting explanations. Because this kind of inquiry is more involved than structured inquiry, it is most successful when students have had numerous opportunities to learn and practice different ways to plan experiments and record data. At the fourth and highest level of inquiry, open inquiry, students have the purest opportunities to act like scientists, deriving questions, designing and carrying out investigations, and communicating their results. This level requires the most scientific reasoning and greatest cognitive demand from students.

Philosophy

The philosophy of inquiry based learning finds its antecedents in the work of Piaget, Dewey, Vygotsky, and Freire among others.

Characteristics of Inquiry-Learning

- Inquiry learning emphasizes constructivist ideas of learning. Knowledge is built in a step-wise fashion. Learning proceeds best in group situations.
- The teacher does not begin with a statement, but with a question. Posing questions for students to solve is a more effective method of instruction in many areas. This allows the students to search for information and learn on their own with the teacher's guidance.
- The topic, problem to be studied, and methods used to answer this problem are determined by the student and not the teacher (this is an example of the 3rd level of the Herron Scale)

The above comments represent a classroom that is fully committed to inquiry, to the greatest extent possible. However, it is not necessary to take an all-or-nothing approach to inquiry-based teaching methods. In the 1960s, Schwab called for inquiry to be divided into four distinct levels. This was later formalized by Marshal Herron in 1971, who developed the Herron Scale to evaluate the amount of inquiry within a particular lab exercise. Since then, there have been a number of revisions proposed, but the consensus in the science education community is that there is a spectrum of inquiry-based teaching methods available.

Examples of Inquiry-based Science

- Students develop a method to find which antacid tablets are the best at neutralizing acids.
- Students learn about inertia and movement by studying what affect rolling of marbles on different surfaces has.
- Students work in groups to build bridges to hold marble weights. By doing so they discover how to build strong bridges.
- Inquiry based learning is a way of assuring students become more actively involved in what they are learning, particularly in the content area of Science.
- A special case of inquiry learning is problem-based learning (PBL). Students are assigned to teams and provided with an ill-defined problem. Teams must organize themselves, define objectives, assign responsibilities, conduct research, analyze results, and present conclusions. The problems are purposely "ill-defined," causing team members to work collaboratively to define specific issues, problems, and objectives. Such tasks mimic the problem-solving skills that professionals engage in, whether repairing automobiles, or treating cancer patients. Problem-based learning employs open-ended questions

that are not limited to a single correct answer. The questions elicit diverse ideas and opinions and require students to work as a group. Problem-based learning naturally integrates various fields of study as students search beyond the traditional curricular boundaries to develop solutions.

- The Hands-On Universe (HOU) project is an educational programme that enables students to investigate the Universe while applying tools and concepts from science, math, and technology. Using the Internet, HOU participants around the world request observations from an automated telescope, download images from a large image archive, and analyze them with the aid of user-friendly image processing software. The HOU pedagogical ressources are typical tools inspired from Inquiry-based science education (IBSE).

Debate

"After a half century of advocacy associated with instruction using minimal guidance, there appears no body of research supporting the technique. In so far as there is any evidence from controlled studies, it almost uniformly supports direct, strong instructional guidance rather constructivist-based minimal guidance during the instruction of novice to intermediate learners. Even for students with considerable prior knowledge, strong guidance while learning is most often found to be equally effective as unguided approaches. Not only is unguided instruction normally less effective; there is also evidence that it may have negative results when student acquire misconceptions or incomplete or disorganized knowledge "— Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching by Kirschner, Sweller, Clark review the literature and have found that although constructivists often cite each others' work, empirical evidence is not often cited. Nonetheless the constructivist movement gained great momentum in the 1990s, because many educators began to write about this philosophy of learning.

Inquiry-based science has been increasingly promoted as a mainstream teaching approach, especially since the publication of the 1996 Standards in Science Education document. However, there are many critics of inquiry-based science. Science testing has become increasingly important with the No Child Left Behind programme, and the rewriting of the National Assessment of Educational Progress to emphasize facts. This has led to a decrease in emphasis on inquiry as a method of teaching science and a fall back to more traditional 'chalk and talk' methods. Hmelo-Silver, Duncan, & Chinn cite several studies supporting the success of the constructivist problem-based and inquiry learning methods.

For example, they describe a project called GenScope, an inquiry-based science software application. Students using the GenScope software showed significant gains over the control groups, with the largest gains shown in students

from basic courses. Hmelo-Silver et al. also cite a large study by Geier on the effectiveness of inquiry-based science for middle school students, as demonstrated by their performance on high-stakes standardized tests. The improvement was 14% for the first cohort of students and 13% for the second cohort. This study also found that inquiry-based teaching methods greatly reduced the achievement gap for African-American students. Based on their 2005 research, the conservative Thomas B. Fordham Institute concluded that while inquiry-based learning is fine to some degree, it has been carried to excess.

SERVICE-LEARNING

Service-learning is a method of teaching, learning and reflecting, frequently youth service, throughout the community. As a teaching method, it falls under the philosophy of experiential education. More specifically, it integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, encourage lifelong civic engagement, and strengthen communities for the common good.The Community Service Act of 1990, which authorized the Learn and Serve America grant programme, defines service-learning as:

"a method under which students or participants learn and develop through active participation in thoughtfully organized service that is conducted in and meets the needs of a community; is coordinated with an elementary school, secondary school, institution of higher education, or community service programme, and with the community; and helps foster civic responsibility; and that is integrated into and enhances the academic curriculum of the students, or the educational components of the community service programme in which the participants are enrolled; and provides structured time for the students or participants to reflect on the service experience."

Alternatively, the National Youth Leadership Council defines service learning as "a philosophy, pedagogy, and model for community development that is used as an instructional strategy to meet learning goals and/or content standards."

Key Components

Service-learning combines experiential learning and community service opportunities. It can be distinguished in the following ways:

- *Curricular connections*: Integrating learning into a service project is key to successful service-learning. Academic ties should be clear and build upon existing disciplinary skills.
- *Student voice*: Beyond being actively engaged in the project itself, students have the opportunity to select, design, implement, and evaluate their service activity, encouraging relevancy and sustained interest. In community settings, this is alternatively called youth voice.
- *Reflection*: Structured opportunities are created to think, talk, and write about the service experience. The balance of reflection and action allows a student to be constantly aware of the impact of their work.

- *Community partnerships*: Partnerships with community agencies are used to identify genuine needs, provide mentorship, and contribute assets towards completing a project. In a successful partnership, both sides will give to and benefit from the project. In order for this partnership to be successful, clear guides must be implemented as to how often a student engages in service to a particular community agency.
- *Authentic community needs*: Local community members or service recipients are involved in determining the significance and depth of the service activities involved.
- *Assessment*: Well structured assessment instruments with constructive feedback through reflection provide valuable information regarding the positive 'reciprocal learning' and serving outcomes for sustainability and replication.

In 2008, the National Youth Leadership Council released the K-12 Service-Learning Standards for Quality Practice that used research in the field to determine eight standards of quality service-learning practice.

The standards are:

- Meaningful Service
- Link to Curriculum
- Reflection
- Diversity
- Youth Voice
- Partnerships
- Progress Monitoring
- Duration and Intensity

Further, to distinguish high quality from low quality service learning experiences, Youth Service California has published the "Seven Elements of High Quality Service Learning" that include:

- Integrated Learning
- High Quality Service
- Collaboration
- Student Voice
- Civic Responsibility
- Reflection
- Evaluation

Typology

As Defined by Robert Sigmon, 1994:

- *Service-LEARNING:* Learning goals primary; service outcomes secondary.
- *SERVICE-Learning:* Service outcomes primary; learning goals secondary.
- *Service learning:* Service and learning goals completely separate.
- *SERVICE-LEARNING:* Service and learning goals of equal weight and each enhances the other for all participants.

In this comparative form, the typology is helpful not only in establishing criteria for distinguishing service-learning from other types of service programmes but also in providing a basis for clarifying distinctions among different types of service-oriented experiential education programmes (*e.g.*, school volunteer, community service, field education, and internship programmes)

Community-Engaged Writing

Community-engaged writing is a method of getting students to write towards and about public problems and issues. A variety of approaches are used by instructors, depending on age group of students and theoretical approach. Two illustrative/related summaries follow. In "Literacy as Violence Prevention," Ena Rosen, Associate Director of Need in Deed, describes a specific example of the teaching methods of Need in Deed, a Philadelphia-based education agency. This newsletter article is based on an anecdotal set of reports on an eighth grade teacher's work with one classroom in 2005. Rosen's purpose is to promote the effectiveness and work of Need in Deed, and Rosen ultimately shows that this method of working with urban youth is an effective teaching method and social intervention: "Meaningful service that addresses a root cause and meets an authentic community need: the best of service-learning and civic engagement" (Rosen). In "Rogue Cops and Health Care: What Do We Want from Public Writing?" Susan Wells argues that writing teachers should not merely have students write within classrooms on socially relevant issues, such as gun control. She uses Habermas's definition of the public sphere to analyze an example of a "citizen" attempting to enter the public sphere through discourse—President Clinton's speech on health care reform—and ultimately demonstrates the failure of that effort. However, Wells contrasts Clinton's failed strategies to get health care reform passed with a more local example of a Temple student who successfully entered the public sphere by writing a citizen's complaint about his arrest and subsequent beating by a Philadelphia police officers. Wells concludes by suggesting four alternatives for writing teachers interested in helping students move their rhetoric into the public sphere: classroom as one type of public sphere itself, analysis of public and academic discourses, writing with and for public/community needs, and analysis of academic discourses as they intervene in the public sphere.

Effect on Engineering Education

Many engineering educators see service-learning as the solution to several prevalent problems in engineering education today. In the past, engineering curriculum has fluctuated between emphasizing engineering science to focusing more on practical aspects of engineering. Today, many engineering educators are concerned their students do not receive enough practical knowledge of engineering and its context. Some speculate that adding context to engineering help to motivate engineering students' studies and thus improve retention and diversity in engineering schools. Others feel that the teaching styles do not

match the learning styles of engineering students. Many engineering faculty members believe the educational solution lies in taking a more constructivist approach, where students construct knowledge and connections between nodes of knowledge as opposed to passively absorbing knowledge. Educators see service-learning as a way to both implement a constructivism in engineering education as well as match the teaching styles to the learning styles of typical engineering students. As a result, many engineering schools have begun to integrate service-learning into their curricula.

Supporting Programmes

There are a number of substantial national efforts in the United States that promote service learning in its myriad forms. They include the following organizations:

The State Education Agency K-12 Service-Learning Network (SEANet) is a national network of professionals committed to advancing school-based service-learning initiatives in K-12 schools and school districts all across the country (seanetonline.org). Our members are directors, coordinators, specialists, or other staff working in a State Education Agency (SEA), or in an organization designated by a State Education Agency, who provide leadership in their respective states for the advancement of school-based service-learning. They promote, develop, and expand school-based service-learning to K-12 schools and school districts; they provide direct assistance in the form of technical support and professional development opportunities to local school-community partnerships; and they administer and dissiminate the annual K-12 school-based state formula grants from Learn and Serve America, the primary federal funding source for service-learning.

Learn and Serve America's National Service-Learning Clearinghouse (NSLC) provides the world's largest database of Service-Learning materials, electronic resources, and job listings. It supports and encourages service-learning throughout the United States, and enables over one million students to contribute to their community while building their academic and civic skills. This organization instills an ethic of lifelong community service; supports and encourages service-learning throughout the United States, and enables over one million students to contribute to their community while building their academic and civic skills. By engaging our nation's young people in service-learning, Learn and Serve America instills an ethic of lifelong community service. National Service-Learning Partnership is a national network of members dedicated to advancing service-learning as a core part of every young person's education. Service-learning is a teaching method that engages young people in solving problems within their schools and communities as part of their academic studies or other type of intentional learning activity. The Partnership concentrates on strengthening the impact of service-learning on young people's learning and development, especially their academic and civic preparation. The Jimmy and Rosalynn Carter Partnership Foundation fosters academic service-learning in

higher education with awards and grants to students/faculty and their 501(c)(3) community partners who demonstrate best practices or innovative approaches in the field.

These programmes can be found at The Carter Academic Service Entrepreneur grant programme seeks to motivate students to develop innovative service-learning projects by providing $1,000 grants to the community organization partner of the student with the most innovative proposal in a state-wide or school-wide competition. ServiceBook sponsored and maintained by JRCPF, is the online community for academic service learning. JRCPF programmes have been held in 16 U.S., states, India and the United Kingdom. The Leadership, Ethics, and Social Action Minor at Indiana University-Bloomington focuses on civic participation, community decision-making, and citizenship skills: how to communicate and organize and lead while serving as a citizen.

The LESA programme is a chance to develop your own voice and interests while you research, serve, and take action in the community. A student who enjoys thinking and working independently and who would like to develop his or her professional presentation through serving the needs of the community will find opportunities to do so with LESA. Pre-professional students who wish to be involved in a community setting are attracted to the programme. Pre-law and pre-med, as well as pre-business, students find opportunities to develop their professional presentation. A partnership between Youth Service America, America's Promise Alliance, and State Farm® Companies Foundation launched GoToServiceLearning. It is recognized as a resource for teachers seeking to learn how to incorporate service-learning into their lessons. GoToServiceLearning.org is an interactive Web site housing a database of quality service-learning lesson plans from across the country, all tied to state academic standards.

OPEN LEARNING

Motivation is typically defined as the force that accounts for the arousal, selection, direction, and continuation of behaviour. Motivation means the desire and willingness to do something. It is a drive that compels an individual to act towards the attainment of some goal. As defined by Daft, "Motivation refers to the forces either within or external to a person that arouse enthusiasm and persistence to pursue a certain course of action." Motivation plays a crucial role in learning. It not only sets in motion the activity resulting in learning, but also sustains and directs it. It is "the central factor in the effective management of the process of learning" (Kelley, 2002, as cited in Aggarwal, 2004). Academic motivation has been found to be positively associated with academic achievement, academic performance, and the "will to learn" (McCelland et al., 1953; Entwistle, 1968; Frymier et al., 1975). Various studies have found that classroom competition (Bolocofsky, 1980), family culture and environment, personal aspiration factors, and study habits positively motivate students to do better.

Open learning has afforded opportunities for education outside the realm of the conventional system by providing flexibility in pursuing courses and taking examinations (Gautam, 1990; Indradevi, 1985). Studies have further stated that the popularity and acceptance of open education systems is on the rise. Freedom from constraint may also be seen as a defining feature of distance learning, for example freedom of content, space, medium, access, and relationship development (Anderson, 2006, as cited in Hartnett et al., 2011). Other than flexibility, job-related goals (Wanieweicz, 1981) and improvement of social status are the main motivation to join the open education system. It has also been revealed that the chances of students successfully completing their open education studies is generally linked to their personal concept, capacity for self-management, and familiarity with technology (Schifter & Monolescu, 2000). Notwithstanding the advantages that distance education offer, retention of students has been a major area of concern in open education. Dropout rates reported by open and distance learning (ODL) institutions are typically higher than those reported by conventional universities (Pierrakeas et al., 2004). Pierrakeas et al. (2004) further report the following:

In Europe, dropout rates in distance education programmes typically range from 20 percent to 30 percent or even higher in Northern America (Schlosser & Anderson, 1994). Asian countries have recorded rates as high as 50 percent (Shin & Kim, 1999; Narasimharao, 1999).

Various reasons such as family (related to childbirth, child rearing, marriage, pregnancy, travel problems, death of a family member), personal, or health reasons (Pierrakeas et al., 2004), distance to the study centre, insufficient academic support from study centers, absence of interaction with other students, and insufficient counselling sessions (Fozdar et al., 2006) have been found to contribute to higher dropouts in the open education system. Apart from these explicit factors, poor motivation has been identified as a decisive factor in contributing to the high dropout rates from online courses (Muilenburg & Berge, 2005). Against this backdrop of poor retention rates, the diverse characteristics of distance learners and the importance of motivation in the learning process prompted our study. This study explores whether the level of motivation in OES students compared to TES students is low enough to raise apprehension among distance education administrators. Issues have been raised and explored regarding the motivation of students of TES and OES. Further, motivation has been explored from extrinsic and intrinsic points of view. While intrinsic motivation is important to influence the learning habits of students, particularly in OES, this study also examines the importance of extrinsic motivation in the formation of the overall motivation level of students.

OBJECTIVES OF THIS STUDY

Though it may not seem logical to compare the pupils of the two types of education systems, which differ so widely in their characteristics and functioning, the researchers have undertaken this study to explore the reasons, if any, for the

differences in motivation levels. The study aims to discover the learning motivations of OES and TES students. The study compares academic motivation between the two education systems. It also incorporates a comparison between male and female students studying under the two systems. The various dimensions that have influence on the motivation level of students are discussed.

The objective of this study is also to apply the theories of motivation to explore the reasons for any significant differences in the motivation levels of the two types of pupil. This study will present suggestions which may be beneficial for policy makers. It will also raise questions which may be the subject matter of future research. To achieve the above stated objectives and after reviewing the related literature the following hypotheses have been framed and tested.

Hypothesis 1: There is no significant difference in the academic motivation of students studying in the two systems of education.

Hypothesis 2: There is no significant difference in the academic motivation of male and female students studying in the two systems of education.

Hypothesis 2 has further been subdivided into the following hypotheses.

Hypothesis 2(a): There is no significant difference in the academic motivation of the male and female students studying in the traditional education system.

Hypothesis 2(b): There is no significant difference in the academic motivation of the male and female students studying in the open education system.

Hypothesis 2(c): There is no significant difference in the academic motivation of the male students studying in the traditional education system and in the open education system.

Hypothesis 2(d): There is no significant difference in the academic motivation of the female students studying in the traditional education system and in the open education system.

DELIMITATIONS OF THIS STUDY

The present study has the following delimitations:

- It is confined to undergraduate students only.
- It is confined to two faculties, namely the arts and science faculties.
- The population under study is limited to the municipal limits of Allahabad Municipal Area (Uttar Pradesh, India).
- The sample size of the present study is limited to 351 students.
- The present study is limited in its design, method, measuring devices, and statistical techniques.

METHOD

The present study is closely connected with the normative survey method of research. The population for the present study has been defined as all B.A. and B.Sc. students (male and female) of session 2009-2010 studying in the degree colleges affiliated to Allahabad University and Allahabad study centre of U.P. Rajarshi Tandon Open University who have gone through the process of examination and evaluation of their respective educational system at least once.

The population for the traditional education system has been defined as the number of students studying in the degree colleges offering B.Sc. and B.A. courses in Allahabad city region; these degree colleges are affiliated to the University of Allahabad.

Only second and third year undergraduate students have been considered as members of the population as they have gone through the examination and evaluation process of their education system. At the time of the study, a total population of 13,748 students from nine colleges was eligible to participate.

The population for the open education system has been defined as the number of students enrolled with Uttar Pradesh Rajarshi Tandon Open University, Allahabad, for the courses in the arts and science streams.

Their study centers are based in Allahabad. This university conducts examinations each semester, which is why the population constitutes all the students studying in the first, second, and third years of their respective stream (n = 305 from five study centers). Those first year students considered to be part of the population have appeared and cleared their first-semester examination, thus fulfilling the criterion of "going through the examination and evaluation process."

SAMPLE SIZE

In the present study a stratified random sampling method has been used as Miller pointed out that "the essential requirement of any sample is that it is as representative as possible of the population or the universe from which it has been drawn."

INSTRUMENTS

The questionnaire used in the present study is primarily a self-developed tool named the Academic Motivation Scale (AMS). A few other standard questionnaires were studied to find their suitability for the present study. No published tool was found suitable by the authors in its exact original form as none catered to the needs of college going students of TES and OES. Development of this instrument has taken inputs from the one that was published and developed by Srivastava (1974) with the title Academic Motivation Inventory. This tool is adapted to Indian conditions and is meant to test the academic motivation of secondary school students. There are 58 items in the tool of which 29 items are positive and 29 negative. This instrument has three dimensions, namely academic aspiration (22 statements), study habits (20 statements) and attitude towards school (16 statements).

The questionnaire used in this study has taken help from the standardized tool developed by Srivastava. The present tool has retained the three dimensions of the Academic Motivation Inventory and added another dimension, social-family-economic (environment). Since college students, whether under TES or OES, have more exposure and interactions with different elements of society and environment, they are more vulnerable to developing positive or negative academic motivation levels as per their environment. Hence, the dimensions used in the questionnaire are as follows:

- *Personal aspiration,*
- *Study habits,*
- *Social-family-economic (environment) factors*, and
- *Attitude towards college/study centre*.

A five-point rating scale was prepared by the researcher with the following alternatives: *strongly agree, agree, undecided, disagree*, and *strongly disagree*. Having identified the items, the preliminary tool was tested on 40 students consisting of 20 students from TES and 20 students from OES belonging to the science stream or the arts stream. Emphasis was laid upon the inclusion of male, female, rural, and urban students in the proper ratio. The tool was administered to examine the gross language mistakes and identify the defects, if any. After making the necessary corrections AMS was administered on 150 students.

FINAL FORM OF QUESTIONNAIRE

Nine items due to t-value and five items due to item validity and item difficulty were rejected. Therefore 46 items remained. These 46 items or statements can be deemed as completely fit and appropriate for further use. In the final form of the AMS, there were 15 items for measuring the first dimension (*i.e.*, personal aspiration), 15 items for the second dimension (*i.e.*, study habits), 8 items for the third dimension (*i.e.*, socioeconomic factors), and 8 items for the fourth dimension (*i.e.*, attitude towards college/study centers). The final scale (AMS) contained 22 favourable and 24 unfavourable statements. The tool was standardized by judging reliability using the split half method (the correlation coefficient was found to be 0.87 and when corrected it was 0.93) and test-reset method (moment product correlation coefficient was 0.97) and incorporating suggestions from students, educationists, psychologists, and specialists working in the field of education (traditional as well as open).

BRIEF DESCRIPTION OF DIMENSIONS OF AMS

The following four dimensions have been taken in designing AMS to analyse the academic motivation of students, keeping in mind the characteristics of the research population.

PERSONAL ASPIRATION.

This is an intrinsic motivation that energizes an individual to perform certain tasks. It is the main driving force that guides a student through the process of learning. A stronger feeling of self-determination and competence will have a positive impact on the development of a student's academic motivation, whereas the opposite will have a negative impact (Deci & Ryan, 1991, cited in Karsenti, 1999).

STUDY HABITS

Habit is customary behaviour or something that a person does naturally and enjoys doing. Analysis of an individual's habit pattern reflects the level of

commitment and determination regarding certain tasks. This domain is a visible component of intrinsic motivation in the form of action and behaviour compared to personal aspiration which is generally not visible. Hull's drive theory (1943) cited in Beck says that drive multiplied by habit produces the excitatory potential for a response: Excitatory potential = habit X drive. Thus, intrinsic motivation when combined with extrinsic motivation may result in the development of good habits (actions) to fulfill the drives (internal) by maximizing potential (efforts). So analysis of study habit patterns is helpful in determining the level of motivation of TES and OES students.

SOCIAL-FAMILY-ECONOMIC (ENVIRONMENT) FACTORS

Personality and individual differences affect the motivation level and behaviour of a person. The personality traits of an individual are often influenced and governed by environmental factors. The environment provides various cues and important extrinsic motivation factors to initiate action and energize intrinsic motivation. Hartman (2001) cited in Kawachi (2006) says that cognition, affect, metacognition, and environment are four interrelated dimensions associated with learning.

ATTITUDE TOWARDS COLLEGE/STUDY CENTRE

Attitude is a learned tendency or predisposition to respond in a consistently favourable or unfavourable manner to some concept, situation, or object. Beck (2005) says that cognitive inconsistency occurs when an event is perceived to be different from an expectation. Such inconsistencies may be arousing and may induce attitude change. In the present study, attitude towards college/study centre refers to the opinion or general feeling the students have towards their college/study centre depending upon the consistency or inconsistency of events with their expectations.

STATISTICAL TECHNIQUE USED

Statements of the AMS were coded and arranged. Then, the t-test (Garrett, 1981, pp. 243-245) statistical technique was used to investigate the different hypotheses.

DESCRIPTIVE ANALYSIS OF QUESTIONNAIRE

Analysis of the questionnaire revealed that 177 TES students out of 200 cited "fear of loss of image in family and society" as one of the major motivations to study many hours to clear the exam successfully. But no such fear was found among OES students; instead, these students wanted to successfully complete the course for their satisfaction and for future career advancement. Students of both systems acknowledged the importance of higher education in achieving elevated career and social growth, but, surprisingly, a majority of students from both education systems emphasized that clearing the examination was more important than enhancing their conceptual understanding of the subject matter

(76% under TES and 93% under OES). The majority of OES students (71%) cited various excuses (lack of time, inaccessibility of tutor and peers to solve doubts, problems with course material, *etc.*) for not being able to study regularly. Similarly, 91% of OES students were dedicated to fulfilling their job and family responsibilities, making learning secondary.

RESULTS AND DISCUSSION

Overall, the present study concludes that there is significant difference in the levels of academic motivation between TES and OES students. The results further show that TES students are more motivated than OES students. On all dimensions, TES students have scored higher means compared to OES students. Students of OES are found to be low on personal aspiration and study habits and less motivated, and they do not have much of a positive attitude towards their study centers. Differences in the means of the two types of students is greater in the study habits and personal aspiration dimensions. This suggests that regular classroom studies, regular teacher-student interaction, regular discussions among students, availability of library facilities, and so on help develop better study habits in TES students. Further, it can be concluded that due to the different social environment settings of the students, there are differences in motivation levels. TES students generally are more conscious about their family and society. Analysis of different statements suggests that parents and society play a major role in the academic decision-making process of these students. They feel it is important and prestigious to attain a good position in their studies.

On the other hand, OES students are self-reliant and are generally engaged in some other occupation. Their first priorities may be job, family, or other things rather than devoting regular time towards studies.

Their personal aspiration extends merely to passing the examination and obtaining the degree. This results in poor study habits. It is the intrinsic motivation which drives the students' will to learn in OES. It is also seen from the descriptive analysis of the questionnaire that a majority of students (in both TES and OES) have a superficial approach to learning habits. The AMS statements used in this research have integrated the factors explained by Kawachi (2006). Analysis of the questionnaire shows that OES learners have lower average scores on these factors compared to TES learners.

It can be concluded that extrinsic motivation is not prominent in OES students. On the other hand, extrinsic motivation is an important factor along with intrinsic motivation in TES students. Beck (2005, p. 257, 264) has stated that anxiety and frustration are strongly motivating.

This study concludes that there are lower amounts of anxiety and frustration in OES students with respect to their learning habits. The reasons for lower frustration and lower anxiety are mainly related to the immediate results that TES and OES produce. TES students see immediately the results of their studies as their degrees make them eligible for various competitive exams and job opportunities.

Thus immediate rewards are associated with effort by the students of TES. On the other hand, for a large section of OES students, no such immediate reward is perceived as most of them are preengaged with other commitments.

The following conclusions can be generalized.

- TES students show better study habits as there are immediate rewards and punishment.
- TES students have more regular study habits mainly due to their regular classroom teaching and peer interactions than OES students.
- The academic environment in TES colleges has a positive motivation on these students compared to OES students.
- Extrinsic motivation has a greater and immediate effect on the motivation level of TES students. Intrinsic motivation is a governing factor in the accomplishments in OES. Since extrinsic motivation is not as valuable for the students of OES, their overall motivation level is low.
- Gender-wise analysis shows that the motivation levels of male and female students of one system compared to the levels of male and female students of the other system differ significantly.

We see that OES students are low in extrinsic motivation, which results in an overall lower motivation level. The difference in the levels of motivation between students of TES and OES is significant. To increase the extrinsic motivation level, recognition and worth of the degrees obtained from OES should be increased. The importance of extrinsic motivation has also been acknowledged by Hartnett et al. (2011) in their recent research: "While intrinsic motivation constituted an important part of students' motivation to learn in the contexts described here, identified regulation (*i.e.*, recognising the value and importance of the activity) was also important."

Policy makers are gradually increasing the worth of degrees procured under OES by making these degrees eligible for students to appear for job interviews and write various competitive examinations. This trend is also evident from the fact that, these days, various advertisements published by institutions/universities offering courses through distance learning are highlighting the equivalence of these degrees to the degrees of TES as far as eligibility for competitive examinations. This can be said to be a step in the right direction but it is also true that such degree holders must be capable to stand at par in knowledge and skills with the students of the traditional education system, which is why the evaluation process of OES becomes important to assure quality.

Facilities at the study centers should be improved and involvement of students in the academic process should be increased under OES to develop positive attitudes towards their education system. The role and intervention of tutors along with peer interaction are of paramount importance in developing motivation among students to learn.

The basic natures of the two systems are different and so require altogether different approaches to run and manage the education process. The traditional education system depends more on verbal communication and methodologies

to impart education thus making it quick and having an immediate effect (in the form of immediate rewards and feedback). On the other hand, the education process of OES is largely completed through written or other media communication involving distances and depends upon many intermediaries. Consequently, the types of skills required in faculty members, students, and administrative personnel are significantly different in the two types of education systems. Administrators and faculty members of OES should be able to design study materials in a way that is effective and easy to comprehend by the students. The importance of administrative roles increases in OES so that course materials and feedback/evaluation are available to students on time and records are updated continuously and correctly. The role of administrators and tutors can also be stretched to keep track of failing students and to guide them towards successful completion of the course by sending motivating letters.

Research can be undertaken to investigate if there is a positive relationship between the personality traits of students pursuing education through OES and successful course completion. Such traits, if any, can be identified and used to formulate policies and strategies for effective governance of OES. Registration and entrance tests may contain a few questions or statements designed to help judge the personality traits of prospective candidates seeking admission to OES courses. This may help in formulating strategies and policies to reduce the dropout rates. The time required to complete a syllabus should be known to OES students beforehand to make them aware of the time and energy they need to put in for successful completion of the course.

In summary, enhancing infrastructure facilities, increasing the worth of degrees, increasing the roles of tutors, and increasing familiarity with technology and administrative correctness and innovation are paramount in OES to lessen the motivation differences between the students of the two systems.

NONFORMAL LEARNING

Non-formal learning is a distinction in learning between formal and informal learning. It is learning that occurs in a formal learning environment, but that is not formally recognised. It typically involves workshops, community courses, interest based courses, short courses, or conference style seminars. The learning takes place in a formal setting such as an educational organization, but is not formally recognised within a curriculum or syllabus framework

Introduction

Non-formal learning normally occurs outside of traditional educational or training institutions and is not formal recognised by way of certification or a qualification. It can take place in the workplace or community and is initiated by either an individual or is a by-product of organized activities that have structured objectives and timeframes. Non-formal learning sits in between and overlaps formal and informal learning and is increasing recognised alongside the concept of life-long learning by the OECD, EU and employers around the world.

Non-formal Learning: A Definition

Non-formal learning occurs in a planned but highly adaptable way, in institutions, organizations, the workplace and situations outside the spheres of formal or informal education. It shares with formal education the characteristic of being mediated, but the motivation for learning may be wholly intrinsic to the learner.

Examples of non-formal education include continuing education courses, organized field trips, museum visits, and structured programmes developed by organizations such as the Boy Scouts.

The learner's objectives may be to increase skills and knowl edge, as well as to experience the emotional rewards associated with increased love for a subject or increased passion for learning.

Characterisations

Non-formal learning can be characterized as follows:

It normally takes place outside of an education or training institution and typically does not lead to certification or qualification.

It is however, structured in terms of learning objectives, learning time or learning support.

It can be undertaken by the individual or be part of an organized activity that occurs within the workplace or community.

Non-formal learning is intentional from the learner's perspective.

History

The debate over the relative value of formal and informal learning has existed for a number of years. Traditionally formal learning that takes place in a school or university and has a greater value placed upon it than informal learning, such as learning within the workplace. This concept of formal learning being the socio-cultural accepted norm for learning was first challenge by Scribner and Cole in 1973, who claimed most things in life are better learnt through informal processes, citing language learning as an example. Moreover, anthropologists noted that complex learning still takes place within indigenous communities that had no formal educational institutions. It's the acquisition of this knowledge or learning which occurs in everyday life that has not been fully valued or understood.

This led to the declaration the by OECD educational ministers of the "life-long learning for all" strategy in 1996. This includes 23 countries from five continents, who have sort to clarify and validate all forms of learning including formal, non-formal and informal.

This has been in conjunction with the European Union which has also developed policies for life-long learning which focus strongly on the need to identify, assess and certificate non-formal and informal learning, particularly in the workplace.

Countries Involved in Recognition of Non-formal Learning (OECD 2010)			
Austria	Denmark	Italy	South Africa
Australia	Germany	Korea	Spain
Belgium	Greece	Malta	Slovenia
Canada	Hungary	Mexico	Switzerland
Chile	Iceland	Netherlands	United Kingdom
Czech Republic	Ireland	Norway	

Formal, Informal and non-Formal Learning

Although all definitions can be contested this article shall refer to the European Centre for the Development of Vocational Training (Cedefop) 2001 communication on 'lifelong learning: formal, non-formal and informal learning' as the guideline for the differing definitions. Formal Learning: learning typically provided by an education or training institution, structured (in terms of learning objectives, learning time or learning support) and leading to certification. Formal learning is intentional from the learner's perspective. (Cedefop 2001)

Informal Learning: learning resulting from daily life activities related to work, family or leisure. It is not structured (in terms of learning objectives, learning time or learning support) and typically does not lead to certification. Informal learning may be intentional but in most cases it is not-intentional (or "incidental"/ random)(Cedefop 2001))

Validation

Many countries within the developed world are suffering from declining birth rates, ageing workforces and skill shortages. To address these issues within their labour markets, both the OCED and EU have been acknowledging and focusing on the processes of formal recognition for both non-formal and informal learning. This recognition states that all learning is of value and that non-formal and informal learning are equivalent to formal learning. This validation or measuring the value of lifelong learning requires a process whereby individuals have their overall skills they have acquired formally acknowledged. This would require systematic documentation for non-formal learning within the workplace or youth organizations, coupled with recognition within the relevant industry for this form of non-formal learning. Moreover, within higher education or universities that non-formal learning is accepted as a formal knowledge within the relevant specialist field. Both the UK and Australia higher education institutions and universities now accept and grant non-formal learning as credit towards a qualification.

Cedefop has created European guidelines to provide validation to a broad range of learning experiences, thereby aiding transparency and comparability across its national borders. The broad framework for achieving this certification across both non-formal and informal learning is outlined in the Cedefop European guidelines for validating non-formal and informal learning; Routes from learning to certification.

Different Countries Approaches

There are different approaches to validation between OCED and EU countries, with countries adopting different measures. The EU, as noted above, through the Cepofd released European guidelines for validating non-formal and informal learning in 2009 to standardise validation throughout the EU. Within the OCED countries, the picture is more mixed.

The Future

With increasing demand for a highly skilled workforce and the movement towards an knowledge economy, recognition of non-formal and informal learning shall become important tools as governments adapt to these demands. This is linked to the 'lifelong learning for all' agenda of the OECD, that is reshaping how we learn to better match the needs of the 21st century knowledge economies and open societies.

3

Usefulness of Web-Based Tools for Teaching and Learning

USEFULNESS OF WEB-BASED TOOLS FOR TEACHING AND LEARNING

We were also interested in the attitudes of these college instructors about Web-based instructional tools, resources, and activities.

As a result, the respondents were asked to rate the degree of usefulness for items categories:

- Online Class Tools.
- Collaboration and Sharing Tools.
- Instructional Activities.
- Web Resources.

After rating each item as low, medium, or high usefulness for online teaching and learning, the instructors were also asked whether they in fact used that item in their courses.

Useful Online Class Tools

In general, these college educators perceived high utility for most of the online class tools considered in this part of the survey. Perhaps more importantly, at least one-third of the respondents actually used each of the items in this category. Not surprisingly, respondents tended to rate the tools that they actually used as more useful.

The highest rated tool was for posting syllabi online. Not only did 72 per cent of the faculty respondents report this feature as highly useful, 85 per cent actually used such a tool in their courses. These findings also match the Web-based Education Commission report, which documented the increased posting of course syllabi to the Web and incorporation of Web resources within college instructor syllabi. Of course, many of our survey respondents were selected for this survey because they had already posted their syllabus online.

The fact that more use this type of tool than rate it as highly useful indicates it is relatively easy to do. The large number of respondents using tools to post their syllabi online reveals an initial area of penetration for the Web in college teaching and learning. For example, the University of Michigan School of Information has compiled a list of faculty course syllabi and placed it online. Similarly, the UCLA Humanities Department created the E-Campus for syllabi, assignment announcements, and other course related links. However, as indicated earlier, the most complete listing of college syllabi to date is located at the World Lecture Hall. This site hosts syllabi across disciplines for college instructors worldwide. A tool for posting cases, questions, or problems corresponding to course material on the Web was the next most valuable courseware feature of these early Web adopters.

Not only did 70 per cent rate this survey item as highly useful, but nearly 70 per cent also had engaged in such online activities. In fact, only 4 per cent rated this item as low in perceived usefulness. These college instructors also valued file uploading and downloading tools. Sixty-five per cent of the respondents felt they were highly useful, and 71 per cent had used such tools in their teaching. The next highest rated item in terms of usefulness was an online lecture notes utility, which was rated as highly useful by 57 per cent of the respondents and actually used by 69 per cent of them.

Once again, this indicates that while faculty members might view different tools as more useful, they generally rely on readily accessible tools that perform a useful function. Such findings also signify that online tools for posting lecture notes, cases, and syllabi are among the first wave of Web-based instruction courseware. In contrast, online databases received high ratings for usefulness from 51 per cent of the respondents but only 44 per cent were using such a tool. Perhaps such tools are not yet available to the degree that college instructors would like. Once a course is on the Web, there must be some student evaluation and assessment. Indeed, some scholars advocate the use of the Web for online testing and evaluation as a means for reducing costs and increasing speed.

In addition to quick and cost effective feedback, online evaluations provide more organized, individualized, and plentiful course feedback. Despite these benefits, Hmieleski and Champagne report that 98 per cent of the most wired schools still use pen and paper course evaluations. Among the early Web-adopting faculty members of this study, however, 52 per cent rated student online evaluation tools as highly useful and 48 per cent were actually using such tools. Online quizzes or tests were deemed highly useful by 47 per cent of

respondents and nearly the same per cent were actually using online exams in their teaching. One in five respondents gave a low usefulness rating to such tools, however.

Receiving even lower support was online student evaluations of course materials. Only 41 per cent rated these as highly useful, while just 36 per cent used such tools. Most of the findings are consistent with the research from Peffers and Bloom which found that online instructors tend to rely on common software such as e-mail, file uploading and downloading, and asynchronous conferencing as well as simple tools for posting static or dynamic syllabi, Web links to course material, and lecture notes. Significantly fewer instructors used chatrooms, multimedia lectures, online examinations, animation, and video streaming.

However, this research also revealed that the instructional impact of Internet media tools in college settings is expected to dramatically increase in the next few years. Firdyiwek's review of courseware tools indicates that few such tools support pedagogy in an integrated fashion. As tool development proliferates, so, too, does resulting confusion about how to effectively use these online tools. Interestingly, in this study, only 49 per cent of respondents were highly supportive of tools to place their entire courses on the Web and 47 per cent were using such tools. Could such modest numbers among early Web adopters be due to the lack of pedagogical support in these tools? Or does it reflect a lack of time or training? Perhaps these early Web adopters simply do not want to give up traditional instruction. Or perhaps they rely on customised courseware tools. Whatever the answer, this seems a ripe area for additional research.

BASIC PRINCIPLES OF LEARNING AND THEIR APPLICATION TO TEACHING

General Agreements Concerning Learning Process

Although opinions differ regarding the many aspects or learning—how it takes place, what the best means of promoting it are, and many other matters pertaining to it, it is an accepted fact that learning does take place. That learning does take place is universally and unanimously agreed. Learning occurs in and out of school in all working hours, and is continuous from the birth until the death of any normal individual. Psychologists have come to agree that trial-success learning, conditioning, and insight are valuable as phases of the learning process if and when they are used appropriately. It is certain that all learning has to do with change going on within the organism. How these changes are facilitated depends in great measure upon the goal or, the purpose of the learner and the differentiation and integration of the factors of learning, situation that make possible the attainment of the desired goal. The achievement of worthy outcomes, whether these be the forming of connections or habits, changing behaviour, or the developing of insight or understanding, is not dependent upon

the realisation of any one point of view of learning but upon the application of the principles that fit a specific learning situation. Although each of the different theories gives somewhat different explanations of the learning process, they have ail certain elements in common. From the different studies and theories formulated were developed general principles governing, learning which are fundamental to teachers and teaching. No one theory accounts for all the problems and facts of learning. A student of education should be critical of the extreme claims of any one school, remembering that each probably has some valid contribution to make to learning and to the attainment of knowledge, in general. However, if the different theories are properly analyzed they will give us a good account of learning as essentially identifiable with the process of growth. In other words, the different theories of learning point to one important goal—that is, growth of the child in terms of integrated knowledge or behaviour, understanding, skills, and attitudes. They are essentials and tools to the child's growth and development.

Basic Principles of Learning

The concept of new learning may be better understood if explained in terms of learning principles rather than in a set of laws or fixed methods and procedures. From the different studies and theories formulated were developed general principles governing learning which are fundamental to teachers and teaching. Some of the guiding principles of learning which are fully well established and quite important in teaching are the following:

1. Learning is an Active or Dynamic Process

Learning takes place only through self-activity. This statement is based on the theory of self-activity by Froebel—that one learns only through his own self-activity. A child learns to do a thing by actual doing, not by memorising the rules or by watching others. In other words, we do not learn singing, oratory, or painting, by standing as passive witnesses. The individual learns exactly the reactions he practices, or he learns what he experience. It can be stated, therefore, that the learning process is essentially experiencing, reacting doing, and understanding. The recognition of the principle of self-activity shifts the focus of thought from external factors to the learner himself. The principle does not demand activity alone, but all-sided activity of the whole self. The principle of self-activity is the great and fundamental principle in all education. Self-activity is a requirement of all learning and of all mental physical, emotional, and social growth and development. The, speed is in direct proportion to the amount of activity that is aroused during the process; hence, it can be established that action promotes learning. This principle requires that pupils should participate in planning, executing, and evaluating tasks. It is on this fact that activity programmes in schools are based. To be effective, learning must be an active process regardless of the philosophy of the school, whether progressive or traditional. Directing pupil-learning experiences is the teacher's major

responsibility. The creative teacher will never be so naive as to assume total responsibility for formulating, explaining, and illustrating the so-called learning experiences. As a general principle, it can be said that learning is best when it utilises the theory of self-activity. Learning is an active, dynamic, and adjustive process.

2. Learning is a Process of Integration

Learning is best when integration occurs in the learning process. Integration, is a process which operates in the unifying of separate items into a perceptual whole. Through integration, related experiences are organized or tied together into bonds of greater meaningfulness. It includes the ability to perceive similarities and to organize dynamic system into a unified whole. Some learning products are themsevles an integration of similar elements. However, it can be said that integration alone is not the whole of learning. Analysis, as well as synthesis, is essential in learning. Integration take place concurrently with differentiation. Integration and differentiation are not independent processes that operate separately without regard to the other process. Differentiation is one part of learning—a kind of preparatory process during which the learner is engaging in the process of integration. The function of differentiation is to distinguish meaning from parts or situations in order to promote understanding. Discovering relationships between the situations is an important aspect of the integrating process. The more effective the integration, the more functional will the learning be. The teacher must select appropriate learning experiences of the pupils to associate learning into a larger and larger whole. Learning tends to unify individual experiences because the learner acts as a unit in his learning. Past experiences help by furnishing organized materials, concepts, meaning, and relations through the process of integration.

3. Learning is a Process of Growth and Not Apart from Development

This principle is based on the philosophy of John Dewey "that education is growth" and on Gestalt's theory "that learning is a process of development." Learning is one kind of growth which involves progressive improvement in behaviour and which results from experience and maturation. Growth is a product of the interaction of the organism with its environment. The child grows as a whole, as a unified organism, as an individual in a world of things, people, and ideas. Education and learning are aspects of growth. The task of the teacher is to, stimulate and to direct growth in physique, mentality, emotional control, and social personality. Modern psychology holds that the growth of the child from birth to adulthood is a continuous and gradual process that cannot be divided into separate stages. Development therefore is not a uniform process that is general in character but rather the composite of the whole series of specific growth processes. Thorndike stated that the capacity to modify response is a general characteristic of a whole life process and that the capacity is continuous throughout adult life with only a slight lessening in degree.

4. Learning is Goal-Seeking or Purposeful

Purpose or goal is essential to all effective learning. Goal-seeking is one of the dynamic factors in learning. Real learning takes place only when the learning situation fills a need to satisfy a purpose of the learner and goals that constantly give direction and destination to the learning activity. When the learner has a knowledge and understanding of the goals to be achieved, he will know how to direct his energies and attention to realize them. Goals which are clearly stated and defined improve both efficiency and motivation. Learning, to be effective, must be related to needs, wants, interests, and desires. Each normal child is capable of learning anything which is related to the attainment of a personal goal.

This goal can be the object which serves to satisfy some psychological drive, or it may be merely the attainment of some situation possessing secondary value. Both the teacher and the pupils should have knowledge of the goals to be achieved in any learning situation. It is, therefore, necessary for the teacher to do her utmost to make the goal evident whenever possible. The goal, in order to be most advantageous, should be purposeful. Goal-seeking is a legitimate aspect of learning. Purposeful learning is more rapid and effective. Learning becomes more rapid and the resulting attitude becomes stronger when the purpose, of the learner is more intense. This is a recognised principle of learning. Unless learning is purposeful, it will be of little value to the learner. To be in keeping with the fundamental fact that learning is goal-seeking in nature, the purpose should be clearly defined and stated precisely. Kilpatrick regards purposeful-activity as the essential basis of intellectual life and as the foundation of intelligent learning. Likewise, Mursell insists that the purpose for which anything is learned must always become apparent in the learning. Pupils learn most effectively when they are engaged in-purposeful tasks that will lead desirable satisfactions after the goals shall have been attained. Half-hearted learning, learning without push and thrust, can never yield authentic results.

5. Learning is Creative

Creativeness is defined as the ability to express oneself through writing, the arts and crafts, music, or other media of expression. Under this concept all children are endowed with creative ability to some degree, and this potential is capable of development through learning experiences favourable to creative expression as a desirable aim of education, and strives to guide children into learning situations which will stimulate creative thinking and doing. Learning is affective when the child is free to create his own responses to the situation he faces.

This creativeness is a characteristic of all human learning regardless of the inherited capacity of the individual facing a life situation is the primary unit in the learning process. When the individual is free to make his own originality, then and only then will creativeness be possible.

6. Learning is a Process of Discovery and Exploration

Learning achieves effective results by a process of exploration and discovery. It starts with the desire to reach a solution. It proceeds by an experimental, intelligible, varied attack in the endeavor to achieve the wish for solution. It must be remembered that learning is not caused by brute repetition. It has been shown experimentally that the degree of learning achieved has surprisingly little' relationship to the number of repetitions. Learning then, is an affair of discovering arid seeing the point that one wishes to know. The best learning anyone ever does is accomplished by exploration and discovery under the urge of strong desire. It is unsound educational practice to organize learning simply for the sake of bringing about more repetition, such as trying to make children put in more time going over and over their assignments.

7. Learning is Understanding

Purposeful and functional learning is well aided by meaning and understanding derived from experience. The meaning attached to any situation comes from experience related to it. This principle calls for the use of the pupil's past experience or background in learning. All learning should go on in meaningful situations and should point towards results in terms of understanding and clarification of meaning. Whenever learning goes on effectively, its outcome is control brought about by an understanding of intelligent response.

The teacher should always try to help the learner to achieve the best possible understanding. Likewise, learning should be organized so that the outcome will be understanding. History is best taught when everything is pointed towards helping the child to some real understanding, however, limited of the interplay, sequence, and significance of past events. Similarly, mathematics is best taught when everything is pointed towards an understanding of spatial and numerical relations. Often, it is discovered that the teachers are asking pupils to study materials for which the latter lack essential experimental background to make understanding possible. In the absence of direct experiences, the teacher may provide indirect experience to make the learning situation meaningful.

8. Learning is a Social Process, Integrating Self with Environment

Learning is best when it is made a social process, integrating self with environment. In varying degrees each person influences others, and vice-versa. This basic principle is based on the philosophy of Spencer—"that education is a social process and should therefore aim towards individual development and social efficiency." The true principle of learning can be evolved from an analysis of the meaningful relation of the learner and the materials of learning to the situations in which learning usually occurs. Effective learning requires a rich environment, replete with experiences. The child needs play, constructive manual activities, aesthetic activities and social activities, including the study of social life in all its aspects. Effective education furnishes the controlled environment for favourable growth and development. Environment influences the extent to which potential is realized.

9. Learning is Transferable

Good learning transfers. This privilege states that the teaching effectiveness is improved by selecting learning experiences similar to life situations in which learning takes place. The rules of transferability apply to making learning functional in life as well as making it functional in the out-of-school life. The nearer school life is to real life, the more surely will the good reaction transfer to life. Transfer is always the hope and invention of learning. Indeed, there is no sharp distinction between transfer and application. If one cannot play, use, or transfer what is supposed to have been learned, then surely that learning is a failure. Conversely, if one can transfer, use, or apply what one has learned, this is the best proof that learning has taken place. The failure of transfer means the failure of learning. Transfer depands on identical elements that are comprehended; that is, upon meaning. The deeper and more comprehensive the meaning is, greater also is the transfer of learning. Rich meaningful learning transfers by its own momentum. Teaching for transfer must be concerned with the kind of responses desired and the areas of living in which their use is anticipated. The teacher is the motivating force in effecting transfer of learning to pupils. Likewise, the teacher has the responsibility of selecting learning materials and methods of teaching that will bear some resemblance to later use. If transfer is to be accomplished, then both the teacher and the learner must meet some responsibilities.

10. Learning Depends on Context

The effectiveness of learning depends largely on its context. A good context for learning, must be one with which the learner dynamically and strongly interacts. It must engage his interest, his will, and his active purpose. The acquisition of a concept requires a context of actual concrete experience. The real point of concrete experience is when it given the learner something to work and experiment with, something that can command his will and energy, and still keep his processes under control. Modern teaching makes a great deal of the principle of context, and one of its greatest contributions is the discovery of the ways and means of applying the principle in the best possible way. Such teaching is often considered different in kind from the routine of the textbook assignments and recitations which are the staple organization of the conventional school.

Self-Activity the Basis of All Learning

The preceding study of learning activities emphasised the importance of self-activity on the part of the learner. There is a great need for activity in effective learning. However, too much emphasis cannot be placed on the importance of activity in the learning process on the fact that learning is promoted by action alone, for the speed and the precision of learning becomes most effective only in direct proportion to the amount of activity that is aroused during the process.

In other words, speed, precision, and permanence of learning will be enhanced in proportion to the amount of activity aroused in the process. This implies that the learner must be active and must participate in as many ways as possible in the learning activity. The learning task assigned must challenge his interest and elicit the learner's cooperation. Mere seeing, hearing, and reading are not sufficient but they are all helpful forms of action. The learner must think and express himself as often as possible. Distributed effort, overlearning, memorisation, active recall and the making of applications stress the importance of activity. There are varying degrees of activity. Listening to a lecture is an activity, but experiencing, reciting, and discussing Activity does not necessarily involve muscular movement. One can be 'mentally' active as well.

When we say that the pupil should be active in the learning process, we mean that there should be a large degree of involvement of the child's total personality. Greater pupil activity may be accomplished by pupil participation in planning the curriculum or the unit to be learned. Discussion and conversational methods are means of implementing pupil activity. The experience unit is increasingly being used to add meaningfulness and activity to learning. Whether the teacher adopts the unit-approach or subject matter approach, he can expand pupil activity through field trips, excursions, and visit to courts or business and industries. Projects which involve construction have been formed to make pupils more active. Learning at its best is the process of discovering by one's self. It is an active end a continuous process. Learning proceeds rapidly in direct proportion to active participation. The teacher plays an important part in the educative process by furnishing the conditions that stimulate the desired physical, mental, social, and emotional experiences. His problem is to determine the different activities essential to the attainment of the goals or objectives of the classroom experiences and then to supply the conditions best adapted to bringing about the desired self-activity on the part of the pupils. It is important that such learning situations should provide for individual differences and the teacher should also take into consideration the associate and concommitant outcomes likely to result also from the classroom activities.

Methods of Self-Activity

The ideas underlying activity teaching are not new. At the present time activity teaching is practised by people with varying points of view and varying degrees of understanding. Regardless of different interpretations, it is a revolt against the mere passive learning from books which has characterised so much of our school work in the past. Activity teaching places less emphasis upon memorising and...less on merely accumulating facts and more on understanding facts collected, less-learning through coercion and more through genuine interest. It emphasises the importance of needs and interest, not only in the work at hand', but interest in improvement, and the acceptance of the work as significant to the pupil's needs. "Self-activity, in the sense of ability to educate oneself, should be an objective of all teaching. Self-activity must be made a definite objective, and the pupil, under proper guidance, must be given experience in using the

means that make self-education possible. In order to develop independent ' ability to learn, self-activity must be exercised. It is necessary also to develop those intellectual interests which make further enrichment of intellectual life a dynamic want. Extreme coercion is antagonistic to the development of interest as well as independent ability. Independent ability is only realized when it is made a special objective, when pupils are gradually thrown upon their own responsibility and guided in their efforts to utilise fruitful technique. In every method, then, provision should be made for giving as full play to the pupil's eshevity as his ability and attitude will justify. Self-activity particular method and it should be a definite objective of all teaching methods.

Importance of Self-Activity in Thinking

The principle of self-activity is of particular importance in teaching pupils to reason. Pupils will only learn to think reflectively by going through experiences of reasoning. Too much of our school work is mere repetition of what has been read or heard and involves little real thinking on the part of the pupils. Reflective thinking results in the solution of a problem or from dealing with a situation in which pupils must use...or facts as found in the problems or situations. The activities in which pupils must engage in order to think through the solution of a problem or situation must be of a kind to give meaning to the factors which must deal with an understanding of the relationships involved. Training in reasoning involves more than just the activities necessary to solve certain kinds of problems or situations. It should also include a critical evaluation of the mental processes used by the pupil to the end that he may critically plan the steps of his thinking process. Thus, significance of the steps of the inductive and deductive reasoning process. In addition, the classroom teacher should make his thinking situations in school approximate as nearly as possible the situations of everyday life. Class experiences furnish thinking situations insofar as they provide opportunities for getting meanings, evaluating, comparing, estimating, generalising, and organizing materials and relationships, *etc.* Every subject in the curriculum should contribute its share to the training in reflective thinking, thus accomplishing the instructional function.

Importance of Self-Activity in Acquiring Specific Motor Abilities

In acquiring specific motor abilities, it is necessary that the pupil experiences each of the sets of muscular movements essential to the development of the ability. Verbal directions, demonstrations, or various kinds of illustration may held in guiding the trial-and-error of the learning process, but actual doing and repetition are essential to the mastery of the ability. For example, in learning how to write, or how to type, the learner must experience the feeling of correct movement, and through repetition, learn to recognise and to make the desired movements. This requires concentration on the part of the learner while he goes through the trial-and-error process.

Generally, in learning a motor activity, attention must be placed upon the movement as a whole or on the results obtained. The principle of self-activity also emphasises the need of having the learning situations approximate as nearly

as possible the situations on which the motor is used. In learning to write, for example, experimentation shows that any attempt to teach the whole arm movement to the exclusion of the finger movement, overlooks the fact that some finger movement is used by all writers. Such instruction ignores the practical application of writing in every life.

Importance of Self-Activity in Acquiring General Adaptive Abilities

The principle of self-activity also applies to the acquisition of all adaptive abilities. The importance of the principle is obvious in learning to express one's ideas and feelings. For example, no high school student will expect to become a good public speaker or debater without considerable experience in appearing before an audience. Fluency in the choice and use of works, whether in speaking or in writing, comes only with correct practice in doing the necessary things—in this case, selecting the appropriate words to express the ideas and feelings to be conveyed. The principle of self-activity applies also even where one chooses to express his ideas and feelings through artistic channel such as painting, drawing, music, *etc.* Pupil activity is a term of particular significance because it implies the necessity of physical, sensory, and mental reactions in understanding, and acquiring abilities, new meanings, idea, relationships, attitudes, interest, ideals, *etc.*, and in expressing and conveying meanings, feelings, and ideas to others. Class exercises then must furnish the physical, sensory, and mental experiences, essential to the attainment of the above-mentioned results. They should be real activity periods instead of period of mere- "lesson-learning" or recitation of learned materials.

Importance of Self-Activity in Giving Mental Association (Memorisation)

Closely related to the process of acquiring mental ability is the process of memorising associations. Under this type of learning maybe included the memorisation of dates, the mastery of addition and multiplication tables, the learning of vocabularies, *etc.* Here, the best school procedure requires primarily an understanding of the meaning and importance of the associations to be learned. Meaning facilities memorisation, and meaning is acquired only through selfactivity appropriate to the particular association to be learned. Thus, in learning the meaning of multiplication, it is not enough for the child to say 2 X 3 = 6, nor to be able to say 6 when he sees 2 X 3. He should go through the experience to understand that 2 X 3 means taking 3 things 2 times before he memorises the association. Experience with concrete things will help the child through the mental experience which is essentially a part of self-activity. To be effective, the learning situation should approximate as nearly as possible the situations in which the associations are to be used in life.

Importance of Self-Activity in Acquiring Emotionalised Learning Products

In learning to enjoy, the responses of enjoyment are just as essential as in any other types of self-activity. Whether it be literature, music, declamation,

oratory, sports, the elements which bring about the enjoyment of these activities must be experienced before the learner discovers the possibilities of enjoyment in these experiences. While it it true that the factor enjoyment comes as a result of these leisure-time pursuits; nevertheless, other elements furnished through understanding situations may add materially to the enjoyment. For example, in reading literature, a number of elements may add singly or in combination, make the reading enjoyable. Thus—rhythm, choice of words, action, plot, character, setting, *etc.*, are elements which the pupil needs to experience in order to find out what there is to enjoy. Without these experiences necessary to discover the possibilities of enjoyment, little progress can be made in the acquisition of emotionalised learning activities. While the foregoing point of view may be acceptable theoritically, we must be sure that the pupils are actually enjoying these experiences in actual practice.

The Importance of the Whole-Method in Learning

Most learning situations consist of an organized pattern of objects or events. Such units ought to call for an organized pattern of response. These facts had led us to ask whether it is more fruitful to handle a learning situation as though it were a single, unit, or, whether the whole situation ought to be divided into parts. The experiments conducted by Seagoe in the geld of whole versus part method has added to the general conclusion that the first method is more economical than the second under a great many conditions. This result holds true both from the standpoint of time consumed during the learning period and of the degree of retention at fixed intervals after the learning period has ended. Further studies made by Cronbach have shown that the whole method is superior to the part method only with respect to certain subjects. The literature suggests (a) that the more meaningful the material, the more efficient the whole method, (b) that the more efficient the learner, the more efficient the whole method, and (c) that learning of any sort is dependant to some extent on the magnitude of the unit to be comprehended. One experimenter found that the whole method was superior to the part method except when nonsense syllables and vocabularies were used as learning materials. Still another was able to show that the whole method was superior when the material to be learned was easy, rhythmical, and well unified. When the material was difficult and the time for learning was fairly limited, the part method was superior. It ought to follow that learning becomes more efficient in direct proportion to the meaningfulness of the material. Menringfulness often depends on the extent to which the learner can discover come sort of form or pattern that will unite many single items into a significant whole.

Learning by whole as compared to learning by the part method appears to depend upon differences in intelligence. According to Crow and Crow, “the part method appears to be best for learners who have a low I.Q.” It is also best for materials which are so difficult that the learner cannot grasp its general significance or get a general perspective over it. It follows that learners should

not be asked to meet learning situations which stand too far beyond their ability to organize or unify. The teacher should devise learning situations commensurate with the learner's level of maturation and comprehension. If it is true that the value of whole method lies in the extent to which meaning, order, or unity can be found in a situation, then learning tasks which are too long ought to be broken up into parts. There are several studies which show clearly that, as a piece of poetry is increased in length beyond the power of the learner to grasp it as a unit, the time required for learning increases rapidly. In general, it has been found that any material which requires more than twelve to fifteen minutes in a single reading can be learned more quickly if it is divided into parts.

The value of learning by whole method has been utilised in many recent changes in teaching methods. The assignment of a project, for example, has this advantage that it continually relates parts to unitary whole. More emphasis is being rightly placed on lesson assignment and even on rote-learaing tasks that are complete units. Students who write summaries of chapters just studied do better than those who spend the same amount of time in mere reading. Outlining a chapter is an aid to learning because it enables the students to learn parts in relation to the whole. The whole method helps the learner to get a broad outline of meaning and to see relationships in the material he is learning. Individual differences of ability among students and the type of material used in a class ought to determine the balance that shall be struck between the whole and the part methods of learning. Here, more than almost anywhere else, the learning task must be made suitable to the learner and the type of material to be learned. If the teacher is aware of the effectiveness of the whole method in most learning situations, he will develop his plans of teaching accordingly. It may be said that there is some evidence that whole learning has a more important place in modern education than it currently fills. With the emphasis on meaning and problem-solving in the present day goals of education, the greater values of relationship in whole learning are to be sought in teaching.

New Learning and Its Implication

The fundamental concept of new learning is that! the child is one whole organism whose various phases of behaviour must receive attention if he is to emerge as a desirable social individual. In other words, not only must his mental development be looked after, as was true with the traditional way of teaching, but his physical activities, his social relationships, and his emotional adjustments must also be developed to make him a worthy member of a democratic society. These aspects of his behaviour are not to be developed separately in simultaneous compartmentalised installments, but as parts of larger experiences. New learning gives the pupils what they need as the occasion demands. The learning is thus more permanent and meaningful. New learning calls for application of facts learned to actual situations to complete the teaching pattern and to make learning meaningful. This meeting of truely problematic situations by the learner is one of the outstanding and decided-advantages of the modern over the traditional

way of teaching. Because learning problems are real, both the pupils and the teachers must think of ways to solve them. Teaching then will not be mechanically following a ready-made course of study which, although perpared by experts, may not meet the actual needs of a particular group or class. Experiences of the pupils and community resources are taken into consideration in selecting subject-matter to be taught or activities to be experienced.

Modern teaching not only aims to unify the behavioural aspects of the learner, but also invites him into the group to which he belongs. He acts upon the group, and the group acts upon him. This interaction which is most clearly seen in effective group planning, discussion, and evaluation, is one of the many excellent features that characterise modern teaching. There is nothing more vital in the learning experience of a child than the way he gets along with the members of his group. It cannot be denied that many facts learned in the classroom are forgotten, especially when done in parrot-like manner, but the human relationship fostered by group planning, discussion, and evaluation will not fail to make its influence felt in democratic citizenship.

The pupils would be learning the ways of democracy by actively living democratic lives in which they may ask questions, make suggestions, express opinions, *etc.*, without fear of being scolded and reprimanded. Democracy carries with it a further implication. It means the enhancement of the individual child's personality by allowing him to grow at his own rate without having this growth forced upon him. Each child must be accepted as he is—which means that academic achievement will no longer be measured by only one yardstick. To the child and the teacher—the social, mental, physical, and emotional aspects of the learner's development are equally important. Because of this reassuring attitude towards each pupil, the former traditional situation which used to be dominated by fear and tension to longer exists, and the pupil acquires self-respect, dignity, and a consciousness of his worth as a contributing member of the group in an atmosphere of love, understanding, and appreciation.

New learning as a way of seeking the democratic socialisation of individuals is characterised by: (i) unifying all aspects of behaviour, (2) correlating school and community life, (3) group interaction, (4) emphasis on democratic living, (5) close cooperation between teacher and pupils, (6) recognition of individual differences, and (7) presence of love and understanding. The fundamental objective of new learning is to help the pupils or students to clarify, intensify, and interpret their life-like experiences so that they will be more intelligently self-directive when they encounter problem situations as citizens in our society. To obtain the greatest amount of good from their school experiences, boys and girls of all ages must have the opportunity to participate actively in the learning experiences The teacher's participate actively learning experience. The teacher's approach to the individual child and the group should be integrative rather than dominative. A dominative approach is defined as an attempt to one's own wishes by force, orders, attack or status.

The Role of the Teacher in Directing and Guiding Learning

This brief review of the concept of learning which is taking shape from recent research gives us a somewhat different conception of the several roles of the teacher. Since learning is an active process on the part of the learner, it is not possible for the teacher to learn for the student. In a very real sense, the teacher cannot make the student learn, but the former can have a tremendous influence on learning.

In the first place, the teacher can help stimulate or motivate the learner by bringing the latter to see the connection between the learning problem and some important need or interest of the student.

In the second place, the teacher can help the learner make those reactions which are to be learned. In some cases, the teacher can help the learner's reaction by demonstrating the desired behaviour, as might be done in teaching a physical skill, like writing. In other cases, the teacher may help the learner acquire the appropriate reaction by guiding his thinking through questions that focus attention on particular aspects of the problem which might otherwise be overlooked. Likewise, the teacher may guide the learner to react almost blindly to a given situation, but at the same time help the latter to eliminate the unsatisfactory reactions.

Furthermore, in the guidance of learning, the teacher may have a great influence by helping the learner get satisfaction from the right sort of reactions. As the desired behaviour is repeated over and over, adequate practice can be provided and progress made towards a high level of learning. This conception of the teacher's role in guiding learning implies that the teacher has clear objectives— that he understands what learning he is trying to help the students develop. Because of the many good things that could be learned and the small amount of time that can be devoted to schooling, not everything that might be desirable can be learned in school. Some selection must be made if the learning objectives are to be attainable. If the teacher is given effective guidance to learning, he needs to have a small number of clearly understood objectives towards which he works with students. This conception of learning also makes it apparent that the teacher cannot be effectively guided by a series of specific-rules.

Since each learner must himself be involved in learning, and since the meaning of the situations has for him determines what he learns, it is clear that the specific steps that might help guide one student would not necessarily be appropriate with another.

Hence, it is necessary for the teacher to utilise general concepts and principles of learning, rather then follow-some collection of specific teaching methods. Recent research on learning has shown that teaching can be made more effectively by approaching it as a task of intelligence, rather than of imitation. Knowledge of learning process can help us in selecting attainable objectives and in providing basic principles to guide our teaching. Results of research are opening up for our possibilities for greatly enhanced learning.

In directing and guiding learning, the following suggestions should be taken into consideration:

1. *The teacher can direct and guide learning by determining the kind of experiences which pupils are to have:* What experiences teachers should provide for pupils cannot be determined without considering the pupil's needs and the end-product, the nature of the pupil at the time as will as the educational objectives to be attained. But the only control the teacher has-over product is through experience. The teacher can never impose the product directly. It is the pupil, not the teacher, who is the active learner.
2. *The teacher can direct and guide learning, and consequently improve it by encouraging pupils to develop a method of attack in learning situations and to develop skills and attitudes that are often first steps in the attainment of certain end-products:* The arithmetic teacher leads the pupils in a process of discovering number relations which become tools in new learning. The science teacher must lead his pupils to develop the ability to reach science materials. The shop teacher stresses-skill in reading blueprints. All of these illustrations emphasise the point that the teacher should anticipate the learning of one kind of product at a later date by providing earlier, an appropriate process.
3. *The teacher can direct and guide learning by providing opportunity for self-activity:* It is generally accepted that learning takes place only through self-activity. In other words, a child learns to do a thing by doing that thing, or he learns what he experiences. A child cannot learn to read by listening or watching others read. He has to read in order to learn. This principle demands not activity alone but an all-sided activity of the whole self. Learning activity can be made more effective if the teacher would trust the individual as an intelligent, purposing organism by insight gained through self-activity.
4. *The teacher can direct and guide learning by using motivation:* This involves both managing the initial want or need or other conditions of learning which prompt the learner to become active in manipulating the goals, incentives, and objects which he desires to attain in order to satisfy the initial want or need. A student is motivated to learn if he is satisfying a need through the learning process or if he sees a connection between his needs and the learning task. Since learning is an active process, it needs to be motivated and guided towards desirable ends. Learning must be directed by goals since the development of goals is one of the important aspects of the direction of learning. It is important for the teacher to get the learner into a state of readiness, for it increases vigour and whole heartedness of learning. Theoretically, it is quite clear the learning will not occur in the absence of a motive or purpose.
5. *The teacher can direct and guide learning by being skillful in creating classroom experiences which provide optimum opportunity for*

practice: The pupils- should be provided with abundant opportunity to use skills, habits, and abilities they have developed. Much that is learned is soon forgotten if it is not practised or used. Many learning outcomes are achieved as a result of practice, drills, review, or re-experiencing. Through correct and intelligent repetition, associations become habitual, new insights are gained, or different meanings emerge.

6. *The teacher can direct and guide learning by managing the amount, kind, and distribution of practice:* Practice is an essential condition of effective learning. However, practice alone does not produce learning, but pupils do not learn without practice. Our present knowledge of how pupils learn tells us to use practice as a method of fixing and making precise or efficient those things which other learning procedures have led us to understand. For example, there is a place for drill in arithmetic and in reading, but it follows and should not precede the development of understanding of the processes to be learned. The teacher can control learning by presenting practice materials which are important in developing the skills, habits, abilities which pupils should be learning. The practice material should be distributed so that those skills, habits, and abilities are maintained.
7. *The teacher can direct and guide learning by providing for continuity in learning:* Experience is continuous in nature. The individual meets and interprets new situations in terms of previous learning. It has already been noted that learning with meaning depends in great measure on the continuity between novel learning situations which are provided and the previous experiences of the learner. Because continuity lies in the experience of the learner rather than in the content, any highly organized curriculum procedures, such as that based in textbook sequence, is questioned. The type of procedure which seems to be indicated is that of planning for continuity, the previous educational history of the group and of individuals within the group must be taken into consideration. Most important however, is the kind of experiences which have been provided for the child in previous years, the kinds of undertaking in which he has been involved, and the units of study which have been developed. These things differ from different groups and individuals from one year to the next. These things must be taken into account if even a semblance of continuity is to be provided, for the new experiences which are planned must be prepared in terms of experience which the child has already had.
8. *The teacher can direct and guide learning by providing suitable educational environment:* Learning experience has been defined as the process of interaction of the learner with an environment. To any environment, whether in the school or without, the learner brings not only a store of learning acquired previous to his school years, but also certain inherited traits and attitudes. The kind of learning experiences

the learner will have depends on his previous learning, on his abilities, and on the kind of environment which the school provides for him. If that environment is narrowly restrictive in its influence on him, if the range of potential learning experience is narrow and formal, if the materials with which he is to work are few in number and poor in quality, the kind of learning he will gain will be meager and restricted. If, on the other hand, the school is able to provide a rich environment with many and varied materials, with facilities which may be adapted to many kinds of experiences, and with ample opportunities to engage in a wide range of activities, the learning experiences of the pupil will be richer, more varied and more satisfying. The pupil reacts to the complex environment which the school provides, and in the course of his experience in that environment, he not only learns subject-matter, but also a great complex of social habits, attitudes, and disposition. A good school from the standpoint of mental hygiene should provide a wholesome environment for the development and growth of the pupils. In other words, the teacher should provide the environment which will best help the pupils achieve their minimum potentials.

9. *The teacher can direct and guide learning by finding what lies back of the learner's difficulty so that he can help the child into a better psychological climate for learning:* The teacher of the children in their formative years of schooling has a most strategic position with regard to the subsequent attitudes of boy and girl towards school and all that goes with it. Whether a child of any age likes or hates school, either attitude has much to do with his success in learning all along the line. True, a skillful teacher in the upper grades may succeed in undoing the negative attitudes a child has developed, but it would be much better for all concerned if such undoing were not necessary. Teachers in the lower grades will do will to remember that the attitudes towards school activities which are being built everyday in each boy and girl have much to do with the type of psychological content that the learner will carry with him in his subsequent learning task. It should be pointed out here that the past and present experience of children are an inescapable part of the learning situation.
10. *The teacher can direct and guide learning by developing wholesome relationship between himself and pupils:* An unfriendly teacher has no place in the classroom because he lacks sunshine in soul and genuine human kindness. Good teaching and learning are only possible if the teacher is friendly and approachable. A good teacher is one who acts as counselor, guide, partner, and friend to the learner. Modern pedagogy recognises more clearly then ever that in the learning situation the personal influence of the teacher is much more significant than the subject-matter achievement alone. Good relationship between the teacher and the pupils will promote a happy state of mind. Learning

comes best when the teacher and learner are both in a happy, satisfied state of mind. The mental distress and apprehension aroused by a severe examination is not conducive to the recollection of facts acquired in the course under happier conditions. The state of mind of the individual should be taken into consideration in teaching and learning.

11. *The teacher can direct and guide learning by providing opportunity for transfer of learning:* To teach for transfer, the teacher must identify and explain the factors which are common to different learning situations. Transfer will be facilitated if the subjects are studied concurrently with one another. Maximum transfer will be achieved when learning and teaching efforts are directed and devoted to transfer. To be able to promote transfer, meanings, relationships, and recurrent factors should be emphasised in teaching and learning. It is clear therefore that teaching for transfer must be concerned with the kind of responses desired by the teacher who is the motivating force in affecting transfer. Transfer of facts learned to actual life situations completes the teaching pattern.
12. *The teacher can direct and guide learning by making the teaching in the classroom psychological rather than logical.* Teaching, to be effective, must be psychological. This is based on the accepted educational concept that the learner, rather than the subject-matter, must be made the center of educative process. This means that only knowledge, skills, habits, abilities, and attitudes that are useful and very valuable to the learner must be taught and developed. Things should be taught in the manner they are to be used or applied in life. Likewise, the educational programmes and other activities must be based on the interests, needs, and abilities of the pupils who are to be directed and guided by the teacher.
13. *The teacher can direct and guide learning by using whole, rather than part-method in memorising:* Learning by whole method derives its great efficiency over part method through the learner's insight of essential interrelationship of parts. In memorising by whole method, there must be a relating of less important facts to more important, a clustering of important points of reference to any other facts which are equally related. It is the logical association of ideas which counts in the possibility of recall. Reading the material over as a whole gives a view of the entire selection and will serve to give meaning and correlation of the parts in the whole. It will also help organize the ideas as a whole. When whole method is used, the retention is more permanent. However, if the selection to be memorised is very long, perhaps the most effective manner of employing the whole method is to learn the material in relatively large sections instead of as a complete whole.
14. *The teacher can direct and guide learning by recognizing individual differences with respect to social characteristics of the pupils:* Any

classor grade is a social group, and each individual must betreated as a personality. The teacher should bear in mind the fact that the pupils come from homes which vary widely in environmental influence. Prejudices of political, social, and neighbourhood varieties affect the dealings of the teacher and the pupils. A thorough understanding of these social peculiarities of the individual members of the class not only enables the teacher to avoid unpleasant class discussion butalso enables him to sound out the social ability of each pupil by properly directing and guiding class discussion and other activities. The non-social pupils must be made social. This can be accomplished by setting up the bigger aims of the daily lessons in terms of the pupil's present status and his future needs as an intelligent and efficient member of a democratic society. All that this demands is that the classroom teacher should know the social characteristics of each pupil in his class.

15. *The teacher can direct and guide learning by recognizing the problem of individual difference with respect to native ability in general:* It is an accepted fact that pupils differ in mental ability. Educators now accept the abilities of the individual members of the class to differ according to a well known law as the "normal probability curve." All pupils are not mentally equal and should not be expected to accomplish equal amounts of work. Different individuals learn at different rates in the same category of learning. Likewise, the rate of learning of an individual may vary from one subject to another. The individual pupil to be lost sight of in the group.
16. *The teacher can direct and guide learning by providing the learner with some criterion for indicating specifically what progress he is making:* Many pupils are interested in evaluating their success or failure in attaining desired objectives and are motivated by a knowledge of the degree of satisfactory progress being made. The pupil who knows to what extent he is achieving finds his study periods much more meaningful than in an instance where the extent of progress being made is obscure. Evaluation thus, should be utilised as a positive, form of guidance and should be designed to motivate a given learner to add effort by the simple expediency of charting their individual progress by basing teaching procedures on the testimony of test data. Such a plan enables the teacher to direct and guide a pupil’s learning activities in relation with his needs as shown by his evaluation of progress.

DEMOGRAPHICS OF ONLINE INSTRUCTORS

Sixty-six per cent of the survey respondents held teaching positions (professors, instructors, or lecturers), while nearly one-fourth were administrators or instructional designers. Respondents represented institutions of various types: approximately half were employed by public, four-year colleges or universities; 23 per cent by community colleges or vocational institutes; and 16 per cent by private postsecondary institutions.

A large majority (87 per cent) said their institutions offer online courses, and about 70 per cent of them had taught online courses. Respondents' experience with online teaching varied from none to more than 10 years. Although not every respondent had online teaching experience, more than 95 per cent had experience integrating computer or Web technology into their face-to-face teaching. Survey results show that women appear to be teaching online in far greater numbers than just a few years ago. In fact, more than half of the respondents (53 per cent) were women. Such findings were surprising because a similar study conducted a few years earlier was dominated by male instructors who were full professors at tier-one universities. Perhaps female instructors had become more comfortable teaching and sharing activities online during the few years that elapsed between surveys, or perhaps support for instructors had improved on college campuses, or both.

EMERGING TECHNOLOGY

When asked about several emerging technologies for online education, 27 per cent of respondents predicted that use of course management systems (CMSs) would increase most drastically in the next five years. Those surveyed also said that video streaming, online testing and exam tools, and learning object libraries would find significantly greater use on campus during this time. Between 5 and 10 per cent of respondents expected to see increases in asynchronous discussion tools, videoconferencing, synchronous presentation tools, and online testing.

The survey also asked what technology would most impact the delivery of online learning during the next five years. Respondents could select one of 14 key technologies. About 18 per cent of respondents predicted that reusable content objects and wireless technologies would have the most significant impact. Smaller percentages (from 7 to almost 14 per cent) selected peer-to-peer collaboration, digital libraries, simulations and games, assistive technologies, and digital portfolios. In contrast, less than 5 per cent predicted that e-books, intelligent agents, Tablet PCs, virtual worlds, language support, and wearable technologies would have significant impact on the delivery of online learning.

These findings seem to reflect the perceived importance of online technologies for sharing and using preexisting content. Additionally, respondents predicted that advances in Internet technology (for example, greatly extended bandwidth and wireless Internet connections) are likely to increase the use of multimedia and interactive simulations or games in online learning during the next five to 10 years. Only about one in 10, however, predicted that advances in Internet technology would enhance videoconferencing or international collaboration, and just one in 16 thought it might offer greater chances to interact with field experts or practitioners.

Again, the focus was on enhancing content and associated content delivery, not on the social interactions, cross-cultural exchanges, or new feedback channels that wider bandwidth could offer. Such responses indicate that respondents still

see learning as content-driven, not based on social interactions and distributed intelligence. The emphasis remains on a knowledge-transmission approach to education, not one rich in peer feedback, online mentoring, or cognitive apprenticeship.

ENORMOUS LEARNER DEMANDS

Our study revealed a number of trends related to areas of growth in online education, future needs for online instructors, and the dominance of online versus face-to-face instruction.

Growth of Online Programmes/Degrees

Comparing current online offerings and projected future online offerings at respondents' institutions yields predictions about the areas of growth in online programmes and degrees. Most respondents expected considerable growth in online certification and recertification programmes in the next few years, as well as in associate's degrees. Yet, our survey respondents predicted little growth in the number of institutions that offer online master's or doctoral programmes in the future. Although more than half of the respondents (54 per cent) expected that their institutions would offer online master's or doctoral programmes in the coming years, almost the same number of respondents (53 per cent) reported that their institutions were presently offering online master's or doctoral programmes. In contrast, respondents predicted that certification and recertification programmes would see 10–20 per cent growth from present offerings. Such responses indicate that higher education institutions might be wise to explore certificate and shortprogram offerings rather than full degree programmes.

Online Instructors' Readiness

Will online instructors be ready to meet the challenges brought by the projected increases in learner demands for online education? About half of the respondents predicted that monetary support for and pedagogical competency of online instructors would most significantly affect the success of their online programmes. In addition, instructors' technical competency was the third most pressing factor. Nevertheless, pedagogical skill was deemed more important than technological skill for effective online teaching. With regard to the needs for pedagogical competency of online instructors, a majority of the respondents expected that online instructors would typically have received some sort of training in online teaching either internally or externally by the year 2010.

The Rise of Blended Learning

The survey asked respondents for their predictions related to the growth of online education in the next few years. Respondents indicated that more emphasis is expected on blended learning—instruction that combines face-to-face with online offerings—than on fully online courses. Those surveyed predicted a

distinct shift from about onequarter of classes being blended today to perhaps the vast majority of courses having some Web component by the end of the decade.

ENHANCED PEDAGOGY

Although the use of CMSs in higher education has increased rapidly and is likely the foundation for the rapid increase in the number of online learners during the past decade, some researchers argue that CMSs are promoted as ways to manage learners rather than to promote rich, interactive experiences. As a result, enhancing pedagogy is perhaps the most important factor in navigating the perfect e-storm. In the present study, respondents made predictions about the quality of online education in the near future and about how online courses would be taught and evaluated.

STUDY LIMITATIONS AND RECOMMENDATIONS FOR RESEARCH

More than two years have passed since we conducted the survey. This time gave us the opportunity to see how the predictions our survey respondents made have played out. We have continued to witness accelerating growth of learner demands for online learning as well as the potential for enhanced online pedagogy due, in part, to the recent open source movement. Predictions related to emerging technologies seem to have been inaccurate, given that only 1 per cent said that the use of blogs would increase dramatically by 2008. Given the thousands of new blogs each day, it is safe to say that this prediction did not hold. This study did not explore actual online teaching and learning practices. It is likely that some responses were related to recent fads that may or may not be sustainable. In addition, we did not survey students for their perceptions of online learning trends and possibilities. A study of students might indicate that they deem different technologies to be important and on the cusp of significant growth. In a learner-centered world, who can better predict technology trends today—instructors or students? This study also indicated that blended learning will perhaps be a more significant growth area than fully online learning. Follow-up studies might focus on aspects of blended learning that institutions need to address, such as types of blended learning, activities that lead to blended-learning success, and instructor training for blended-learning situations.

PARTICIPATION IN ONLINE COURSE SHARING

WHENDO THEY SHARE

The emergence of online course sharing is a relatively new phenomenon. In fact, 54 per cent of respondents first posted to one these two Web sites— the WLH and MERLOT—within the past year, and an additional 17 per cent within the past two years. The remaining 29 per cent indicated that they posted more

than two years ago. While these numbers are reflective of how long these sites have been available, a culture of sharing online resources seems to be emerging.

It might be the case that sites such as the WLH and MERLOT have simply become more popular among faculty during the year leading up to this study. Or, perhaps, sufficient Internet access and speed finally exists for college faculty to share resources online.

How did they Discover Sharing Resources

We were interested in finding out how the college faculty members discovered sites for sharing resources online. Thus, we enquired as to how they heard about the WLH or MERLOT resources. Fewer than 5 per cent had heard about them through advertisements, and, surprisingly, none listed a friend as an important source. More typically, they had learned about these resources through their institution, a colleague, an Internet link, or through other means such as mailing lists, journal objects, special interest groups, or conferences. Thus, the most effective communication channels were professional contracts or electronic communications.

Why Share

In addition to asking how the faculty respondents in our study were informed of these resources for online course sharing, we asked why they posted to these sites. Around 8 per cent responded that their institution or department required them to do so. Approximately twice as many respondents claimed to have posted to these sites as a means of marketing themselves to other colleagues. About the same number indicated that they posted to one of these sites as a pedagogical experiment, while another 16 per cent became active in the site for fun.

Thirty-eight per cent of those posting simply wanted to share pedagogical theories or strategies with their colleagues. Slightly more were active in one or more of these sites in order to grow as professionals. The most frequently selected response was that they simply believed in the importance of course sharing. Around 18 per cent gave other reasons for their affiliations to the WLH or MERLOT. For instance, several respondents noted that they were asked by Merlot officials to join, while a few others indicated that someone else posted their name or information.

Type and Number of Resulting Contacts

We also enquired about the type and number of contacts that these faculty respondents received as a result of posting resources or information to one of these two Web sites. Of the faculty completing this item, sixty-one per cent were contacted by others after sharing their syllabus or profile on the Web. The data here are varied and interesting.

Twelve per cent of the respondents had been contacted by researchers, while nearly three times as many were contacted by other instructors. In addition, more then 30 per cent had been contacted by students not in their courses. Interestingly,

14 per cent had been contacted by publishers and 12 per cent by other companies and institutions. Such findings reveal the marketing and networking potential of online resource sharing. Not only are students attracted to one's class after reading an online syllabus, but textbook publishers, researchers, and other institutions are also knocking on one's door. We were interested in determining the average number of contacts for each group described previously. Whereas contacts by publishers, institutions, and other companies were relatively infrequent, a number of people indicated that they had been contacted by students or instructors more than ten times as a result of their online resource contribution or membership.

Perhaps it is the course marketing and enhanced collegiality that instructors find most appealing about these course-sharing resources. In fact, more than ninety per cent indicated that comments from colleagues on their syllabus or other posted course resources would be helpful.

ONLINE TEACHING IN COMPUTER WORLD

Welcome to the first of at least two reports related to instruction on the Internet. The aim of this particular report, "Online Teaching in an Online World," is to understand the online learning experiences, obstacles, supports, and preferences of college instructors across a variety of institutional settings and disciplines.

Whereas this initial report focuses on the online learning needs and supports of higher education faculty, the second study, "Online Training in an Online World," addresses similar issues in the corporate training world. After detailing the survey results and conclusions, a set of recommendations are proposed related to online learning in higher education settings.

Perhaps no technology has so swiftly assumed prominence in both educational and commercial settings as the Web. In educational arenas, those who previously found higher education too expensive or physically inaccessible can now access a myriad of online information resources and materials.

Ideas and feedback from online expert guests, mentors, and peers are now available in college classes. Finnish instructors and students can collaborate with those in the United States and Korea. Online student mentoring can come from practitioners in the field, experts at the North Pole, or graduate students and colleagues down the hall. Collaborative teaming in online college settings knows no bounds, and, not surprisingly, higher education administrators have taken notice. As a result, new instructional expectations for college faculty are emerging. This survey targeted instructors who were likely to have greater experience with these new teaching methods and tools than others. This final report is intended to provide insights into the future directions of online teaching as well as to identify the gaps in tool and courseware development efforts.

PREVIOUS REPORTS

A report from the Web-based Education Commission indicates that Web technologies are increasingly used in both online and traditional classroom-

based courses. This report also notes that distance learning course offerings are expected to increase from 62 per cent of four-year colleges offering some courses online in 1998 to 84 per cent of such colleges offering such online course experiences in 2002. As a result, the Commission notes that many higher education institutions are forming consortia and collaborative groups to share course materials and resources in an effort to enhance college teaching and learning.

In terms of specific Web tools, the commission reports a dramatic increase in college faculty utilizing e-mail, Web resources, course homepages, and online discussions within their courses. In fact, they report a 25 per cent increase from 1996 to 1999 in college faculty utilizing Web resources in their class syllabi.

This report also acknowledges the additional time and risk on the part of faculty who attempt to take advantage of online learning tools and activities in their courses. But why is there a risk? Higher education institutions simply do not yet have the teaching rewards, expectations, or support structures in place for promoting faculty teaching in an online world. As e-learning environments take centre stage in college programmes around the world, it is vital to determine the tools and tasks that facilitate student learning in this new context as well as to establish quality standards for such courses. A recent report from the Institute for Higher Education Policy that was commissioned by the National Education Association and Blackboard, Inc. identified 24 key benchmarks for online learning quality.

These benchmarks addressed course development guidelines, instructional material reviews, student feedback and interaction, access to library resources, technical support, student advising procedures, and the evaluation of intended learning outcomes. There are a number of other summary reports attempting to describe and evaluate the use of distance education technology in education.

Some reports speak to the challenges of teaching in an online world, including issues of compensation, time, ownership, profitability, training, technology infrastructure, and university policies. Jaffee for instance, discusses the costs of online instruction as well as the forms of resistance to such courses and programmes at both the institutional and individual level. Others point to new economic markets and opportunities. Such reports document key trends, social demographics, stakeholders, policy makers, major players, and workplace needs. Still other reports detail newly formed and tenuous partnerships and consortia. What about the instructional, psychological, and social aspects of online learning? At least one report has been commissioned to develop guidelines or benchmarks—including many instructional design guidelines—to ensure quality distance education practices.

On the social and psychological side of online learning, Joseph Walther and his colleagues point to the social issues embedded in online environments such as student social isolation and shared knowledge. In a more recent report, Bonk and Wisher summarize the research related to online collaborative tools, e-learning, the role of the instructor, and the increasing importance of learner-centred approaches to instruction.

They also suggest more than two dozen psychologically-based research opportunities in online collaboration related to principles of cognition, motivation, social interaction, and individual differences. Within the plethora of distance education reports and prophecies, the TeleLearning Network Centres of Excellence of Canada have assumed a leadership role related to online learning research. One of their key reports compares eight key post-secondary institutions offering e-learning. In this report, Massey and Curry provide a preliminary analysis of universities emerging in this field such as Stanford University, Nova Southeastern, Western Governors University, Indiana University, the University of Illinois, Open University UK, University of Phoenix Online, and California Virtual University.

They offer a competitive analysis of the courses/programmes, pedagogy, and learner support structures in place at each of these institutions. In addition, they address expansion plans, marketing, faculty, learners/clients, and course production and delivery mechanisms at each institution. As such, this particular report offers useful insights into the direction of online technologies and course delivery.

While the TeleLearning NCE is a source for online learning reports from Canada, UCLA has recently published an inaugural report on the impact of the Internet on social, political, cultural, and economic behaviour and ideas across the United States. While that research investigates Internet usage across the general population of the United States, the data in the present study focus on evaluations of Internet usage in college courses among college instructors likely to use it.

CURRENT TENSION

There is no doubt that the Internet has brought about a new forum for learning and instruction. Higher education faculty and administrators must not only understand the new technologies that present themselves, but they also must grapple with how best to utilize them for student learning. Or as Steven Gilbert recently noted, "Acquiring the knowledge and skill necessary to improve teaching and learning with technology requires faculty, support professionals, and administrators to think and behave in new ways—deep learning." The challenge, he argues, is for early adopters of technology to push at the educational frontiers in ways that help transform themselves as well as their colleagues with new insights and lifelong learning, while staying within the educational missions and resources of their respective institutions.

But on college campuses there is tension and uncertainty surrounding the use of the Internet in teaching and learning. There is also a lot of hype. Free classes mentioned one day are delayed by downturns in the economy the next. Standards and guidelines are encouraged, but too often not established. Distance learning policies created one year are revamped in the years that follow. Moreover, too many reports speak from an administrator, politician, or corporate executive viewpoint. What is often lacking is a sense of what the faculty member or instructor

thinks about the online experience. As a result, few reports reflect on the pedagogical practices that lead to online learning success. It is as if the technology alone is sufficient to build an effective environment for learning. And this, we know, is not the case. Few can doubt that Web-based teaching and learning is a growing field with rapid changes. In part, it has emerged to fill the void in training as technical skills quickly fall into obsolescence. Reskilling simply is a fact of life. Online reskilling may be a necessity as the age of learners increases and the time available for one's studies is curtailed by job and family responsibilities. Web-based courses may simply be the only viable option for many learners.

The present study attempts to determine the supports and resources that college faculty have available to meet those needs. Whereas other surveys of online learning in higher education have explored areas such as technological resource availability, instructor skills and attitudes, or institutional policies, this particular study is more comprehensive by attempting to understand instructor attitudes, experiences, preferences, and online support structures, as well as prevalent pedagogical tools and practices. Given this focus, the results of this survey can perhaps help educators design more powerful e-learning environments as well as methods to teach within them. Hopefully, it will serve as a barometer for higher education institutions considering online courses and programmes as well as a guidepost for instructors first encountering online teaching in this online world.

FOCUS ON PEDAGOGICAL PRACTICES

There is no doubt that Web-based instruction offers new ways for students to collaborate and for instructors to share pedagogical ideas and practices. It is also a way to expand the resources available to students and build permanent course archives. With the emergence of the Web, it is now possible to involve practitioners, experts, and peers as online learning guides or mentors. Case-based learning can take on a new sense of authenticity as business students chat with company executives, counseling students reflect online about crisis situations faced during internships, preservice teachers peek in on the classroom management strategies of expert teachers, and medical students virtually view sophisticated operations in action.

There seem to be limitless opportunities to exploit the Web in college teaching and learning. As online learning resources accumulate and become archived, there is even a new sense of course history and legacy. Events that were delivered or that unfolded a decade or more ago can be replayed, modified, salvaged, contemplated, and debated at any time. As a result of all these new instructional opportunities, the decisions confronting the online college instructors are multiplied. Part of this is due to the complexity of these environments that often beg for quick managerial decision making one minute, technological expertise the next, and social or pedagogical intervention just a few moments later. This survey will help document some of the early pedagogical practices of those deciding to teach online, or, at least, those beginning to utilize online resources somewhere in their teaching practices.

PURPOSE OF THE STUDY

This report is based on a survey of 222 college faculty members, most of whom have been early adopters of Webbased technology in their instruction. Unlike some of the previous studies, online course quality is just one aspect of this particular report. In addition, this survey report is intended to inform administrators and courseware designers of the benefits and challenges of using Web-based learning tools in higher education settings.

It also provides suggestions about the types of tools, activities, resources, and support structures that might enhance online learning in college settings. This survey report provides descriptive information about the types of college instructors and institutions involved in typical online environments.

It has five primary goals:

- To identify the resources, tools, and activities that college instructors desire in their Web-based teaching efforts;
- To document the gaps between online teaching practices and preferences;
- To understand some of the key obstacles as well as support structures for Web-based teaching in college settings;
- To point to online learning tools and communities that might be developed to enhance teaching and learning in higher education settings; and,
- To determine who is responsible for making online learning decisions in higher education.

In effect, this study intends to document how faculty educators are being trained, supported, and rewarded for online instruction. It also seeks to determine the types of online tools and activities that faculty prefer. Additionally, this survey explores college instructor attitudes related to online learning obstacles and support.

It addresses their perceptions of controversial online learning issues such as course ownership and quality, online programme accreditation, online teaching and learning opportunities, and the general utility of the Web as a teaching and learning resource. The conclusions are intended to help those teaching in online environments as well as those developing policies and funding new online initiatives. The findings may also be useful to companies developing and evaluating online tools for distance teaching and learning.

METHODS AND DATA METHODOLOGICAL OVERVIEW

As distance learning tensions rise in response to concerns about online pedagogy and policy, we need to understand more from faculty who have crossed some of the first hurdles. Where can one go to look for the early adopters or at least those who are less resistant to incorporating the Web in their teaching? Who are the ones to ask about online teaching practices? While previous research indicates that college instructors too often are not utilizing the most sophisticated technologies and interaction opportunities, nevertheless, faculty members were

considered ideal sources for providing information on Web-based teaching policies, experiences, training, and incentives in higher education. In this report, we sampled college instructors who had a history of sharing resources on the Web.

SAMPLING PROCEDURES

Our sampling of instructors employing the Web for teaching and learning purposes comes from two separate sources. First, we selected a random sample of names from The World Lecture Hall. The WLH is an international site first created in 1994 at the University of Texas at Austin to post college syllabi for courses within a variety of academic disciplines. The developers have received national praise and recognition for offering this service.

When beginning to select that sample, however, we noticed the emergence of another resource for faculty and students in higher education. MERLOT was created in 1997 by the California State University Centre for Distributed Learning. It has since expanded to consortia of other institutions and state systems. MERLOT is now a fast growing and free resource intended as an online community of shared knowledge and ideas. In contrast to the WLH, the MERLOT site was originally designed for sharing a wide variety of online learning materials, including assignments, reviews, and member profiles across many academic disciplines within higher education. The capability for peer instructors to review online learning materials was the key feature that distinguished MERLOT from other online resource sharing sites at the time of this study. Even though the WLH and MERLOT members are not representative of all college faculty members, they provide richer online learning backgrounds and experiences than most other available populations. Over 2000 syllabi reflecting more than 80 disciplines and subdisciplines have been posted to the WLH.

Those posting syllabi to the WLH include faculty from religious studies, sociology, theater and dance, accounting, philosophy, marketing, zoology, history, neuroscience, astronomy, nutrition, anthropology, rhetoric, law, and electrical engineering.

At the time of this study, MERLOT contained over 2000 members representing more than 120 different disciplines. Members of MERLOT include faculty from such disciplines as nursing, teacher education, business information systems, geology, arts, computer science, political science, evolution, and theoretical mathematics. The combined sample population, therefore, included a variety of disciplines, degree programmes, and types and sizes of institutions. It also included a wide range of Web expertise.

All these people, however, either had experience posting syllabi online or posting online profiles, critiques, or learning materials. For some in the sample, however, this may have been just a one-time post or brief comment. While the WLH and MERLOT were perhaps the most well known Web sites for resource sharing within higher education at the time of this study, we were not aware of

surveys of college faculty representing either or both of these sites. Our random sample during November and early December 2000 included 415 instructors from MERLOT and 286 from the WLH, or a total of 701 instructors from a wide spectrum of disciplines at both sites.1 From e-mail solicitations to this sample, we collected 222 completed surveys; the vast majority were faculty or administrators with additional college teaching responsibilities. While our 32 per cent response rate was generally lower than direct mail or phone surveys, online survey research suggests that this rate is quite good. However, at this time, no expected response rate for online surveys has been firmly established. Nearly fifty different disciplines and subdisciplines were represented in our final sample. Most responses were received from instructors from across the United States, though around 5 per cent of the respondents came from other countries including Hong Kong, Australia, Canada, and the United Kingdom.

LIMITATIONS OF THE STUDY

As with most online surveys, the present project had several limitations that may have constrained the results and generalizability of the study:

- There are few available resources for faculty online course-sharing, thereby limiting the selection to two of the more popular sites, the WLH and MERLOT. These two Web sites were possibly not representative of all college faculty members who use the Web in their teaching.
- Since users created these sites over long periods of time, many of the collected online faculty member names and e-mail addresses were outdated, incorrect, or changed, especially those in the World Lecture Hall.
- Many of the faculty respondents here were Web savvy and could be described as early adopters of Web technology, thereby inflating any optimistic results regarding online learning experiences and felt need for additional online collaborative tools compared to college faculty in general.
- Tools for teaching and learning on the Web are constantly changing. As a result, it is difficult to generalize many of the findings of this survey related to the utility of particular Web-based instructional tools.
- The online survey instrument was relatively lengthy, effectively lowering the response rate and perhaps causing some inaccurate or skipped responses.
- This survey report labels respondents as college or post-secondary instructors, even though a few of the respondents were in administrative positions with only part-time faculty or teaching responsibilities.
- In an effort to keep the survey at a manageable length, the online survey failed to address key issues such as how courseware tools are funded, the per cent of respondents with tenure, the perceived quality of online certificates or institutes, the forms of online training for instructors, the types of technical support provided for students and

faculty working online, how costs are determined for online courses, and perceived learning and motivational factors in online learning. It is hoped that future studies will address such issues.

Despite these limitations, the response rate for this online survey was higher than expected for an e-mail solicited Web survey. In fact, only 7 per cent of those solicited in this particular survey explicitly refused to participate.

USEFUL COLLABORATION AND SHARING TOOLS

There are decades of research studies detailing the clear advantages of cooperative and collaborative learning over more individual and competitive formats. Fortunately, many collaborative pedagogical strategies have relevance in Web-based instruction. In fact, a proliferation of collaborative learning technologies have recently emerged for both work and educational environments. In higher education, technologies are becoming more interactive and distributed, enabling learners and instructors to participate in an incredible array of information, resources, and instructional experiences.

The blending of technological and pedagogical advancements presents new opportunities for both research and teaching focused on online dialogue, information sharing, and facilitating learning. In part, such collaborative tools have come on the scene to meet the needs of an older and more diverse student population than in the past. Perhaps this survey will help educators design more powerful e-learning environments for Web-based collaboration and sharing. Collaborative Web-based learning tools offer unique ways for learners, instructors, and experts to interact.

There are now Web tools for student collaborative inquiry, problem-based learning, articulation and dialogue, debate, and personal reflection. Some research indicates that effective use of these new tools can actually foster communities of practice. To create a learning community, the tool or system must bring people together for some initial common interest or quest. There not only is a need for a common reference point or issue for the online group, but members also need multiple ways to become informed about events of that community. Sharing information online often involves conferencing and computer-supported collaborative learning tools. Fortunately, such tools have begun to infiltrate online learning courseware. In addition, communities such as the World Lecture Hall, MERLOT are now available for visitors to locate and share learning materials within specific discipline or interest areas. But what were the views about such resources and tools among the respondents to this particular survey who already had been involved in online information and resource sharing?

Surely, they would understand and promote collaboration and sharing tools more than the rest of the population. As research from Peffers and Bloom predicts, the respondents to this survey perceived less utility for collaborative and online sharing tools than for test, lecture note, and syllabus tools. For

instance, when asked about the utility of tools to share success or failure stories with other instructors, only 27 per cent had done so and only 30 per cent listed this as a highly useful item. Another 51 per cent, however, rated the degree of usefulness as medium.

Hence, more than 80 per cent would find some use for such tools; perhaps they simply are not yet available. Similarly, only 26 per cent used online tools to collaborate and form partnerships with other instructors. Still, 40 per cent saw this as a highly useful idea. Another 44 per cent saw it as of medium utility. Slightly more college instructors used Web-based tools in their courses for students to share success or failure stories with other students.

Forty-one per cent listed this as highly useful and another 45 per cent felt that it was of medium utility. Slightly higher, 46 per cent of the respondents used tools for students to collaborate and form partnerships with other students. In fact, 56 per cent felt that this was a highly useful endeavor and another 34 per cent found it of medium usefulness. The fact that 90 per cent perceived value in student online collaboration is of significance. Asynchronous discussion forums, synchronous chats, and annotation or feedback tools are common means for electronic collaboration. Sixty-one per cent of faculty members in this study utilized bulletin board or asynchronous types of discussion in their courses. While 60 per cent rated this type of tool as highly useful, another 31 per cent saw it as having medium utility. There was a significant drop in perceived utility and actual use in terms of synchronous collaborative environments compared to asynchronous environments.

Only 32 per cent of the instructors in this survey had used real-time chats, and only 37 per cent rated this item highly. In fact, 28 per cent of the respondents rated this item low in utility. In contrast, tools for interactive feedback, commenting, and annotations fared much better in terms of usefulness among these respondents. Forty-six per cent of the faculty respondents had used interactive feedback or annotation tools in their classes. Even more, 56 per cent perceived them as highly useful, while only 6 per cent rated this type of collaborative tool as low in utility. Perhaps software developers might want to target annotation and feedback tools; they are highly valued and yet not everyone is using them.

Personal profile tools are another means to share information online with peers and other instructors. Whereas 52 per cent claimed to use instructor profile tools in their courses, only 34 per cent utilized student profile tools. Such a finding seems odd. Perhaps there was misinterpretation on this item or perhaps it is easier to reflect on tools one is personally using. Only 30 per cent considered instructor profiles important, indicating that they are using such a tool simply because it is there and it is easy to use. Even less, just 25 per cent, found student profile tools useful.

In fact, 35 per cent rated the degree of usefulness of student profile tools as low. Online guestbooks were even less appealing. Only 6 per cent used them and just 7 per cent rated them highly. In fact, 66 per cent of the respondents—

the largest of any item—rated this type of tool as low in usefulness. Related to our findings about online evaluation and testing, only 7 per cent used the Internet for collaborating with other instructors for test-making. Still 22 per cent rated this as a highly useful item, while another 40 per cent felt it was of medium utility. Similarly, few instructors collaborated with other instructors on class tasks, activities, and discussion. Only 18 per cent had engaged in such collegial activities, while 34 per cent rated this as highly useful and another 41 per cent consider it of medium utility. Perhaps these are two immediate areas wherein universities and software development companies might partner together to develop and test new Web-based teaching and learning tools. Finally, online technology demonstrations received fairly favourable reactions from our respondents.

Thirty-one per cent of the faculty members had used this type of tool in their classes. In addition, 42 per cent rated this item as highly usable in their classes, while 38 per cent rated it of medium utility. Despite these findings, college instructors perceived a need for more collaborative tools. Tools with more than a 10 per cent gap between actual use and perceived high utility included tools for instructors to form collaborations with other instructors, tools for students to share stories with other students, tools for interactive feedback and annotations on student work, tools for instructor test-making collaboration, tools for instructor task collaboration, and tools for online technology demonstrations.

These large gaps between teaching practice and perceived utility indicate a need for more collaborative tools in e-learning environments. They may also point to the current direction of Web-based teaching and learning practices.

Useful Online Instructional Activities

Instructional activities that these instructors found useful were also of interest in this study.

The first four online activities asked about were:

1. Scientific simulations;
2. Data analysis;
3. Lab activities; and
4. Performance activities.

Examples of the latter activities might include band or music tasks as well as online decision making in any discipline including counseling, finance, or teaching. These four activities were all infrequently used by the survey respondents. The actual use of these tools ranged from 23 to 26 per cent, with lab and performance being used slightly more often than scientific simulations and data analysis. All of these types of activities were deemed highly useful by approximately 45 per cent of the respondents. Such are interesting since the percentage of respondents who rated these items as highly useful was nearly double the percentage of who actually used them. When combining those who rated activities moderately or highly useful, more than 75 per cent of the respondents indicated utility for each of the four tools. Such data clearly indicate

that there is a market for such tools, but college faculty members currently do not have access to them. A fifth and final instructional activity was online critical and creative thinking activities. This item was rated more favourably than the other four.

Forty-five per cent of these faculty members used such activities in their online teaching, and even more impressively, 62 per cent rated them as highly useful for their teaching discipline. An additional 28 per cent rated them of medium usefulness. Only 10 per cent considered their degree of usefulness low. Such results are further indication of the need for better pedagogical tools in online learning environments.

Useful Web Resources

The Web is highly touted as an online resource. Some suggest that it is a gigantic library sprawling in front of students and instructors alike. But in what ways do early Web adopters actually view it as a resource for teaching? Questions were asked about the utility of such Web resources as search engines, glossaries with links to examples, Web link suggestions, article and journal links, book recommendations, newsgroups, collegial Web sites, and general and discipline-specific online resources.

Given that research has revealed that college instructors tend to rely on easy to use tools, it is not surprising that search engines were the most commonly used Web resource with 83 per cent of these faculty members utilizing search engines in their teaching. Equally impressive, 70 per cent ranked search engines such as Yahoo or Lycos as highly useful and only 6 per cent ranked them low. The next most favourable ranking was for online article and journal links. Seventy-four per cent of the respondents used such tools and 70 per cent rated them as highly usable. Only 3 per cent rated this item low. Sixty-one per cent of these college educators used discipline specific resources in their teaching and 63 per cent found them highly useful. Along these same lines, 59 per cent had used Web sites created by colleagues in their teaching. Such collegial Web site use included syllabi and lecture notes. This is not surprising given where the sample was derived. In fact, only 8 per cent rated the utility of this item as low. Similarly, 58 per cent had used general teaching and learning resources or instructional strategies that had been posted online. Once again, only 8 per cent viewed this item as low in utility.

Online glossaries are another emerging Web-based teaching resource. In fact, 57 per cent of the survey respondents had used online glossaries with links to examples on the Web in their teaching. Similarly, 55 per cent viewed this Web resource as highly usable, while another 35 per cent gave it a medium rating. In effect, the use of online glossaries, colleague Web sites, and general as well as discipline-specific online teaching and learning resources indicates that the Internet has spawned a new type of teaching—one that is reliant on the Web for a significant part of college instruction. Online teaching in an online world is different, and new faculty, as well as experienced ones, need to be prepared for it.

The three lowest rated areas, which were the only items used by less than 50 per cent of the respondents, were student Web link suggestions, online book reviews, and newsgroups. Slightly under half of the faculty members in this survey had used tools where students made Web link suggestions. Still, 45 per cent of the survey participants viewed this item as having high utility, while another 42 per cent rated it as medium in degree of usefulness. Book recommendations received roughly the same ratings; 47 per cent had used such a tool and 44 per cent deemed it as highly useful. In contrast, newsgroups were used by only 18 per cent of these faculty members, while just 17 per cent rated them as highly useful. Our findings suggest a relatively high and diverse use of Web resources in teaching. Web resources are highly valued by college educators since they can augment lecture notes with visual depictions of concepts, replace the need for textbooks with online articles and glossaries, and provide more current research and professional news. Tools to search, share, and evaluate online course materials are vital parts of one's Web-based teaching arsenal.

When asked to share URLs of Web resources they found particularly useful in their teaching, 15 per cent of these college instructors responded with extremely diverse suggestions. For instance, they listed course-sharing Web sites such as MERLOT, professional organization sites such as the American Psychological Association, textbook publisher Web sites, locations for instructional design models, and university teaching and learning centre resource listings. Only MERLOT was listed more than once.

The findings denote many areas wherein improvements in online teaching and learning could occur. The numbers reveal that tools for collaboration and resource sharing are highly valued by college faculty members but are not yet part of their typical online teaching life. Tools for annotation and feedback, article or journal linking, and online discussion were considered highly valuable. Additionally, activities for student labs, simulations, and critical and creative thinking have not been as prevalent as college faculty desire. Nevertheless, the number of tools and activities that were of substantial use already, as well as the high usefulness ratings that many additional tools received, was striking. Such ratings are signs that online teaching and learning is not going away in higher education settings, but, instead, is about to be enhanced, extended, and perhaps even transformed.

OBSTACLES AND SUPPORT MECHANISMS

Obstacles to Web-Based Teaching

There certainly are a myriad of obstacles to utilizing the Web in higher education instruction. Issues of time, training, experience, ownership, costs, confidence, technological infrastructure, administrative support, and interest are often mentioned. In this study, the main obstacle to effective use of the Web was time; more specifically, the amount of preparation time required for Web-based course development and delivery. Sixty per cent of the college instructors

in this survey reported that preparation time was a major issue. What other obstacles did our respondents face? Contrary to findings from the NEA study, nearly 4 in 10 found the lack of technical support to be a major deterrent.

Slightly fewer, 37 per cent, indicated that a lack of time to learn to use the Web was an obstacle. Along these same lines, a quarter of the respondents lacked training on how to use the Web.

And even if they did receive proper training or time allocation, nearly 30 per cent felt that they lacked the equipment or software to display the Web in the classroom. Of course, such findings contrast with what was reported earlier about fairly abundant technology access. Perhaps it indicates that technology is available in their buildings for utilizing the Web in instruction, but it is not yet found in their particular classroom settings.

What were not viewed as major obstacles? Fewer than 20 per cent of the faculty respondents cited lack of hardware or outdated equipment in their office as a barrier. Even fewer, 15 per cent, indicated that the lack of software or outdated software was a problem. And amazingly, fewer than 2 per cent had no interest in using the Web in their teaching. Keep in mind, once again, that the respondents were generally early Webbased teaching adopters who would be expected to be interested in using the Web in their instruction.

Still, the nearly unanimous interest in using the Web indicates that this is a technology with the potential for transforming higher education. Around 17 per cent of the respondents remarked on other problems holding up their adoption of the Web in their teaching. In open-ended responses, these early Web adopters focused on issues of administrative support, time, student interest, pedagogy, vision, funding, incentives, utility, reliability, motivation, and bandwidth.

Administrative support comments included:

- "Lack of administrative vision."
- "Lack of incentive from administration and the fact that they do not understand the time needed."
- "Lack of system support."
- "Little recognition that this is valuable."
- "Rapacious U intellectual property policy."
- "Unclear university policies concerning intellectual property."

Pedagogical comments included:

- "Difficulty in performing laboratory experiments online."
- "Impossible to teach drawing and lithography."
- "Lack of appropriate models for pedagogy in content-based instruction."

Time-related comments included:

- "Lack of incentive."
- "More ideas than time to implement."
- "Not enough time to correct online assignments."
- "People need sleep; Web spins forever."
- "Time to grade/interact."

Cost also appears to be an issue as the following comment notes, "Institution supports because it is the cheapest…is too hard for students and faculty to learn." The following comment from one respondent summarizes many of these issues:

- "…(the) lack of time to develop materials and add to what is already developed. Little recognition that this is valuable and thus hurts promotion and tenure decisions which seem to be primarily based on publications in juried journals not on stuff on the Web."

When comparing obstacles encountered at private and public institutions, two important differences emerged,

1. The perceived lack of time to learn to use the Web and
2. Other obstacles faced by faculty at private institutions.

First, faculty members from public institutions were significantly more likely to indicate that time to learn to use the Web was a problem than those from private institutions. It is unclear, however, whether this is due to differing teaching and research expectations, support structures, or Web-based learning initiatives at their institutions.

Second, 30 per cent of the faculty respondents from private universities noted that they faced other obstacles not listed as compared to just 14 per cent of respondents from public institutions. On several other items, faculty members from public institutions were more likely to indicate problems than those from private ones. For instance, faculty respondents from public institutions were slightly more likely to complain that Web-based learning required too much preparation time and that they lacked the proper equipment to display the Web in their classrooms.

An interesting finding emerged when comparing differences in the number and type of obstacles by the size of the institution. While faculty respondents from smaller institutions perceived a lack of Web training, computer hardware, and technology support compared to those from larger institutions, only the perceived lack of support for technical problems and courseware development was significantly different.

More specifically, 47 per cent of those from institutions under 3,000 students viewed this as a problem, 53 per cent of those from institutions between 3,000 and 9,999 noted it as a major obstacle, and only 31 per cent from institutions over 10,000 indicated that this was an obstacle. When combining the responses for those in institutions under 10,000 students, the differences remained significant with 51 per cent of those in the smaller institutions indicating a need for such technical and courseware support versus only 31 per cent in larger institutions.

There were also some modest indications that the lack of Web training and inadequate technology in the classroom and office were also obstacles in the smaller colleges and universities. We also explored obstacles to Web-based teaching as reported by gender. The only item that approached a significant difference here was a lack of software or outdated software that was noted by 19 per cent of the males compared to only 9 per cent of the females. However, females pointed to such obstacles as time to learn to use the Web, lack of classroom equipment to display the Web, too much preparation time, and a lack

of technical and courseware development support. Apparently, there are more perceived barriers for female instructors in college settings than for males.

While male instructors might recognize outdated software tools, females seem to be seeking additional training and support. Overall, time for course preparation and delivery as well as technical and administrative support are among the major obstacles for college instructors attempting to teach online. Equipment and software tools are less significant factors. All findings vary, however, by type and size of institution.

Support for Web-Based Teaching and Research

The survey also addressed the type of support required by college educators to utilize the Web in their teaching, research, and administrative duties. Given the previous answers regarding online teaching obstacles, it was not surprising that release time was the most popular form of support selected here.

In addition, each of the following three forms of support were desired by nearly 7 in 10 respondents:

1. Recognition for use of the Web in tenure, promotion, and salary review decisions;
2. Technical support staff to assist with online course development and associated technical problems; and
3. Instructional development grants or stipends.

Given the lack of differentiation in responses, universities may want to embed aspects of a few of these key support preferences in their distance education policies and initiatives. For instance, they might offer options between release time, instructional development grants and stipends, additional salary, and designated technical support. They might also adopt policies and practices wherein online teaching and research activities would be more fully recognized in college professor tenure and promotion cases. Nearly 60 per cent of respondents felt that it would be valuable for instructional designers to assist faculty members when needed. The same per cent asked for time to learn about and utilize the Web. In addition, 45 per cent thought that additional training on how to use the Web in teaching would be beneficial.

Around thirty per cent of these faculty respondents suggested that greater student access to computers as well as online resources would also be helpful, while slightly over one fourth of them considered e-mail notification of technology changes or updates to be valuable. In contrast, a mere 13 per cent thought that chat room help for Web-related problems was a support they needed for effectively using the Web in teaching, research, or administrative duties.

A few respondents suggested additional ideas for online teaching support. Among the advice was for "better equipped classrooms for demos," "really specific examples of 'good courses' so we have some idea what we are trying to achieve," "more money," and "assistance with routine office tasks, grading objective tests, *etc.*, to free up my time to create Web lectures and other course materials." Others argued for outcome data and useful learning research, clearer

royalty definitions, and administrators who believed in the priorities of student learning and could articulate the importance of Web teaching. These support needs correspond closely with the perceived obstacles including the need for greater technical support. Given these findings, it appears that a multi-pronged approach to online instructor support and training is warranted. Respondents at public and private institutions expressed some significant differences in the types of support they needed.

Those in public institutions were significantly more likely to ask for online resources to use the Web effectively in their teaching, research, and administrative duties compared to those in private institutions. They were also significantly more likely to suggest that they needed instructional development grants or stipends to support their online teaching efforts than those at private institutions. Along these same lines, they were significantly more inclined to ask for release time than those in private institutions. Perhaps faculty members at public institutions are simply more demanding.

For instance, other areas wherein faculty members in public institutions indicated that they needed more support to effectively use the Web in their scholarly pursuits than those in private institutions included the need for instructional design help, time to learn about and utilize the Web, greater training regarding how to use the Web in teaching, greater access to computers for students, and recognition for tenure, promotion, and salary review decisions.

Technical support staff was identified as necessary by about 68 per cent of both public and private institution respondents. It is clear that those in public institutions have higher expectations of the support structures required before adopting the Web in their teaching and other duties. Whether they have differing instructional standards, course loads, or support histories and experiences is not known and is an open question for further investigation. In exploring the data by size of institution, there were no significant differences in Webbased teaching support.

However, from a descriptive standpoint, faculty members at institutions with enrollments under 3,000 students pointed to the need for instructional design support and training on how to use the Web in teaching. Instructors in medium-sized institutions were more likely to select time to utilize the Web and student access to computers. Instructors at the medium and large institutions favoured recognition for tenure, promotion, and salary review decisions, development grants and stipends, and release time.

While none of these differences were significant, they do provide an interesting picture of Web-based teaching support needs at different sized institutions. When comparing those in institutions larger and smaller than 10,000 students, respondents at the smaller colleges and universities were more likely to select technical support and student access to computers as important issues, whereas instructors at the large institutions were focused on having more online resources, recognition, and development grants or stipends. Gender differences in terms of perceived supports were minimal.

4

Online Adult Learning

Covering on-line adult learning in a short article is a little like trying to see a city in a day—a whole lot of running around with brief, and hopefully meaningful, visits here and there. That being said, the focus here is to take the broad span of adult learning and apply it to an on-line environment. Ideally, he will reduce the "running around" and provide you with a few meaningful "visits" to adult learning in on-line environments.

His searches on both the WWW and Proquest revealed little that was directly applicable to adult learning on-line. There is lots on adult learning generally (both on-line and print based) and a growing literature base on on-line education and web based training generally (again, on-line and print based), but little that linked the two in a meaningful way for people who are actually taking a course on-line. So what follows are my observations - first as an academic and practitioner in adult education, and second, as a learner and facilitator on-line since 1995.

He views this course as a way to build the theory and practice in learning and facilitating on-line. We are pioneers in this area and can contribute a tremendous amount to future on-line learners! Through our discussions and your assignments, we can create a set of valuable resources and "publish them" on the net for others to see.

This is probably one of the most exciting aspects of on-line education to me - it is relatively easy to create and share our knowledge as a class and leave a legacy for others! How often in traditional face-to-face classes have we been able to do this in a relatively easy way?

Definitions and Perspectives

There are hundreds of articles and books written about adult learning and hundreds of definitions. In a class devoted to adult learning, one might spend the first two weeks alone defining learning and exploring it from a multitude of perspectives and another two weeks defining adult. For me, adult learning is about change-change in attitude, change in knowledge, change in behaviour, change in a skill, change in how we think about things. He used to get into more complex definitions and models but have found that less useful as time has gone on.

The perspectives on adult learning vary according to the context or discipline in which one operates. Some businesses and industries appear to view adult learning as a commodity that, once mastered, will lead to efficient workers. Some entrepreneurs in the "workshop business" view adult learning as a golden opportunity to make money. Some self-help groups view adult learning as a transformational process that empowers people to live healthier, happier lives. Some futurists view adult learning as central to our transition into the knowledge age. Some psychologists view adult learning as a cognitive process, while still others focus exclusively on behaviours. Some adult educators, view adult learning as a lifelong process of discovery and have committed their lives to exploring it and facilitating it for others.

If you are interested in exploring adult learning in depth, try Merriam and Caffarella's book as a start (listed in the bibliography at the end). It orients you to the literature and is an excellent reference.

Types of Learning

The most useful categorization I've seen is one offered by Saljo in Candy (1991):

- Learning as an increase in knowledge. (eg. You now know what emoticons are, for example.)
- Learning as memorizing. (eg. You may have memorized how to post messages in the bulletin board area.)
- Learning as acquisition of knowledge that can be retrained and/or utilized in practice. (eg. You have learned how to use WebCT and could apply this skill to other forms of on-line conferencing.)
- Learning as the abstraction of meaning. (eg. You are exploring your own understanding of adult learning and on-line education and what this means to you.)
- Learning as an interpretive process, aimed at understanding reality. (eg. You will probably engage in speculation and interpretation about how the Internet/WWW are going to affect how people work, live, learn in a broader sense.)

Dialogue and discussion with others are central to any type of learning, but most especially for the type of learning concerned with meaning and interpretation. That is why the main activities of this course involve discussion and the assignments involve working with others.

Learning Capabilities

A writer who has influenced him the most in thinking about different learning capabilities is Virginia Griffin (1988). She suggests that he has six learning capabilities comparable to the six strings on a guitar. Most of our education has focused on one string—the rational—and excluded the other five. As with playing a song on a guitar using six strings instead of one, tapping into the six capabilities of learning enhances our learning. The six strings are:

- Rational (The one we are familiar with and have the most experience with. We assume that learning is a rational, intellectual activity.)
- Emotional (Instead of denying that emotions play a role in learning, they are acknowledged, accepted and considered valuable in aiding the learning process.)
- Relational (Learning is enhanced through relationships with others.)
- Physical (Learning can be enhanced or inhibited by our physical state.)
- Metaphoric (Learning can be enhanced through symbol, metaphor, intuition.)
- Spiritual (A deep sense of connection with everyone and thing.)

Griffin suggests that if the rational, emotional, relational, physical, and metaphoric capabilities are facilitated, the spiritual will evolve.

My own significant learning experiences have always occurred when more of the "guitar strings" were activated. Knowing about Griffin's framework has allowed me to analyze why a particular learning experience is not meaningful, and what I can do as a learner to make it better.

I would say that Griffin's framework is especially important in an on-line environment. When I first started as a learner myself in an on-line course, I was concerned with the emotional and relational aspects of learning. I didn't feel that such a high tech approach could facilitate these dimensions of learning. As in face-to-face classes, however, it is the design of the course, the learners themselves, and the approach the facilitator takes that make the difference. The tone of an e-mail, together with the use of emoticons, can convey much - both expressions of joy or frustration and anger!

The relational aspects of learning can occur to a certain extent in main list discussions, but it is the small group activities, both synchronous and asynchronous, that facilitated my getting to know someone. I learned much through my e-mail conversations (asynchronous) and webchat sessions (synchronous) with individuals in the course and, as with face-to-face sessions, I am still in contact with some of these people.

The physical capability of learning was most striking for me as an on-line learner. I work best very early in the morning. I am awake, alert, and do my best work. Afternoons are my down time and right after dinner is especially low for me. As a face-to-face learner and facilitator, most of my classes have occurred in the time slots when I'm most tired. It was a real joy to tailor my participation in the on-line class around the times of day I was most awake and, if need be, not participate at all when I was tired. This is not a luxury we have in face-to-face classes!

I make use of metaphors a great deal in my learning, especially so when I'm encountering a completely different subject or content. Such is the case with on-line learning. It was so new to me that I needed to find ways to attach the "new" to an "old" framework. For example, taking an on-line class for the first time is similar to taking a class for the first time at a university. How much time do we spend trying to find the place to park, the building, the classroom? It's overwhelming and confusing. A first time experience in an on-line class can be the same. I tried to find metaphors like this for helping me to become used to the on-line environment.

The spiritual capability of learning is something I've not experienced to a great extent in face-to-face classes, but one that I've actively sought to develop in myself. There are some Internet users who believe that e-mail communication (and some synchronous chats) are a more direct "experience" with others, a connection to their consciousness or true essence, as opposed to the usual distractions we read into face-to-face communication.

A lengthy discussion on cyber relationships took place on a list to which I subscribe—the wisdom at work list. While there were certainly those who believed that there is more fiction on the net (that people may create characters and misrepresent themselves), there were also those who felt that the internet was the vehicle that would move our society to a higher level of consciousness and spirituality. As Let Davidson, moderator of the Wisdom at Work list so eloquently stated on April 5, 1996:

I agree that at this point there is no obvious revolution in interpersonal relations... yet. But I definitely agree with Susan that something is afoot and that the technology has a tremendous potential to affect the way we relate, in both directions: towards avoidance and escapism, as well as towards greater spiritual intimacy. I think it helps to recognize that cyber communication is a different form and shouldn't be expected to accomplish what face-to-face experience yields. It will be very frustrating to expect it to carry the freight of sensuality or physical intimacy.

Electronic communication seems to me to be more suited to conveying consciousness or spirit, and is much closer to the way consciousness operates than it is to physicality. We could say that basically what you see in front of you is consciousness— code—translated into subtle on-off pulses of light transfigured into virtual pixels on the screen. It is all light taking virtual forms in the same way that all colours are refractions of the same light. In the same way that what we call physical reality is varying speeds and frequencies of light energy. (E=mc2)

It seems e-relating is a more subtle, intermediate technology, somewhere between physical relating and pure mind communication (ESP, clairvoyance, telepathy, etc). I think cyberspace represents a step in the evolution of consciousness which seems to be moving many people beyond strictly egoic bodymind identity to a greater sense of our true identity as spirit, consciousness or light energy, and eliciting our ability to commune with this underlying reality. Let, Some challenging ideas.

Let captures the real essence of Virginia Griffin's coming together of the five capabilities of learning into the sixth - the spiritual. This is food for thought for those of us who have thought (and maybe still do) that high tech cannot be high touch.

Adult Learning Principles (A Selection)

The following adult learning principles are compiled from many sources. Most are ones he feels most represent his own experience as an adult learner, while others are included because they raise many questions for me. What do you think?

- Increasing and maintaining ones sense of self-esteem and pleasure are strong secondary motivators for engaging in learning experiences. (Zemke, 1988)
- New knowledge has to be integrated with previous knowledge; that means active learner participation. (Zemke, 1988)
- Adult learning must be problem and experience centred. (Gibb, 1960 as quoted in Brookfield, 1986)
- Effective adult learning entails an active search for meaning in which new tasks are somehow related to earlier activities. Prior learning experiences have the potential to enhance or interfere with new learning. (Knox, 1977 as quoted in Brookfield, 1986)
- A certain degree of arousal is necessary for learning to occur, whereas stress acts as a major block to learning. (Brundage and MacKeracher, 1980)
- Collaborative modes of teaching and learning will enhance the self-concepts of those involved and result in more meaningful and effective learning. (Brundage and MacKeracher, 1980)
- Adults will generally learn best in an atmosphere that is non-threatening and supportive of experimentation and in which different learning styles are recognized. (Smith, 1982)
- Adult learning is facilitated when the learner's representation and interpretation of his own experience are accepted as valid, acknowledged as an essential aspect influencing change, and respected as a potential resource for learning. (Brundage and MacKeracher, 1980)
- Adults experience anxiety and ambivalence in their orientation to learning. (Smith, 1982)
- Adult learning is facilitated when teaching activities do not demand finalized, correct answers and closure; express a tolerance for uncertainty, inconsistency, and diversity; and promote both question-asking and -answering, problem-finding and problem-solving. (Brundage and MacKeracher, 1980)
- Adult skill learning is facilitated when individual learners can assess their own skills and strategies to discover inadequacies or limitations for themselves. (Brundage and MacKeracher, 1980)

- Adult learning is facilitated when the teacher can give up some control over teaching processes and planning activities and can share these with learners. (Brundage and MacKeracher, 1980)

Group Development in On-line Education

There has been much research on group development in educational settings. The most well known one is Tuckman's (1965) who suggests groups move through four sequential phases—forming, storming, norming and performing. He also like Cog's Ladder (sorry, he can't find the full reference!) which suggests the phases are the polite phase, why we're here, bid for power, constructive phase, esprit phase and the grieving phase. He has noticed the same type of group development in on-line education as he has observed in hundreds of face-to-face classes. Similar group development occurs in listserves as well. While every class may not go through every phase in the same manner, sequence or to the same degree, there are definite predictable commonalities. In on-line education, it goes something like this:

Polite Phase (Forming)

- People send out introductions and are excited about working with people from all over.
- People usually make welcoming and polite comments about other people in the course.

Why We're Here Phase (Forming)

- There are always a few individuals who question their participation in the class. Some may send notes to the instructor individually clarifying expectations or asking to participate at another time or even drop out.
- Others may post to the whole group asking clarifying questions about either the content or process of the course.
- Most experience some type of "imposter syndrome" (Brookfield, 1992) which they may or may not express to the entire group. The syndrome goes something like - everyone else is smarter than I am, I am not qualified to be in this course, someone will find out (most likely the instructor!) and ask me to leave!
- He finds the imposter syndrome especially prevalent among people very new to the Internet/WWW. Even though others in a group may have announced their own inexperience, everyone feels like s/he is the "ultimate newbie among newbies". They may also be quite hesitant to post notes.
- Everyone is trying to get a feel for how the course will run and what they can expect.

Bid for Power Phase (Storming)

- People may start to voice dislike or opposition at some aspect of the course process or content.
- People may start to openly disagree with one another—sometimes politely, sometimes not so politely!

- Groups or cliques may develop as people start to seek out those with similar opinions.
- People may start to openly (or in private e-mail to one another) question the instructor's competence and authority.
- Some "flaming" (strongly voiced criticism, personal attack or insult) may occur, although I've seen this only rarely in the courses he has taught.

Constructive Phase (Norming)

- People will start to ask that personal criticism be left behind to be replaced by the task at hand-the course.
- People will come to terms with their concerns about the course-sometimes, a person may even apologize for a hastily sent note to the group in the storming stage.
- People remind each other of the reason they are there and restate some fundamental norms about how the course should run.
- People start to own their own reactions to the learning process.
- Discussions about the course content and process resume, but at a more sophisticated level than before.

Esprit (Performing)

- Real group synergy takes place. This may happen in the whole group or in smaller groups that have developed in the class.
- Discussions are initiated by everyone and people build on each other's comments.

Grieving (Sometimes when a Group ends)

- May occur with a whole group but more likely among individuals who have worked together and come to know one another.
- Sometimes, the group (or subgroups) are extended beyond the conclusion of the course.

The role the instructor plays during this group development is central to how quickly the group moves through stages (or even skips stages) on their way to a productive learning experience.

Instructors who are aware of group development anticipate the stages and use techniques to facilitate a smooth transition. They also learn not to "personalize" notes of frustration or even anger from participants at certain points in the class, as very often becoming used to the on-line world can be intimidating and alienating for some learners.

Understanding these stages from a learner's perspective is also helpful. For example, sometimes the "storming" stage can be particularly stormy and for people like myself, quite distressing. Understanding group development gives one another perspective from which to view things.

Group Work in On-line Education

For the most part, he had favourable experiences with group work in an on-line environment, again a surprise to him. He assumed that the lack of face-to-face contact and nonverbal cues would limit the "human touch" of working cooperatively with people in groups.

My experience was just the opposite, an observation made by researchers in the computer-mediated communication (CMC) field. As pointed out by Rob Higgins (1991):

Without encompassing the full range of human sensory and expressive capabilities, text-based interaction is often thought to be an impersonal medium devoid of social context cues and nonverbal communication. Experience and research, however, are demonstrating that socio-emotional content can be communicated in text. Steinfeld (1986) states that: "Evidence continues to mount showing that CMC will be used for emotional interaction. People seem to work around the nonverbal cue limitations and actively provide their own text-based translations of nonverbal cues" (p. 176). Tracz (1980) bears out this perception in a comment on his experience: "I was pleasantly surprised, nevertheless, that most users of electronic information exchange system (EIES) attempt to incorporate many little expressions to compensate for the lack of face-to-face contact, and on the whole, gentleness prevails." (p. 17). (p. 40-41)

Group methods or cooperative learning are widely written about in both adult and youth education. A common belief is that such approaches to learning are more human and productive than competitive approaches. Also, such approaches are held up as facilitative of the construction of knowledge (see for example Belenkey et. al.. (1988) and Vygotsky (1978)), a focus of many adult educators, myself included. Links have been made between cooperative learning and educational computing as pointed out by Higgins (1991).

Those involved with cooperative learning have not missed another growing innovation: educational computing. Johnson and Johnson (1986) discuss the complementary strengths of cooperative learning and computer-assisted instruction (not including Educational CMC). They cite their research involving cooperative, competitive, and individualistic learning in conjunction with the use of educational computer programmes featuring drill and practice, simulation and discovery, and word processing (pp. 16-17). Their data confirm the general effects of cooperative learning:

...computer-assisted cooperative learning promoted greater quantity and quality of daily achievement, more successful problem solving, and higher performance on factual recognition, application, and problem-solving test items than did computer- assisted competitive and individualistic learning (p. 15).

Another interesting finding was that the computer-assisted cooperative methods had an especially positive impact on female students in terms of their attitudes towards computers. Conversely, the competitive methods had an especially negative impact on their attitudes towards computers. Competitiveness also reduced the female students' confidence in their ability to work with computers (Johnson & Johnson, 1986, p. 15). (pp. 31- 32)

Concepts from cooperative learning, computer-assisted learning, and CMC are particularly relevant to educational classes being delivered using Internet/ WWW technology. Again, Higgins (1991) clarifies the role of synchronous (simultaneous) and asynchronous (flex-time) in cooperative learning:

In the realm of educational computer-mediated communication, there are many studies that cover issues of social psychology and deal with socio-emotional factors, but nothing that addresses the cognitive foundations needed to help establish a theoretical and practical model for computer supported cooperative learning (CSCL). A variety of research efforts and numerous descriptive, or anecdotal reports appear in the literature. Some address issues relating to the use of computer conferencing (CC) (Harsim, 1989; Hiltz et. al.., 1990; Mason, 1990; Phillips et. al.., 1988) in asynchronous mode. Others report on the application of synchronous communication via local area networks in the classroom (Foster, 1991; O'Kelly, 1991; Peyton, 1989; Wilton, 1988)....

Those involved with computer conferencing seem particularly resistant to the notion of an important role for synchronous CMC. This is not surprising in view of the fact that the features and capabilities provided by computer conferencing software have not changed significantly over the past 10 years, and appropriate synchronous capabilities have not been readily available. Another reason for lack of attention to the potential of synchronous CMC is that the asynchronous nature of computer conferencing is regarded as one of its most valued attributes in terms of intellectual activity. Levinson (1988) notes, "'Asynchronous' or nonimmediate communication...may produce exchanges of richer intellectual quality than those resulting from immediate face-to-face dialogue" (p. 115).

In an on-line seminar, Turoff (1989c) took the extreme position and challenged the participants to produce examples to counter his proposition, "that there is no human group problem solving activity that would not be better served by asynchronous communications..." (conference note C1295 CC4). Further, he stated that, "...a pure synchronous system is worthless as far as I am concerned" (conference note C1295 CC16).

Obviously, then, an important debate exists. Synchronous interaction may be a critical feature of peer interaction and an important component in the developing theories of the social construction of knowledge as they pertain to cooperative learning. Asynchronous interaction, on the other hand, may improve group problem solving and lead to richer intellectual quality in the communications. (pp. 6-7)

Higgins research with nursing students working on a nursing case study demonstrated that ...*the synchronous mode of text-based CMC are more likely to include verbal elements reflecting important cognitive activities such as problem formulation, interactive arguing, and task management than similar discussions in asynchronous mode.*

...greater focus on, and accuracy of outcomes are possible with synchronous text-based CMC than with asynchronous.

...greater mutual facilitation occurs in synchronous text-based CMC than in asynchronous mode. This facilitation is reflected in verbal elements demonstrating attempts to establish interpersonal ease, support, understanding, and encouragement.

... the novel and unique modes of interaction possible through CMC (synchronous and asynchronous) can have a motivating effect for learning activities undertaken in dyad or group situations. (p. 19)

His own experience as a learner in an on-line class and anecdotal reports from learners in previous classes I've taught confirm the importance of synchronous communication in collaborative learning. This course is designed around these considerations and, thus, group work is considered essential to the overall success and enjoyment of participants, and synchronous chats are encouraged as a way to address the human element.

Creating a Learning Community in an On-line Environment

One of the best papers he has read on creating an on-line learning community is Sally Fox and Don Comstock's Computer Conferencing in a Learning Community. Their "Summary of Processes that Build a Learning Community" provide a number of suggestions and points to ponder for anyone either taking or facilitating a course on-line. He has tried to build in a number of their strategies.

Another interesting paper is Creating Community On-line. The authors of this paper discuss their "learnings" in terms of converting a face-toface class to on-line delivery. Of particular interest, is their rethinking of the instructor's role in a classroom and how instructors may (unknowingly) contribute to learners looking to them for approval, instead of thinking about things themselves. The on-line environment challenged this perspective.

EVALUATING ON-LINE LEARNING AS A PROCESS

This paper describes the kinds of evaluation employed in the creation and management of a credit course in technical writing developed at the University of Waterloo. From September 1995 to April 1998, sections of this course have been offered entirely on the Web to students across Canada at 4-month intervals. The course uses SGML converter technology in the creation and maintenance of its materials and in students' preparation and submission of assignments. Evaluation includes examination of students' records of system use and access, assignment preparation and a variety of electronic communications, as well as the electronic marking and measurement of their course assignments.

We attempt to assess group performance against perceptions and to incorporate student requests into our design and expectations. In addition to the above methods, we present students with a series of optional on-line evaluations after significant assignments and at the conclusion of their final report at the end of the course. All student responses in this process remain anonymous.

University Community and their On-line Variations

Generally, the University of Waterloo distributes course evaluations to students to obtain responses on the success of every course. Instructors distribute

evaluations to on-campus students during the last scheduled class, while distance-education students are mailed the evaluation at the end of the term. In both cases the responses are anonymous, and the professor does not receive the evaluation results until after the final marks are registered. Each faculty administers a variation of the form specific to its academic needs. Both the number and the range of the questions are limited.

For example, the distance-education evaluation is made up of nine questions dealing with presentation of course material, the course's ability to maintain student interest, the course organization, value of readings, fairness in grading, instructor feedback, and an overall evaluation of both the instructor and the course. Students may respond to these questions in the five categories of 'excellent', 'good', 'satisfactory', 'fair', and 'poor'. In addition, there are three 'comment' style questions dealing with the strengths and weaknesses of the course, and a general view of the course. In this way, this form is specific to distance-education needs. By comparison, our on-line technical writing course incorporates the evaluation process throughout the course, allowing for a two-way dialogue to which the instructor can react, and the students witness responses to their suggestions. Instead of a single evaluation at the end of the term, students have the option to complete several evaluations throughout the course. These occur at times when their new skills and our grading of their work enable them to understand both their performance and our learning objectives in light of applied instruction.

In total, the students can respond to over one hundred questions. They receive the evaluations after each assignment is submitted but before the return of their graded work on-line. Such timing provides for more honest responses because the students are not influenced by their assignment marks. Evaluation responses are completely confidential. They are sent via e-mail to a designated computer account from which authorship cannot be traced. These evaluations solicit information on most aspects of users' learning experience, participation, support and their sense of what the course provides, with its relevance to their expectations about their own training and understanding of the processes of technical documentation.

We have synthesized the ranges of questions from five faculty models and resolved them to the new conditions of the electronic version of the course. We have developed these evaluation procedures to elicit a comprehensive view of both real activity and student opinion about their learning process. We make modifications in content, course administration and requirements in light of the results of each term's survey and we try to show students the immediate good effects of their responses by announcing changes to procedures and materials.

These have given us clear evidence that students:

- Deem the on-line learning process to be highly effective as an academic exercise
- Perceive it to be comprehensive and integrated in application
- See its technology and theory as integrated into a useful set of tools for their scholarly and applied writing.

Structures for the Evaluation Process

The 4-month university course in technical writing, which we offer entirely on the Web as credit and certificate learning through the Department of English at the University of Waterloo. Our colleague, Dr. Katherine Schellenberg, has provided the extensive statistical planning and analysis which now form the bases for our evaluation methods.

The course consists of a web site with:

- Extensive content on technical writing techniques and standards.
- Integrated internal communication methods-e-mail, chat, newsgroups, Instructor Comments, on-line marking and the evaluation procedures which are the topic of this paper all available at the course site.
- The course's delivery engine, an SGML editor and converters, which enable students and instructors to create the entire range of course content on any topic or subject area.

We use these same tools to develop on-line materials for this and other courses and we incorporate appropriate student materials, (with their permission), in new aspects of the work. Students complete five technical documents in a sequence of increasing complexity. They provide all other members of the course with a current resume and proposal letter, from which, by a process of enquiry and selection, all members form themselves into groups of three to complete the central 50 per cent of the exercise.

They work together to produce portions of a manual, on which they then conduct usability tests. They complete the course with an extended Report on an aspect of their learning experience, often related to the application of on-line techniques to other areas of their training and work. Students create all assignments in SGML and then convert them into HTML for on-line display to classmates and markers. A graded version of each assignment is returned to the student under a password for privacy.

Members are encouraged, in chats and by tutorials, to look at their own work in the contexts of others' submissions and the instructor's remarks internally in their documents. Students retain and may distribute their materials as proof of their abilities in SGML and the creation of interactive learning. We provide references on students' request to potential employers and recommend members to companies seeking technical writers with these skills. By the completion of the course each participant has experienced the major communications tools used in the creation and exchange of Web-based technical documents.

Each has worked with and understood the mark-up and conversion issues surrounding SGML, RTF and HTML displays. Most have dealt with some of the requirements for full multimedia expression on CD-ROM, the Web or on Intranets for internal distribution. This is 'Technical Writing' in a very current and complete sense and our students have been trained in it, individually and in groups, with all the resources our databases and course layout can provide. In the near future we plan to add optional services in audio and video interchange, XML document creation and Java authoring.

In effect, we have made a course in which the course materials and techniques are learned and used by participants even as they complete their writing assignments. By the conclusion of the course many members have the full capacity to create SGML-based interactive projects for inter- and Intranet expressions. for their own and their employers' uses. Most course materials have been available to the public at our web site and we continue to respond to enquiries and applications from individuals and companies on the Web. At the time of writing we are preparing a commercial version of our work, with certificate status for participants and an extended range of topics related to on-line learning and information exchange, to launch in fall of 1998.

LEARNING ON AND OVER THE INTERNET

We live in a continuously shifting state of realities in which the only predictable constant is the inevitability of more change. This is the basic element of our Information Technology Era, which commenced with the development of the microprocessor (1973) and proceeds into the foreseeable future. The most recent impetus to microprocessor development, the convergence of technologies, is represented in embryonic form by the Internet, particularly the World Wide Web. This paper reports on the findings of an online investigation intended to explore the educational function of the Internet by analysing the ways learning opportunities are presented and utilised on and over it, in an attempt to understand the trends of changes in learning technology and how these changes affect adult learners.

Points of Departure: I based the planing of this investigation on reflecting on the observations made by Kirkup and Jones (1996) on open learning and distance education related to the concept and reality of a learning society. In particular, the issues raised in their chapter of whether new ICTs may "overcome the previous weakness of ODL without undermining its strengths", and that, in a learning society, learning opportunities should be open to "all classes of society, especially those people who have had less formal education than the majority, and what usually follows from (this) lower income", have been used as a measurement throughout the investigation.

THE INCREASING NUMBERS

Enrolment in all sectors of the education system has increased in recent years. It is estimated that "two trillion dollars or one-twentieth of global gross domestic product" is spent on education. Roughly speaking, one-fifth of this amount is being spent by the private sector while the rest is spent by governments on the public education system.

International and national campaigns such as "education for all" have succeeded in drawing learners into the education system, but the development of distance education opportunities has also had much to do with the growth in numbers. Research conducted by the International Data Corp indicate that "distance learning enrolments are growing by 33 per cent and will reach 2.23 million in 2001".

Many students are attracted by the prestige of off-shore degrees, and this trend it likely to continue as distance and virtual education continue to develop. In a recent travelling "road show" by three major U.S.-based universities, Lynne McNamara (Director of Programmes Development in Asia for the University of Maryland University College) projected that her university expects to have 70,000 to 80,000 online students by the end of 2001, many of them from Asia.

The private sector has also supported and been a driving force behind the increase in participation in distance and virtual education. Employees who want to advance their careers, but who can't afford to take the time out to study at contact institutions, are attracted to virtual learning opportunities. Many corporations recognise the benefits of supporting such studies: they save both in training-related travel expenses and in employee productivity.

THE IMPACT OF ICT

New technologies have made "the walls of the learning space transparent, providing a freedom for the learner to explore sources of information outside his institution, even outside his country". While ICT has undoubtedly opened new avenues for increased numbers of learners, it has also opened new areas of research focusing on the role of pedagogical processes when using new technologies and on their impact on cognition.

Kofi Anan, the United Nations Secretary General, has noted the broader impact of ICT, asserting that:

- Recent developments in the field of communication and information technology are indeed revolutionary in nature. Information and knowledge are expanding in quantity and accessibility. In many fields, future decisionmakers will be presented with unprecedented new tools for development. In such fields as agriculture, health, education, human resource and environmental management, or transport and business development, the consequences could be revolutionary. Communications and information technology have enormous potential, especially for developing countries, and in further sustainable development.

The use of ICT is a vital component of the new “information economy” and “information society.” Mansell and Wehn also point out that the term “knowledge society” has enabled a shift away from technology as a driver of change to a tool that offers new ways of combining the information available with people who will drive development. This shift pressures countries to develop education systems that enable skilled people to work within the knowledge society and within the global economy. The result of such pressure on both developing and developed countries has been a massive increase in education and the drive for qualifications.

The rapid development of virtual education is most noticeable in the developed world where there is much greater access to educational institutions and learning technologies, especially computers, CD-ROMs and the Internet. In the developing world, limited access to ICT is apparent. A recent report by e-Marketer noted that only 229.8 million or 5% of the world’s population is online.

The report also notes that this number is likely to increase to 640.2 million by 2004, which will represent approximately 14% of the world's population. Figures from U.S., government officials are slightly more generous. They put the number of people connected to the Internet at 332 million, with only 1% living in Africa. And less than 5% of the computers connected to the Internet are in developing countries. The figures proposed by the International Data Corp estimate that by 2003, the number of Internet users worldwide will grow to about 508 million, up from 87 million in 1997.

As access increases, in the corporate world, companies will focus on their ability to exploit Internet and e-commerce opportunities. Employees will need to rapidly develop their knowledge and skills to use the technology and to re-design the business process. Many businesses will encourage in-house and distance education and training, and they will complement this with e-learning. One prediction suggests that by 2003, less that 30% of formal corporate learning programmes will employ the traditional classroom model.

Because the above projections were made prior to and during the crash of the technology market of 2000/2001, some argue that they are incorrect. However, the effect is likely to be minimal. Current research indicates that while the education market has "declined in tandem with other sectors that make up the Internet economy, the sector encompassing corporate e-learning providers and companies serving the K–12 and higher education markets hasn't suffered more than other sectors anchored in Internet technologies. Barron notes that many companies view e-learning as a strategic necessity that is vital in today's knowledge economy.

He goes further to note that e-learning and broader educational technology areas are faring relatively well in a slowing economy.

LIMITS TO ACCESS

While ICT makes it possible for many potential learners in many parts of developing countries, including remote and rural areas, to have access to education, such access is very limited.

There are a number of technological constraints that restrict virtual education. For one, the telecommunications infrastructure (telephone and other communication facilities) outside many of the major cities in developing countries are limited and inadequate.

A few examples show the problem:

- Africa has approximately 12% of the world's population, but only 2% of the global telephone network. Telephone density is less than two lines per 1000 people. These figures become even more startling when compared with Asia (48 per 1000), America (280 per 1000), Europe (314 per 1000) and high-income countries (520 per 1000).
- Nigeria is the most populous country on the African continent. However, the services provided by its state-run phone company, NITEL, are meagre for a country of 108 million people. In terms of the Internet, there are fewer than 500,000 lines connected.

- Internet reach in India doubled from a subscriber base of one million to over two million within six months in 2000. However, when this impressive figure is matched against the total population of India of one billion, you get the sense of the magnitude of the lack of access to computers and the Internet.
- The situation in Latin America indicates huge disparities. In the mid-1990s, few people in South America, rich or poor, owned a computer or had access to the Internet. The changes have been dramatic over the last few years. Now 35 million Latin Americans own PCs and 20 million use the Internet, but the poor have been largely left out of this development. In Brazil, for example, 72% of the 7.7 million Internet users are from the wealthiest fifth of society, with only 8% coming from the poorest fifth.

Both developing and developed communities have responded in different ways to these and other constraining factors to virtual education. One key response has been to redefine the nature and function of learning venues that enable virtual education.

THE TRADITIONAL NATURE OF LEARNING VENUES

The world is changing rapidly in all areas - in the environment, in the economy, in technology and in education. While it is important to spend time pondering the implications of such change, perhaps it is more important to consider the implications of the changes to education. The education system should be the key platform that enables young people to develop the necessary skills required to prepare for the changing world. The introduction of ICT to support virtual education has generated a range of discussion, generally focusing on the value of using the technology for this form of education delivery. Often such discussion shows a lack of unanimity on the issues that need to be addressed for the effective use of technology to support virtual education. However, there are three issues that seem to generate consensus by all people involved in education: costs, decision-making and access.

The COL study on virtual institutions noted that the lack of access to learning venues and the lack of access to connectivity and learning technologies within venues was a major constraint, particularly in developing countries. And it is this element of education, the "place" of the educational interaction, that is increasingly being seen as crucial to promoting access to virtual education.

In focusing on learning venues, a range of vital questions should be considered to guide the thinking on the spatial and social construction of such venues.

These include:

- What are the implications for learning where students are able to access second opinions and further information to that provided by the textbook and teacher? How can the student access such opinions and information and what technology will best serve this purpose?

- What will the role of the teacher be in the context of different learning venues and environments? When does the teacher become the author, the expert, the tutor, the presenter and the facilitator? What learning space is required to enable the teacher to carry out these tasks?
- Increasingly there is a shift away from a class defined only by age to individually tailored education based on the requirements of each student. Using resource-based methods, institutions are able to cater to different students in terms of their capabilities, potential and stage of learning maturity. What are the implications of this for peer group relations, teachers, tutors and librarians? What are the implications in terms of the nature of the learning venue and its physical construction and its resources?
- Shifting away from mass groups of students to individual learning requires administrative and resource control systems that enable such learning to occur. What are the implications of this type of system for the learning space necessary for the learner to be successful?

Such questions pose interesting considerations on the nature of the learning structure. The "buildings" may be a school; or part of other public buildings like libraries, town centres, community centres; or part of private buildings like shops, factories or telecentres. In constructing such "buildings," issues such as noise, connected and unconnected spaces, electricity and telecommunications, and public and private learning spaces need to be considered.

COMMUNITIES AND THE INTERNET

As the Internet is becoming a major influence in education, trainers feel the impact on their lives and the lives of their students. How can we help students avoid a sense of alienation as they work with computers? First came television and video games-now more hours are spent in isolation "surfing the net". In the future, many courses will be computer-mediated. Work may be generated from the home computer. Is it possible we will see each other primarily on monitor screens?

The Antidote? Through this vast network we may in fact, become more connected, more unified. Communities now benefit from this system of communication, from meeting electronically. The following sites promote connections. This collection demonstrates the variety of "communities" now active on the Internet.

The ever increasing presence of Community networks in the medium facilitates learning within the virtual community and, furthermore, enables the accumulation of power in the hands of independent groups of people, thus enabling participation of marginalised groups and individuals. Perhaps, this is the answer to Henrick van der Zee's (1991) call for organised counterforces who will eventually build a learning society.

Education and Community—Four Scenarios for the Future of Public Education: Global Business Network and the National Education Association

(USA) came together to create scenarios on the future of public education. Trends that cut across all scenarios are: the decline of the nuclear family, the issues surrounding special education, and the promise of technology.

Scenario 1: Orthodoxy. Hierarchical (traditional), Inclusive: "this scenario assumes a turn towards traditional values, and the effort to enlist educators to impose those values on any and all who might resist them."

Scenario 2: Orthodoxies. Hierarchical (traditional), Exclusive: "like the last scenario, this one, too, plays out the reaction against value-free public education. Today's public education would seem to avoid imposing any one set of values in order to avoid offending other sets of values. The last scenario accepts the risks of offending marginal groups by imposing one set of red, white, and blue values. Here, values are also central to education, but different values guide different schools."

Scenario 3: Wired for Learning. Participatory (radical), Exclusive: "this scenario revolves around new applications of information technology. Information technology influences all of the scenarios, but this scenario is distinguished by an evolution of information technology more rapid and far-reaching than most people now anticipate. That info-tech will influence education is predetermined. How, and how fast, is uncertain. This scenario assumes that the evolution is very fast, and that information technology is the biggest story in the transformation of education over the next decade."

Scenario 4: The Learning Society. Participatory (radical), Exclusive: "in this scenario the pieces come together. Technology moves faster than in the first two scenarios, making this a radical change scenario. But the technology serves the ideals of inclusive community by facilitating a more participatory process than in the last scenario. Technology is a tool, not a driver. It serves the interests of play as well as work. Technology is designed to enhance humanity rather than to make money. The marketplace is less central than public space. While every bit as ubiquitous as in Wired for Learning, technology fades into the background of the Learning Society. It is a servant, not hero." (GBN, 1995)

Global Village or Global Imperium?: Ziauddin Sardar, visiting Professor of Science Policy at Middlesex University, is one of the few prominent voices to strongly question the "propaganda" about cyberspace. He challenges the view that the Internet is a tool which brings freedom and empowerment. He strongly feels cyberspace's gain is humanity's loss. Sardar, who hails from Pakistan, is an internationally-known scholar, information scientist and futurist. He has worked for British science journals like "Nature" and "New Scientist", and was Consulting Editor of "Inquiry". The book he coedited, "Cyberfutures: Culture and Politics on the Information Superhighway", had just been released by Pluto Press.

From basic literacy and numeracy education to the pursuit of advanced college degrees, computer technology appears to hold the promise of providing educational opportunities for all those who previously have been prevented from participating in adult education by the constraints of place or time. Yet,

despite the resources devoted by governments across the world to adapting computer technology for purposes of mass adult instruction, policy development in this area has not resolved contentious issues of access and equity. Existing divisions between educationally advantaged and disadvantaged groups within societies, and between the first and third worlds, are likely to be gravely exacerbated as technology advances. Children who are borne into homes where computer terminals are as familiar as TVs or telephones have an inbuilt advantage when competing as adolescents for entry to an increasingly computerised higher education system, or as adults for jobs along the information super highway. This is a good example of how policy related to adult education and training must be coordinated with policy for children and adolescents at earlier stages in the life-span. Without the development of some universal computer literacy in schools-which itself requires children to have equal access to technological hardware and instruction irrespective of their class, ethnicity, gender or area of residence-there is a real danger of an informational underclass developing that parallels the economic underclass.

The future outcome will be largely determined by the expectations of those, in the population affected, whose aggregated individual decisions will shape that outcome. The confusion and uncertainty, caused by so many revolutions coming along at the same time-from the 'IT Revolution' though 'Postmodernism' to the 'End of Ideology', have resulted in a great deal of pain. In Thomas Kuhn's famous words—from the field of science—a paradigm shift is under way. His concept encapsulates much of what is now happening around us. According to his observations, there is almost always a period of great uncertainty; as the defenders of the old world order, the old paradigm, dispute with those of the new.

TECHNOLOGICAL DETERMINISM AND THE NETWORK OF LEARNING SOCIETY

The Internet is an evolving, growing entity aligned to continuous technological change. This constant change is instrumental in paradigm shifts in the development of learning technology. To some learners (and educators alike) it appears to have become too complex, too technical, and many make an assumption of technological determinism. There is no need to assume technological determinism, we can ensure that the development of technology will not be detrimental to learning and education.

Barry Jones (1990) uses the example of Los Angeles and the way the car and tyre industry was allowed to replace the public transport system with cars and freeways, as a warning that we should not accept the consequences of technological determinism, but that we have a choice in the way technology is used and developed. The development of the car was an uncontrolled, chaotic phenomenon with wide reaching "side-effects", such as road deaths, urban sprawl and environmental pollution. This did not necessarily need to be the case, but was accepted as part of the development of technology.

The Alternative Network: In the educational field, as in the commercial, innovations may develop spontaneously. Some may be planned, such as in the commercial arena when a new calorie-controlled, portion-controlled, fixed weight chicken product is developed for sale to consumers at retail level because they are now cholesterol conscious and then diffuses to restaurants who in turn have expressed a need for such a product. Many developments have however occurred spontaneously from research with a different purpose, such as the many offshoots of the NASA space programmes and the Internet from its 1967 beginnings as ARPANET, initially commissioned by the US DoD and the Pentagon, for military purposes.

What is the Internet?: At a technological level, the Internet is millions of computers (no one is quite sure how many,) interconnected through the worldwide telecommunications systems. All these computers are able to share information with each other because they use common communications protocols.

At the human level, the Internet is the people who use those computers and the information they share. The people come from all walks of life, acting both as private individuals and representatives of organisations. Everyone on the Internet can publish information on any subject they wish, and almost everything published is available to everyone else. As a result, the content is staggeringly extensive and varied.

Finally, the Internet is a technological, social and cultural phenomenon, unlike anything the world has seen before. It has emerged as such not because of some ideology or social manifesto, but simply because of its anarchic technological structure. It might be seen as historical irony the reason that this network was initially built during the period of the cold war, which was to ensure that there would always be some means of communication in case the USA was hit by enemy nuclear missiles.

Unlike other human-conceived networks which exist since the beginning of humanity (*e.g.*, power and energy networks), the Internet is not owned by anyone. No one owns the Internet. It is shared, by the consensus of its users. It does not come from a place, or even a country. It recognises no political boundaries. It was not invented. It evolved, over three decades, from the desire of people worldwide to share knowledge and to communicate.

"Why do people want to be "on the Internet?" One of the main reasons is simple freedom. The Internet is a rare example of a true, modern, functional anarchy. There is no "Internet Inc." There are no official censors, no bosses, no board of directors, no stockholders. In principle, any node can speak as a peer to any other node, as long as it obeys the rules of the TCP/IP protocols, which are strictly technical, not social or political. (There has been some struggle over commercial use of the Internet, but that situation is changing as businesses supply their own links)." (Sterling, 1993)

Trends in Technological Change: Different technologies and methods for educational delivery. People retain about 20 per cent of what they see, 30 per

cent of what they hear, 50 per cent of what they see and hear, and up to 80 per cent of what they see, hear, and do simultaneously; to the extent that computer-based learning systems integrate these techniques, they can be very effective.

Technological change, occurring at a faster rate now than ever before, is having incremental effects upon communication and social interaction. Increasing sophistication in the technologies of communication and computerisation are decreasing the cost and increasing the availability of instantaneous communication across the world. Electronic Mail, video-conferencing and multimedia applications are just a few examples of innovative technology now being used in education.

The use of the Internet is growing exponentially, although it is not possible to measure accurately that growth rate. These figures are collated by one of the largest Internet hosts in the USA, using world wide surveys. They show that minimal figures of Internet hosts had reached approximately 13 million by mid 1996 and exceeded the 20 million mark by August 1997, of which approximately 5 million were European hosts representing a quarterly increase of nearly 15 per cent.. Of these, educational institutions as hosts (edu domains) had reached more than 2 million by June 1996 and neared 3 million in August 1997.

One of the implications of this is that our learning institutions and practices will change. Moore (1995), refers to models explaining how educators will respond to new technologies:

- The minimal change model-in which instructors make no fundamental changes but merely use technology as an instructional aid;
- The marginal change model-in which the pedagogy and organisation of education remain unchanged and students are added on to conventionally taught classes (the most common application of distance education in North America);
- Systemic change in which institutions change the fundamental organisation of teaching by reorganising it into a system driven by technology; and a virtual system in which universities and schools are "place-free, with little or no formal organisation"

Only the last model acknowledges the existence of a paradigm shift. It differs significantly from Scott's notions of the British perspective (Scott, 1993), as it attempts to do away with the established institutional culture. This model should flow on to changes in the text-paper based emphasis on knowledge and content, and to the training of teachers, and perhaps a redefining of the position of teacher from "teacher as knowledge source" to "teacher as facilitator of the learning process" (D. Spender, 1995, pp114ff).

Other implications of this are that there will be fewer on-campus students, more education over the Internet, more universities online, and "virtual degrees" through virtual universities. The methodology of education will change, becoming more varied and flexible. Isolated and other marginalised students will benefit-assuming they have the technology of access. An example of this trend is Ken Eustace of Charles Sturt University, Australia, who has received accreditation for an MA from Paideia University. Eustace is the first Australian academic to be awarded an online degree from a "Virtual University".

"The electronic transfer of a global Master's degree over the Internet from Paideia University in Amsterdam to Perth in Australia six weeks ago signified the start of profound changes-and dilemmas-to the university system", The 'Australian' reported on 6th September 1995. There is a wide spectrum of learning opportunities on and over the Internet, especially on the World Wide Web. The existence of Virtual Universities and Classrooms on the Net paves the way for wider access and participation for adult learners as it changes the philosophy and practice of ODL.

Hypertext, the nonlinear medium, a term coined by computer utopian Theodor Nelson in his 1974 'Computer Lib/Dream Machines' to describe electronic texts embedded with links to other texts is yet another tech-tool which enhances learning, breaks down the traditional linear narrative of the written word by encouraging readers/users/surfers to find their own paths though large amounts of information. His idea came to fruition with the advent of the World Wide Web, where "hypermedia" also includes sounds, pictures, and moving images. Hypertext was the first tool to enhance interactivity on the Net.

The capacity for learners to add to the dialogue through an interactive medium provides opportunity for development, application and linkage of new knowledge to the adults own learning context. The Internet recreates the 'agora' or meeting place in which knowledge is not only shared but created and recreated. Learners engage in active learning within conferenced environments where they take responsibility for their own learning processes. Learners "are required to examine thinking and learning processes; collect, record, and analyse data; formulate and test hypothesis; reflect on previous understandings; and construct their own meaning" (Crotty 1994, as quoted in Jonassen et al., 1995, p. 11) within an environment that gives the opportunity for students to interact together to build a community of learners.

Computer conferencing (CC), now common on the Internet, is a technology that facilitates interaction between learner and instructor and among learners and, potentially, opens the door to active learning. It creates opportunities for students to engage in the kind of active learning activities that Meyers and Jones (1993) and others identify. For example, CC allows the formation of small groups, creates opportunities for collaborative learning, discussion using case studies, role playing, simulations, online journaling, and provides opportunities to discuss and make connections between content and their own lived experiences. One such example could be the online experience I have had in attending one of the newly established OU courses which are delivered over the Internet.

A Case Study within the Project: Because of its asynchronous nature, CC-based group discussion allows for more thoughtful, well-constructed responses than one might find in a face-to-face classroom. Also, within the group context, students have opportunity to interpret and transform content (*i.e.*, make content their own); they can integrate new material with what they already know about the subject. Both large and small group discussion facilitates the active exchange of ideas and opinions related to specific content.

MZX205 is a computing OU course. It is delivered in the usual OU manner, plus the fact that OU offers learners access to its WWW and e-mail conferencing facilities over the Internet. Since the beginning of the term, I have accumulated 362 conferencing messages from the 21 fellow learners on the course. We have been discussing our common concerns on the course, facilitating each other and commenting on our work, flaming about and complaining, socialising in virtual reality, using our first names and showing intimacy rarely found in everyday acquaintance under similar circumstances.

CC mediated case studies and collaborative activities gave us opportunity to apply and test theory and knowledge to a "real-life" context. Specifically, collaborative activities encouraged mutual decision-making, and shared analysis amongst group members (skills that are valuable in the work world!). Generally, we were required to produce some product as evidence of our collaborative efforts, such as a final report or posting which was presented online for comments from other students and the instructor. Online journaling allows learners to reflect on content in a personal context, and to analyse and evaluate content in light of their experience. This reflection facilitates a personal level of integration and interpretation of content. Although an individual activity, journaling is, nonetheless, "active," because it provides the opportunity for reflection on and "meaning-making" with regard to course content. (SCHANK, R. & CLEARY, C.1994)

5

The Role of Assessment in Learning

Assessment plays a major role in how students learn, their motivation to learn, and how teachers teach.

Assessment is used for various purposes.

- Assessment *for* learning: where assessment helps teachers gain insight into what students understand in order to plan and guide instruction, and provide helpful feedback to students.
- Assessment *as* learning: where students develop an awareness of how they learn and use that awareness to adjust and advance their learning, taking an increased responsibility for their learning.
- Assessment *of* learning: where assessment informs students, teachers and parents, as well as the broader educational community, of achievement at a certain point in time in order to celebrate success, plan interventions and support continued progress.

Assessment must be planned with its purpose in mind. Assessment *for*, *as* and *of* learning all have a role to play in supporting and improving student learning, and must be appropriately balanced. The most important part of assessment is the interpretation and use of the information that is gleaned for its intended purpose.

Assessment is embedded in the learning process. It is tightly interconnected with curriculum and instruction. As teachers and students work towards the achievement of curriculum outcomes, assessment plays a constant role in informing instruction, guiding the student's next steps, and checking progress and achievement. Teachers use many different processes and strategies for classroom assessment, and adapt them to suit the assessment purpose and needs of individual students.

Research and experience show that student learning is best supported when:

- Instruction and assessment are based on clear learning goals
- Instruction and assessment are differentiated according to student learning needs
- Students are involved in the learning process (they understand the learning goal and the criteria for quality work, receive and use descriptive feedback, and take steps to adjust their performance)
- Assessment information is used to make decisions that support further learning
- Parents are well informed about their child's learning, and work with the school to help plan and provide support
- Students, families, and the general public have confidence in the system

The Department believes that the primary role of assessment is to enhance teaching and improve student learning and supports this through the Provincial Assessment Initiative and the Provincial Assessment Programme.

ASSESSMENT FOR LEARNING

In classrooms where assessment for learning is practised, students are encouraged to be more active in their learning and associated assessment. The ultimate purpose of assessment for learning is to create self-regulated learners who can leave school able and confident to continue learning throughout their lives. Teachers need to know at the outset of a unit of study where their students are in terms of their learning and then continually check on how they are progressing through strengthening the feedback they get from their learners. Students are guided on what they are expected to learn and what quality work looks like. The teacher will work with the student to understand and identify any gaps or misconceptions (initial/diagnostic assessment). As the unit progresses, the teacher and student work together to assess the student's knowledge, what she or he needs to learn to improve and extend this knowledge, and how the student can best get to that point (formative assessment). Assessment for learning occurs at all stages of the learning process.

HISTORICAL PERSPECTIVE

In past decades, teachers would design a unit of study that would typically include objectives, teaching strategies, and resources. The student's mark on this test or exam was taken as the indicator of his or her understanding of the topic. In 1998, Black & Wiliam produced a review that highlighted that students who learn in a formative way achieve significantly better than matched control groups receiving normal teaching. Their seminal work developed into several important research projects on Assessment for Learning by the King's College team including Kings-Medway-Oxfordshire Formative Assessment Project (KMOFAP), Assessment is For learning (Scotland), Jersey-Actioning-Formative Assessment (Channel Islands), and smaller projects in England, Wales, Peru, and the USA.

COMPLEX ASSESSMENT

A complex assessment is the one that requires a rubric and an expert examiner. Example items for complex assessment include thesis, funding proposal, *etc.* The complexity of assessment is due to the format implicitness. In the past it has been puzzling to deal with the ambiguous assessment criteria for final year project (FYP) thesis assessment. Webster, Pepper and Jenkins (2000) discussed some common general criteria for FYP thesis and their ambiguity regarding use, meaning and application.

Woolf (2004) more specifically stated on the FYP assessment criterion weighting:'The departments are as silent on the weightings that they apply to their criteria as they are on the number of criteria that contribute to a grade'. A more serious concern was raised by Shay (2004) who argued that the FYP assessment for engineering and social sciences is 'a socially situated interpretive act', implying that many different alternative interpretations and grades are possible for one assessment task. The problems with the FYP thesis assessment have thus received much attention over the decades since the assessment difficulty was discussed by Black (1975).

DEFINITIONS

There are a number of assessment terms that will appear in any discussion of assessment. Listed below are common interpretations of some of these terms:

Assessment A working definition of Assessment for learning from a widely cited article contends: "the term 'assessment' refers to all those activities undertaken by teachers, and by their students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged.

Since this seminal article, educators have differentiated assessment according to its purpose:

Assessment for learning:

- Comprises two phases—initial or diagnostic assessment and formative assessment
- Assessment can be based on a variety of information sources (*e.g.*, portfolios, works in progress, teacher observation, conversation)
- Verbal or written feedback to the student is primarily descriptive and emphasizes strengths, identifies challenges, and points to next steps
- As teachers check on understanding they adjust their instruction to keep students on track
- No grades or scores are given - record-keeping is primarily anecdotal and descriptive
- Occurs throughout the learning process, from the outset of the course of study to the time of summative assessment

Assessment as learning:

- Begins as students become aware of the goals of instruction and the criteria for performance

- Involves goal-setting, monitoring progress, and reflecting on results
- Implies student ownership and responsibility for moving his or her thinking forward (metacognition)
- Occurs throughout the learning process

Assessment of learning:

- Assessment that is accompanied by a number or letter grade (summative)
- Compares one student's achievement with standards
- Results can be communicated to the student and parents
- Occurs at the end of the learning unit

Evaluation:

- Judgment made on the basis of a student's performance

Diagnostic assessment (now referred to more often as "pre-assessment"):

- Assessment made to determine what a student does and does not know about a topic
- Assessment made to determine a student's learning style or preferences
- Used to determine how well a student can perform a certain set of skills related to a particular subject or group of subjects
- Occurs at the beginning of a unit of study
- Used to inform instruction:makes up the initial phase of assessment for learning

Formative assessment:

- Assessment made to determine a student's knowledge and skills, including learning gaps as they progress through a unit of study
- Used to inform instruction and guide learning
- Occurs during the course of a unit of study
- Makes up the subsequent phase of assessment for learning

Summative assessment:

- Assessment that is made at the end of a unit of study to determine the level of understanding the student has achieved
- Includes a mark or grade against an expected standard

PRINCIPLES

Among the most comprehensive listing of principles of assessment for learning are those written by the QCA (Qualifications and Curriculum Authority). The authority, which is sponsored by England's Department for Children, Schools and Families, is responsible for national curriculum, assessment, and examinations. Their principal focus is on crucial aspects of assessment for learning, including how such assessment should be seen as central to classroom practice, and that all teachers should regard assessment for learning as a key professional skill.

The UK Assessment Reform Group (1999) identifies 'The big 5 principles of assessment for learning:

1. The provision of effective feedback to students.
2. The active involvement of students in their own learning.

3. Adjusting teaching to take account of the results of assessment.
4. Recognition of the profound influence assessment has on the motivation and self-esteem of pupils, both of which are critical influences on learning.
5. The need for students to be able to assess themselves and understand how to improve.

FEEDBACK

The purpose of an Assessment for Learning (AFL) task is to provide feedback to both the teacher and learner regarding the learner's progress towards achieving the learning objective(s). This feedback should be used by the teacher to revise and develop further instruction. An effective AFL method is to use a performance task coupled with a rubric. This type of assessment is fundamental in illustrating how and why such principles need to be adhered to.

ASSESSMENT THAT PROMOTES LEARNING

Realising our vision for personalising learning means that schools and teachers have to ensure that their assessment practices contribute to improving learning and teaching. Since 1998, the work of Paul Black and Dylan Wiliam has demonstrated the double impact of assessment for learning: it improves pupils' scores in national tests and examinations as well as their metacognitive skills, including the capacity to learn how to learn.

Assessment for learning is not new but, as much richer data have become available, it has become a more important and sharper tool, aided by developments in technology. It is not an occasional activity at the end of a unit of work, but a complex, joint activity between teacher and pupil. It helps teachers identify what pupils have or have not achieved, while pupils increase their understanding of the standard expected, their progress towards it and what they need to do to reach it. All this provides information to help teachers adjust their teaching, using five core strategies shown to have an impact on pupils' performance.

In implementing these strategies, teachers will choose the approaches and techniques that they consider likely to have the most significant impact, according to their pupils' responses and their own teaching style and preferences. For example, boys may respond particularly well to competitive assessment, such as the use of quick quizzes and 'sports coach'-style feedback, where the teacher suggests specifically what the pupil could do to improve his performance. Local conditions, such as the ethos and culture of the school, and whole-school systems and policies, such as those relating to behaviour management, will also influence teachers' choices.

Teachers are familiar with many of the elements of assessment for learning: they lie at the heart of outstanding learning and teaching. They involve teachers changing what they do, day by day, to respond to their pupils. When they do this within a whole-school context that establishes the priority of assessment for

learning, supported by effective systems for tracking pupils' progress, the impact of assessment on learning is likely to be considerable. We recognise that there has been a strong focus through the National Strategies on encouraging schools to establish assessment for learning at whole-school level. However, the Annual Report of Her Majesty's Chief Inspector confirmed recently that good practice is not widespread. In part, this is because teachers' use of data to inform their teaching remains one of the weakest areas of practice. In part, also, as Black and Wiliam's work with schools suggests, it is because the kinds of 'short cycle' adaptations that lead to the most significant benefits for pupils involve teachers changing some deeply embedded habits.

SUMMATIVE ASSESSMENT AND THE NATIONAL CURRICULUM

Summative assessment – the assessment *of* learning – when combined with assessment *for* learning, is a powerful tool for ensuring that all learners make good progress. It includes, but goes beyond, formal national tests and public examinations. For example, regular assessments by teachers give information not only about individual pupils but also comparative information about different classes and cohorts of pupils and the impact of teaching. The results of such assessments can be used to give parents a clear picture of how well their children are progressing.

However, such information must do more than report progress. Crucially, summative assessment must be combined with assessment for learning to enable teachers to respond rapidly in order to bring pupils back on track if they begin to fall behind. For this to happen, the information gained from high quality assessments needs to be used systematically and frequently to improve learning and teaching.

We do not consider that national summative assessment and personalising learning are incompatible. The purposes of national assessment include:

- Reporting on individual pupils
- Monitoring national performance
- Contributing to improving learning and teaching by identifying and reporting on common weaknesses in pupils' responses
- Contributing to monitoring the effectiveness of schools.

National assessment data fulfil some of these purposes better than others. In particular, the data do not always enable teachers to use them in diagnosing common problems and improving learning and teaching. Nor do they recognise and record adequately the extent to which pupils have developed the skills and attitudes are increasingly important to later outcomes. We acknowledge that dealing with these issues presents complex challenges.

However, we consider that those challenges must be faced as a priority as part of the development of personalising learning. While there are no formal restrictions on when National Curriculum assessment takes place, in practice, schools have tended to enter pupils for assessments at the end of each key

stage, because of the requirement to report on progress at these set points. Recently, many secondary schools have increased the number of pupils entered early for national assessments and public examinations, enabling them to progress at a pace that matches their learning better. We believe there is a case for increasing further the flexibility of national assessment to enable all pupils to demonstrate their level of achievement when they are ready.

The National Curriculum is the basis for assessment: it describes an entitlement to learning for all pupils in terms of the knowledge, skills, understanding and attitudes they are expected to develop. Although it was never intended to describe the whole curriculum, many primary and secondary schools nevertheless perceive it as being too extensive and prescriptive, with too little scope for local flexibility. Recent moves to tackle concerns about the secondary curriculum.

While considerable flexibilities exist, schools do not use these to the extent they might. For example, the time required for each subject is not statutory and there is no requirement that curriculum content should be taught in subject blocks. Schools are able to open up curriculum choice to pupils, for example, through project work, out-of-classroom activities and offering clubs within and beyond the school day. Many already do this very effectively. However, to realise the curriculum's full potential, some schools will need help to understand what flexibilities look like in practice and how barriers to innovation may be lifted.

Subject choices have always been a feature of pupils' final years of secondary school. The government's 14-19 reforms offer a significant opportunity to extend the range of learning pathways for young people: specialised Diplomas, Apprenticeships and the International Baccalaureate alongside GCSEs and A levels.

As these reforms are implemented, it will be vital to ensure that the choices young people make at 14 do not commit them irreversibly to pathways that may turn out to be inappropriate. Monitoring the take-up of the different pathways (at school, local and national levels) will be important to guard both against differential ambition for particular groups of pupils and against extending gender-stereotypical subject choices. Teachers, careers advisers and Connexions personal advisers therefore have a key role in guiding pupils as they choose their learning pathways.

The rationale for having some form of a National Curriculum holds now – and will do so in 2020. During this time, there will be changes to it, and its assessment, beyond those already planned. The statutory responsibility for keeping the curriculum under review and advising ministers on changes rests with the QCA, although a number of other bodies, in particular Ofsted, hold evidence on the impact on schools and pupils of the National Curriculum and its assessment. In recent years, reviews have focused on specific stages of schooling and have tended to deal separately with the curriculum and assessment. We believe that future changes should be informed by a shared understanding of the National Curriculum and its assessment (from the Foundation Stage to 14-19) and of the key issues affecting both.

TEACHER ROLES IN A COLLABORATIVE CLASSROOM

Across this nation, teachers are defining their roles in terms of mediating learning through dialogue and collaboration. While mediation has been defined in different ways by Reuven Feuerstein, Lev Vygotsky and others, we define mediation here as facilitating, modeling, and coaching. Most teachers engage in these practices from time to time. What is important here is that these behaviours (1) drive instruction in collaborative classrooms, and (2) have specific purposes in collaborative contexts.

Facilitator Facilitating involves creating rich environments and activities for linking new information to prior knowledge, providing opportunities for collaborative work and problem solving, and offering students a multiplicity of authentic learning tasks. This may first involve attention to the physical environment. For example, teachers move desks so that all students can see each other, thus establishing a setting that promotes true discussion. Teacher may also wish to move their desks from the front of the room to a less prominent space.

Additionally, teachers may structure the resources in the classroom to provide a diversity of genres and perspectives, to use and build upon cultural artifacts from the students' homes and communities, and to organize various learning activities.

Thus, a collaborative classroom often has a multiplicity of projects or activity centers using everyday objects for representing numerical information in meaningful ways and for conducting experiments that solve real problems. These classrooms also boast a rich variety of magazines, journals, newspapers, audiotapes, and videos which allow students to experience and use diverse media for communicating ideas. In Video Conference 1, for example, students were shown investigating science concepts using everyday materials, such as paper and straw, found in their neighbourhoods.

Facilitating in collaborative classrooms also involves people. Inside the classroom, students are organized into heterogeneous groups with roles such as Team Leader, Encourager, Reteller, Recorder, and Spokesperson. Additionally, collaborative teachers work to involve parents and community members.

Examples are: A workshop center in New York invites parents to come and experience the thinking processes involved in conducting experiments using everyday objects so that they can provide such learning experiences at home; teachers in Tucson involve parents and the community in academic tasks their students engage in, and rural students in Colorado perform community services such as producing a local newspaper.

Another way that teachers facilitate collaborative learning is to establish classrooms with diverse and flexible social structures that promote the sort of classroom behaviour they deem appropriate for communication and collaboration among students. These structures are rules and standards of behaviours, fulfilling several functions in group interaction, and influencing group attitudes. Particular

rules depend, of course, on the classroom context. Thus, teachers often develop them collaboratively with students and review or change them as needed. Examples of rules are giving all members a chance to participate, valuing others' comments, and arguing against (or for) ideas rather than people. Examples of group functions are: asking for information, clarifying, summarizing, encouraging, and relieving tension. To facilitate high quality group interaction, teachers may need to teach, and students may need to practice, rules and functions for group interaction.

Finally, teachers facilitate collaborative learning by creating learning tasks that encourage diversity, but which aim at high standards of performance for all students. These tasks involve students in high-level thought processes such as decision making and problem solving that are best accomplished in collaboration. These tasks enable students to make connections to real-world objects, events, and situations in their own and an expanded world, and tap their diverse perspectives and experiences. Learning tasks foster students' confidence and at the same time, are appropriately challenging.

Model Modeling has been emphasized by many local and state guidelines as sharing one's thinking and demonstrating or explaining something. However, in collaborative classrooms, modeling serves to share with students not only what one is thinking about the content to be learned, but also the process of communication and collaborative learning. Modeling may involve thinking aloud (sharing thoughts about something) or demonstrating (showing students how to do something in a step-by-step fashion).

In terms of content, teachers might verbalize the thinking processes they use to make a prediction about a scientific experiment, to summarize ideas in a passage, to figure out the meaning of an unfamiliar word, to represent and solve a problem, to organize complicated information, and so on. Just as important, they would also think aloud about their doubts and uncertainties. This type of metacognitive thinking and thinking aloud when things do not go smoothly is invaluable in helping students understand that learning requires effort and is often difficult for people.

With respect to group process, teachers may share their thinking about the various roles, rules, and relationships in collaborative classrooms. Consider leadership, for example. A teacher might model what he or she thinks about such questions as how to manage the group's time or how to achieve consensus. Similarly, showing students how to think through tough group situations and problems of communication is as invaluable as modeling how to plan an approach to an academic problem, monitoring its progress, and assessing what was learned.

A major challenge in mediating learning is to determine when it is appropriate to model by thinking aloud and when it is useful to model by demonstrating.

If a teacher is certain that students have little experience with, say, a mathematical procedure, then it may be appropriate to demonstrate it before students engage in a learning task. (This is not to say that the teacher assumes

or states that there is only one way to perform the procedure. It is also important to allow for individual variations in application.) If, on the other hand, the teacher believes students can come up with the procedure themselves, then he or she might elect to ask the students to model how they solved the problem; alternatively the teacher could give students hints or cues.

Coach Coaching involves giving hints or cues, providing feedback, redirecting students' efforts, and helping them use a strategy. A major principle of coaching is to provide the right amount of help when students need it—neither too much nor too little so that students retain as much responsibility as possible for their own learning.

For example, a collaborative group of junior high students worked on the economic development of several nations. They accumulated a lot of information about the countries and decided that the best way to present it was to compare the countries. But they were stymied as to how to organize the information so they could write about it in a paper, the product they chose to produce.

Their teacher hinted that they use a matrix—a graphic organizer they had learned—to organize their information. When the group finished the matrix, the teacher gave them feedback. In so doing, he did not tell them it was right or wrong, but asked questions that helped them verbalize their reasons for completing the matrix as they did. The principle the teacher followed was to coach enough so that students could continue to learn by drawing on the ideas of other group members.

STUDENT ROLES IN A COLLABORATIVE CLASSROOM

Students also assume new roles in the collaborative classroom. Their major roles are collaborator and active participator. It is useful to think how these new roles influence the processes and activities students conduct before, during, and after learning. For example, before learning, students set goals and plan learning tasks; during learning, they work together to accomplish tasks and monitor their progress; and after learning, they assess their performance and plan for future learning. As mediator, the teacher helps students fulfill their new roles.

Goal setting Students prepare for learning in many ways. Especially important is goal setting, a critical process that helps guide many other before-, during-, and and after-learning activities. Although teachers still set goals for students, they often provide students with choices. When students collaborate, they should talk about their goals.

For example, one teacher asked students to set goals for a unit on garbage. In one group, a student wanted to find out if garbage is a problem, another wanted to know what happens to garbage, a third wanted to know what is being done to solve the problem of garbage. The fourth member could not think of a goal, but agreed that the first three were important and adopted them. These students became more actively involved in the unit after their discussion about goals, and at the end of the unit, could better evaluate whether they had attained them.

Designing Learning Tasks and Monitoring While teachers plan general learning tasks, for example, to produce a product to illustrate a concept, historical sequence, personal experience, and so on, students assume much more responsibility in a collaborative classroom for planning their own learning activities.

Ideally, these plans derive in part from goals students set for themselves. Thoughtful planning by the teacher ensures that students can work together to attain their own goals and capitalize on their own abilities, knowledge, and strategies within the parameters set by the teacher. Students are more likely to engage in these tasks with more purpose and interest than in traditional classrooms.

Self-regulated learning is important in collaborative classrooms. Students learn to take responsibility for monitoring, adjusting, self-questioning, and questioning each other. Such self-regulating activities are critical for students to learn today, and they are much better learned within a group that shares responsibility for learning. Monitoring is checking one's progress towards goals. Adjusting refers to changes students make, based on monitoring, in what they are doing to reach their goals. For example, a group of students decided that the sources of information on the Civil War they selected initially were not as useful as they had hoped, so they selected new materials. Another group judged that the paper they had planned to write would not accomplish what they thought it would the way they had organized it, so they planned a new paper.

Students can further develop their self-regulating abilities when each group shares its ideas with other groups and gets feedback from them. For example, in the first video conference, elementary students were shown collaborating in small groups to define and represent math problems. Working in small groups, the children determined what was being asked in story problems and thought of ways to solve the problems. Then each group shared its ideas with the whole class. Members of the class commented on the ideas. As students developed problem-solving skills with feedback from other groups, they learned more about regulating their own learning which they could use in the future.

Assessment While teachers have assumed the primary responsibility for assessing students' performance in the past, collaborative classrooms view assessment much more broadly. That is, a major goal is to guide students from the earliest school years to evaluate their own learning. Thus, a new responsibility is self-assessment, a capability that is fostered as students assess group work.

Self-assessment is intimately related to ongoing monitoring of one's progress towards achievement of learning goals. In a collaborative classroom, assessment means more than just assigning a grade. It means evaluating whether one has learned what one intended to learn, the effectiveness of learning strategies, the quality of products and decisions about which products reflect one's best work, the usefulness of the materials used in a task, and whether future learning is needed and how that learning might be realized.

Collaborative classrooms are natural places in which to learn self-assessment. And because decisions about materials and group performance are shared,

students feel more free to express doubts, feelings of success, remaining questions, and uncertainties than when they are evaluated only by a teacher. Furthermore, the sense of cooperation (as opposed to competition) that is fostered in collaborative work makes assessment less threatening than in a more traditional assessment situation. Ideally, students learn to evaluate their own learning from their experiences with group evaluation.

INTERACTIONS IN A COLLABORATIVE CLASSROOM

The critical role of dialogue in collaborative classrooms has been stressed throughout this Guidebook The collaborative classroom is alive with two-way communication. A major mode of communication is dialogue, which in a collaborative classroom is thinking made public. A major goal for teachers is to maintain this dialogue among students.

Consider examples of interactions in collaborative groups. Members discuss their approaches to solving a math problem, explain their reasoning, and defend their work. Hearing one student's logic prompts the other students to consider an alternative interpretation.

Students are thus challenged to re-examine their own reasoning. When three students in a group ask a fourth student to explain and support her ideas, that is, to make her thinking public, she frequently examines and develops her concepts for herself as she talks.

When one student has an insight about how to solve a difficult problem, the others in the group learn how to use a new thinking strategy sooner than if they had worked on their own. Thus, students engaged in interaction often exceed what they can accomplish by working independently.

Collaborative teachers maintain the same sort of high-level talk and interaction when a whole class engages in discussion. They avoid recitation, which consists primarily of reviewing, drilling, and quizzing; *i.e.*, asking questions to which the answer is known by the teacher and there is only one right answer. In true discussion, students talk to each other as well as to the teacher, entertain a variety of points of view, and grapple with questions that have no right or wrong answers. Sometimes both students and the teacher change their minds about an idea. In sum, interactions in whole group discussion mirror what goes on in small groups.

Still a third way interactions differ in collaborative classrooms has been suggested above. Teachers, in their new roles as mediators, spend more time in true interactions with students. They guide students' search for information and help them share their own knowledge. They move from group to group, modeling a learning strategy for one group, engaging in discussion with another, giving feedback to still another.

CHALLENGES AND CONFLICTS

When teachers and schools move from traditional to collaborative instruction, several important issues are likely to arise. They are important concerns for

teachers, administrators, and parents. Classroom Control Collaborative classrooms tend to be noisier than traditional classrooms. This is a legitimate issue for a number of people. Some teachers believe that noisy classrooms indicate lack of discipline or teacher control. In such situations, they argue, students cannot learn.

Earlier in this essay we stressed that collaborative classrooms do not lack structure. Indeed, structure becomes critical. Students need opportunities to move about, talk, ask questions, and so on. Thus, we argue that the noise in a smoothly running collaborative classroom indicates that active learning is going on.

However, students must be taught the parameters within which they make their choices. Rules and standards must be stressed from the beginning, probably before any collaboration is initiated, and reviewed throughout a school year.

Preparation Time for Collaborative Learning Teachers and administrators may believe that new lesson plans must be formed for these classrooms. To a certain extent, they are correct.

But many teachers already have created engaging units and activities that are easily implemented in a collaborative classroom. Furthermore, teachers can begin slowly, making changes in one subject area or

unit within a subject area, probably one they are already very comfortable teaching, and then add other subjects and units. Teachers can also share their plans with each other. Indeed, if we expect students to collaborate, we should encourage teachers to do the same! Principals and curriculum specialists can also collaborate with teachers to plan effective segments of instruction. Moreover, there is a tradeoff between the extra planning time needed and benefits such as less time correcting lessons, increased student motivation, and fewer attendance and discipline problems.

Individual Differences Among Students We have touched on this concern in the section on heterogeneous grouping. Nevertheless, many people will still doubt that individual differences can be better addressed in collaborative classrooms than in traditional classrooms with homogeneous grouping. A major question people have concerns the advantage collaboration affords gifted or high-achieving students. There are two tough issues here.

First, many teachers do not believe that low-achieving students have much to contribute to the learning situation; in effect, that they have no prior experiences or knowledge of value. Second, teachers worry that high-achieving students will be held back.

In response to the first issue, many collaborative teachers have expressed surprise when seemingly less-able students had insights and ideas that went way beyond what teachers expected. Further, if each student contributes something, the pool of collective knowledge will indeed be rich. In answer to the second concern, data suggest that high-achieving students gain much from their exposure to diverse experiences and also from peer tutoring. Also, students who may be high achieving in one area may need help in other areas.

Teachers and others also wonder whether shy students can fully participate in a classroom that depends so much on dialogue. We suggest that these students might feel more comfortable talking in small groups that share responsibility for learning. Furthermore, interaction between learners can happen in ways other than oral dialogue, for example, writing and art.

A related concern is that many schools are structured homogeneously so that an individual teacher cannot form heterogeneous groups without involving changes in the entire school. A whole class of "low" readers are taught by one teacher, "average" by another. High school tracks are even more systematically entrenched. Clearly, these practices are not conducive to collaborative learning and require system-wide restructuring. Individual teachers or groups of teachers can initiate dialogue on the problem, however.

Individual Responsibility for Learning This concern is a difficult one to solve unless major changes in other areas of schooling are also undertaken. Students are used to being graded for individual work; parents expect to know how their students fare in school. School staff and state departments depend on traditional assessments.

In collaborative classrooms, it is often difficult to assign individual grades. Some teachers give group grades, but many students and parents are uncomfortable with these.

Ideally, assessment practices should be changed so that they are consistent with collaboration, with a new view of learning and with a thinking curriculum. Video Conference 4 addresses recent research and practice on assessment. In the meantime, effective ways have been developed whereby individual students can be evaluated in collaborative classrooms. For example, David Johnson and Roger Johnson, as well as Robert Slavin, advise making individuals responsible for subtasks in group work and then determining both group and individual grades.

Conflict of Values Susan Florio-Ruane has observed that many teachers do not feel comfortable allowing students to initiate dialogue, determine topics, or explore perspectives other than the teacher's. This reluctance conflicts with the way effective caregivers teach their children in the home.

Florio-Ruane and others, such as Annemarie Palincsar, have found that teachers often have difficulty helping students construct meaning, especially linking the new information to the prior knowledge and culture of the students. In part this is because many teachers believe that their role is to transmit knowledge; in part it is because they are held accountable for teaching discrete skills. In one poignant example, a student teacher's concern for grammar and punctuation prevented her from seeing the sophistication and meaning in what the child was actually communicating in a book report.

The reluctance people feel when asked to make major changes in the way they do things is clearly the most serious issue of those discussed here. Hardly a person exists who eagerly gives up familiar ways of behaving to attempt something that is unknown and is likely to have many challenges of implementation.

CLASSROOM ASSESSMENTS IMPROVE LEARNING

Teachers who develop useful assessments, provide corrective instruction, and give students second chances to demonstrate success can improve their instruction and help students learn.

Large-scale assessments, like all assessments, are designed for a specific purpose. Those used in most states today are designed to rank-order schools and students for the purposes of accountability—and some do so fairly well. But assessments designed for ranking are generally not good instruments for helping teachers improve their instruction or modify their approach to individual students. First, students take them at the end of the school year, when most instructional activities are near completion. Second, teachers don't receive the results until two or three months later, by which time their students have usually moved on to other teachers. And third, the results that teachers receive usually lack the level of detail needed to target specific improvements (Barton, 2002; Kifer, 2001).

The assessments best suited to guide improvements in student learning are the quizzes, tests, writing assignments, and other assessments that teachers administer on a regular basis in their classrooms. Teachers trust the results from these assessments because of their direct relation to classroom instructional goals. Plus, results are immediate and easy to analyze at the individual student level. To use classroom assessments to make improvements, however, teachers must change both their view of assessments and their interpretation of results. Specifically, they need to see their assessments as an integral part of the instruction process and as crucial for helping students learn. Despite the importance of assessments in education today, few teachers receive much formal training in assessment design or analysis. A recent survey showed, for example, that fewer than half the states require competence in assessment for licensure as a teacher. Lacking specific training, teachers rely heavily on the assessments offered by the publisher of their textbooks or instructional materials. When no suitable assessments are available, teachers construct their own in a haphazard fashion, with questions and essay prompts similar to the ones that their teachers used. They treat assessments as evaluation devices to administer when instructional activities are completed and to use primarily for assigning students' grades.

To use assessments to improve instruction and student learning, teachers need to change their approach to assessments in three important ways.

MAKE ASSESSMENTS USEFUL FOR STUDENTS

Nearly every student has suffered the experience of spending hours preparing for a major assessment, only to discover that the material that he or she had studied was different from what the teacher chose to emphasize on the assessment. This experience teaches students two un-fortunate lessons. First, students realize that hard work and effort don't pay off in school because the

time and effort that they spent studying had little or no influence on the results. And second, they learn that they cannot trust their teachers (Guskey, 2000a). These are hardly the lessons that responsible teachers want their students to learn.

Nonetheless, this experience is common because many teachers still mistakenly believe that they must keep their assessments secret. As a result, students come to regard assessments as guessing games, especially from the middle grades on. They view success as depending on how well they can guess what their teachers will ask on quizzes, tests, and other assessments. Some teachers even take pride in their ability to out-guess students. They ask questions about isolated concepts or obscure understandings just to see whether students are reading carefully. Generally, these teachers don't include such "gotcha" questions maliciously, but rather—often unconsciously—because such questions were asked of them when they were students.

Classroom assessments that serve as meaningful sources of information don't surprise students. Instead, these assessments reflect the concepts and skills that the teacher emphasized in class, along with the teacher's clear criteria for judging students' performance. These concepts, skills, and criteria align with the teacher's instructional activities and, ideally, with state or district standards. Students see these assessments as fair measures of important learning goals. Teachers facilitate learning by providing students with important feedback on their learning progress and by helping them identify learning problems (Bloom, Madaus, & Hastings, 1981; Stiggins, 2002).

Critics sometimes contend that this approach means "teaching to the test." But the crucial issue is, What determines the content and methods of teaching? If the test is the primary determinant of what teachers teach and how they teach it, then we are indeed "teaching to the test." But if desired learning goals are the foundation of students' instructional experiences, then assessments of student learning are simply extensions of those same goals. Instead of "teaching to the test," teachers are more accurately "testing what they teach." If a concept or skill is important enough to assess, then it should be important enough to teach. And if it is not important enough to teach, then there's little justification for assessing it.

FOR TEACHERS

The best classroom assessments also serve as meaningful sources of information for teachers, helping them identify what they taught well and what they need to work on. Gathering this vital information does not require a sophisticated statistical analysis of assessment results. Teachers need only make a simple tally of how many students missed each assessment item or failed to meet a specific criterion. State assessments sometimes provide similar item-by-item information, but concerns about item security and the cost of developing new items each year usually make assessment developers reluctant to offer such detailed information. Once teachers have made specific tallies, they can

pay special attention to the trouble spots—those items or criteria missed by large numbers of students in the class. In reviewing these results, the teacher must first consider the quality of the item or criterion. Perhaps the question is ambiguously worded or the criterion is unclear. Perhaps students mis-interpreted the question. Whatever the case, teachers must determine whether these items adequately address the knowledge, understanding, or skill that they were intended to measure.

If teachers find no obvious problems with the item or criterion, then they must turn their attention to their teaching. When as many as half the students in a class answer a clear question incorrectly or fail to meet a particular criterion, it's not a student learning problem—it's a teaching problem. Whatever teaching strategy was used, whatever examples were employed, or whatever explanation was offered, it simply didn't work.

Analyzing assessment results in this way means setting aside some powerful ego issues. Many teachers may initially say, "I taught them. They just didn't learn it!" But on reflection, most recognize that their effectiveness is not defined on the basis of what they do as teachers but rather on what their students are able to do. Can effective teaching take place in the absence of learning? Certainly not. Some argue that such a perspective puts too much responsibility on teachers and not enough on students. Occasionally, teachers respond, "Don't students have responsibilities in this process? Shouldn't students display initiative and personal accountability?"

Indeed, teachers and students share responsibility for learning. Even with valiant teaching efforts, we cannot guarantee that all students will learn everything excellently. Only rarely do teachers find items or assessment criteria that every student answers correctly. A few students are never willing to put forth the necessary effort, but these students tend to be the exception, not the rule. If a teacher is reaching fewer than half of the students in the class, the teacher's method of instruction needs to improve. And teachers need this kind of evidence to help target their instructional improvement efforts.

FOLLOW ASSESSMENTS WITH CORRECTIVE INSTRUCTION

If assessments provide information for both students and teachers, then they cannot mark the end of learning. Instead, assessments must be followed by high-quality, corrective instruction designed to remedy whatever learning errors the assessment identified. To charge ahead knowing that students have not learned certain concepts or skills well would be foolish. Teachers must therefore follow their assessments with instructional alternatives that present those concepts in new ways and engage students in different and more appropriate learning experiences.

High-quality, corrective instruction is not the same as reteaching, which often consists simply of restating the original explanations louder and more slowly. Instead, the teacher must use approaches that accommodate differences in students' learning styles and intelligences (Sternberg, 1994). Although teachers

generally try to incorporate different teaching approaches when they initially plan their lessons, corrective instruction involves extending and strengthening that work. In addition, those students who have few or no learning errors to correct should receive enrichment activities to help broaden and expand their learning. Materials designed for gifted and talented students provide an excellent resource for such activities.

Developing ideas for corrective instruction and enrichment activities can be difficult, especially if teachers believe that they must do it alone, but structured professional development opportunities can help teachers share strategies and collaborate on teaching techniques (Guskey, 1998, 2000b). Faculty meetings devoted to examining classroom assessment results and developing alternative strategies can be highly effective. District-level personnel and collaborative partnerships with local colleges and universities offer wonderful resources for ideas and practical advice.

Occasionally, teachers express concern that if they take time to offer corrective instruction, they will sacrifice curriculum coverage. Because corrective work is initially best done during class and under the teacher's direction, early instructional units will typically involve an extra class period or two. Teachers who ask students to complete corrective work independently, outside of class, generally find that those students who most need to spend time on corrective work are the least likely to do so.

As students become accustomed to this corrective process and realize the personal benefits it offers, however, the teacher can drastically reduce the amount of class time allocated to such work and accomplish much of it through homework assignments or in special study sessions before or after school. And by not allowing minor errors to become major learning problems, teachers better prepare students for subsequent learning tasks, eventually need less time for corrective work (Whiting, Van Burgh, & Render, 1995), and can proceed at a more rapid pace in later learning units.

By pacing their instructional units more flexibly, most teachers find that they need not sacrifice curriculum coverage to offer students the benefits of corrective instruction.

GIVE SECOND CHANCES TO DEMONSTRATE SUCCESS

To become an integral part of the instructional process, assessments cannot be a one-shot, do-or-die experience for students. Instead, assessments must be part of an ongoing effort to help students learn. And if teachers follow assessments with helpful corrective instruction, then students should have a second chance to demonstrate their new level of competence and understanding. This second chance helps determine the effectiveness of the corrective instruction and offers students another opportunity to experience success in learning.

Writing teachers have long recognized the many benefits of a second chance. They know that students rarely write well on an initial attempt.

Teachers build into the writing process several opportunities for students to gain feedback on early drafts and then to use that feedback to revise and

improve their writing. Teachers of other subjects frequently balk at the idea, however—mostly because it differs from their personal learning experiences.

Some teachers express concern that giving students a second chance might be unfair and that "life isn't like that." They point out that that a surgeon doesn't get a second chance to perform an operation successfully and a pilot doesn't get a second chance to land a jumbo jet safely. Because of the very high stakes involved, each must get it right the first time.

But how did these highly skilled professionals learn their craft? The first operation performed by that surgeon was on a cadaver—a situation that allows a lot of latitude for mistakes. Similarly, the pilot spent many hours in a flight simulator before ever attempting a landing from the cockpit. Such experiences allowed them to learn from their mistakes and to improve their performance. Similar instructional techniques are used in nearly every professional endeavor. Only in schools do student face the prospect of one-shot, do-or-die assessments, with no chance to demonstrate what they learned from previous mistakes.

All educators strive to have their students become lifelong learners and develop learning-to-learn skills. What better learning-to-learn skill is there than learning from one's mistakes? A mistake can be the beginning of learning. Some assessment experts argue, in fact, that students learn nothing from a successful performance. Rather, students learn best when their initial performance is less than successful, for then they can gain direction on how to improve (Wiggins, 1998).

Other teachers suggest that it's unfair to offer the same privileges and high grades to students who require a second chance that we offer to those students who demonstrate a high level of learning on the initial assessment.

After all, these students may simply have failed to prepare appropriately. Certainly, we should recognize students who do well on the initial assessment and provide opportunities for them to extend their learning through enrichment activities. But those students who do well on a second assessment have also learned well.

More important, their poor performance on the first assessment may not have been their fault. Maybe the teaching strategies used during the initial instruction were inappropriate for these students, but the corrective instruction proved more effective. If we determine grades on the basis of performance and these students have performed at a high level, then they certainly deserve the same grades as those who scored well on their first try.

A comparable example is the driver's license examination. Many individuals do not pass their driver's test on the first attempt.

On the second or third try, however, they may reach the same high level of performance as others did on their first. Should these drivers be restricted, for instance, to driving in fair weather only? In inclement weather, should they be required to pull their cars over and park until the weather clears? Of course not. Because they eventually met the same high performance standards as those who passed on their initial attempt, they receive the same privileges. The same should hold true for students who show that they, too, have learned well.

SIMILAR SITUATIONS

Using assessments as sources of information, following assessments with corrective instruction, and giving students a second chance are steps in a process that all teachers use naturally when they tutor individual students. If the student makes a mistake, the teacher stops and points out the mistake.

The teacher then explains that concept in a different way. Finally, the teacher asks another question or poses a similar problem to ensure the student's understanding before going on. The challenge for teachers is to use their classroom assessments in similar ways to provide all students with this sort of individualized assistance.

Successful coaches use the same process. Immediately following a gymnast's performance on the balance beam, for example, the coach explains to her what she did correctly and what could be improved. The coach then offers specific strategies for improvement and encourages her to try again. As the athlete repeats her performance, the coach watches carefully to ensure that she has corrected the problem.

Successful students typically know how to take corrective action on their own. They save their assessments and review the items or criteria that they missed. They rework problems, look up answers in their textbooks or other resource materials, and ask the teacher about ideas or concepts that they don't understand.

Less successful students rarely take such initiative. After looking at their grades, they typically crumple up their assessments and deposit them in the trash can as they leave the classroom. Teachers who use classroom assessments as part of the instructional process help all of their students do what the most successful students have learned to do for themselves.

THE BENEFITS OF ASSESSMENT

Using classroom assessment to improve student learning is not a new idea. More than 30 years ago, Benjamin Bloom showed how to conduct this process in practical and highly effective ways when he described the practice of mastery learning (Bloom, 1968, 1971). But since that time, the emphasis on assessments as tools for accountability has diverted attention from this more important and fundamental purpose.

Assessments can be a vital component in our efforts to improve education. But as long as we use them only as a means to rank schools and students, we will miss their most powerful benefits. We must focus instead on helping teachers change the way they use assessment results, improve the quality of their classroom assessments, and align their assessments with valued learning goals and state or district standards.

When teachers' classroom assessments become an integral part of the instructional process and a central ingredient in their efforts to help students learn, the benefits of assessment for both students and teachers will be boundless.

THE CURRICULUM FLEXIBILITY AND ASSESSMENT

Culture themes relate to the Learning content. Leadership and Teacher skills fall under the theme Agents. Finally, Reliability and Appropriation of available tools refer to aspects of the technology. In summary, the contextual factors quite well to the mediating circumstances categorised in the Generative Framework. One development to emerge is to distinguish the Generative Framework heading "Context? into two themes: the Environment and Learning Content.

FRAMEWORK OF CONTEXTS

The framework places the learner clearly at the centre, with three elements of context distinguished: Knowledge, Resources, and Environment. The framework highlights how these elements interact but importantly how they are "filtered? or mediated by certain factors. For example, the ability to count is named as a form of knowledge, and the curriculum as a knowledge filter - a factor mediating the learner's access to this knowledge. The structure of different social relationships is an example of how certain (human) resources may be filtered.

The framework is used in the next section to discuss the different factors mediating the adoption of technologies in the Capital research.

Contextual theme Key mediating factors identified as:

- *Environment Home*: School setting
- Learning Spaces
- Learning Content Curriculum Flexibility
- Assessment Culture
- Agents Leadership
- Teacher skills/confidence
- Tools Reliability
- Appropriation of available tools

ENVIRONMENT

He environments created by the interplay between the locations, the technologies, the cultures and the agents raise new issues and opportunities in TEL. New technologies are being employed to support learning within and across many different environments from the campus to museums and art galleries, to field trips, to workplaces and to homes. Indeed, technologies have the potential to change the nature of learning in the classroom and, as reported in the Yewlands Technology College Case Study, can help the entire campus to be viewed as a space (or a series of spaces) for learning. In some cases technology may enhance traditional undertakings such as collecting samples and artifacts' and taking notes on a school-trip for discussion on return to class. Increasingly, however, technologies can facilitate activities which would not previously have been possible - the use of location based devices or the use of a platform to share and access data from anywhere at any time (such as the city- wide Bristol Eat-a-meter project,) or simply to capture images and audio.

HOME - SCHOOL SETTING

There has been a considerable drive towards increasing learners? access to their learning from home. In parallel there has also been a drive to increase parental access to their children's schooled learning. Although clearly aimed at maximising opportunities, this has been as the means to monitor pupils? progress rather than to instigate or enhance the conversation about learning (although the two are neither synonymous nor mutually exclusive).

Internet provision in itself does not lead to enhanced conversations about learning and there are significant disparities between schools with regards to making learning content available, accessible and current. For some learners, particularly those with disruptive domestic circumstances, the home is not necessarily the best place for out of school learning and alternative provision is necessary. Previous research into (non-ICT facilitated) parental involvement in homework has also reported that disadvantaged parents can engage less in supporting their children than the better-off. However, the example of Shireland Gateway illustrate that where a coherent strategy is implemented the conversations between parent/career and child and parent/carer and school can be enhanced. For families without home access, schools might consider approaches where access is provided in community centres, mosques and supermarkets. Teachers and practitioners generally seem to be strongly 35 persuaded by the research which suggested that"good Internet and computer facilities add one more GCSE grade to any pupil?. There is significant enthusiasm for the acceptance, and integration, of learners? own devices on and off-campus. In the HE sector this is now commonplace but schools remain generally far more cautious (Phillips, 2010b). The benefits in terms of ease of use and sustainability are widely accepted. However, there are clear technical implications and in some cases learners may be reluctant to use their own devices for learning activities (they may not wish to have video of themselves performing Shakespeare or a dance routine on another pupil's phone, nor to use their own device for filming another pupil). Whether the user owned devices in question are PCs, notebooks, handhelds or phones, there will be questions of parity of experience.

LEARNING SPACES

The design of learning spaces can hinder or facilitate the pedagogical approach adopted and hence the way in which technology is used to support this. The move to change spaces partly reflects recognition of the need to move away from the traditional didactic model, however there appears to remain two typical set ups: rooms with no technology except a couple of PCs or ICT suites with rows of PCs. In the first type of room, there is little opportunity for the integration of technology.

In the second, there is little opportunity for the integration of innovative pedagogy, such as collaboration and conversation. Both can inhibit innovative teaching and learning. A third familiar set-up, laptops on a trolley, can alleviate

this stark contrast, but the time needed to book these out and set them up acts as a disincentive for many teachers. The deployment of smaller devices and careful positioning of kit - so that the technology is unobtrusive but always available - can open up spaces for learning in new ways.

Technologies can also help to create flexible and/or collaborative new spaces where new builds are planned. Consideration does need to be made though of practicalities of employing different devices - such as cables needed for power. A number of independent studies have been carried out in the UK into the effects of technologies on attainment in selected subjects. Whilst the remit of this research did not extend to investigating virtual learning spaces, it is clear that these have the potential to bring another dimension to the learning experience - either in tandem with the increasing range of physical learning spaces we have noted or with the likely growth of the "virtual campus? model.

LEARNING CONTENT

Curriculum Flexibility

A significant challenge in adopting new technologies is to understand how their use maps onto curriculum. With a more rigid curriculum and timetabling for its delivery, this may be difficult as it can be impractical to introduce a novel tool simply to address particular domainspecific content within a particular short period of time. The growing interest in new curricula such as the RSAs Opening Minds, Futurelab?s Enquiring Minds or the Australian New Basics has been inspired by the view that the traditional curriculum neither prepares students appropriately for the world of post-compulsory education nor takes account of their current non-school experiences.

Our action research with schools using such curricula indicated great promise for how technologies can be integrated into more flexible "rich tasks?. A difficulty, however, was separating how the increased use of technology reflected the curriculum per se or the resultant change in pedagogy - the two are clearly interlinked. Furthermore, whilst there remains a firm belief in the potential of technologies, perhaps the necessity to support curricular developments there are also concerns about introducing another dynamic into an already ambitious attempt to transform pedagogy.This concern which was voiced by some in the deployment of the "learning platform? and/or CPD issues may indicate the difficulties in translating innovation into whole-school change.

ASSESSMENT CULTURE

A clear theme to emerge from our investigations into the adoption of e-assessment was the dominant effect of summative assessments. Assessment scores can determine the future opportunities of learners and institutions, so shaping teaching practice. Consequently, if a tool does not directly benefit such performance measures, there is a danger that is it not seen as cost effective. This notion was voiced during our investigation of tools to support higher order thinking as well as our focus on social

learning tools. It was reported that a key barrier was encountered when these tools did not map to particular skills measured through assessment. Implicit to this argument is how assessment can hinder the adoption of new curricula that focus on a wider range of skills: Since curriculum and assessment are inter-twined, then innovations in curriculum (such as "rich task? learning through cross-disciplinary projects) need to be accompanied by new forms of assessment that can capture the richness of learning across times and settings then package it in a way that can offer both evidence of achievement and a source for reflection."

Designing technologies to meet assessment requirements is clearly a challenge therefore, although our work identified successful attempts to do so, such as the Bowland Maths Materials.

It is also important to emphasize here that whilst summative assessment pressures may represent a significant barrier, tools to support formative assessment offer great potential. Indeed, a commitment to formative assessment was perceived as a key enabler in the successful use of e-portfolios in the e-Scope project.

PROJECT-BASED LEARNING ASSESSMENTS: RUBRICS, PORTFOLIOS, AND E-PORTFOLIOS

The tools and methods for assessing project-based learning are explained in the following paragraphs. Above all, assessments should be based on students' performance of real tasks. The entire course of the project should be assessed, not just the end product. The following components of assessing project-based learning help accomplish these important goals.

Rubrics

The assessment component of a project or other authentic learning experience guides the entire learning process. Usually the guidelines for a project are spelled out in a rubric.

“In short it is a list of objectives, what the student will learn or learn to do as a result of completing the assignment. For each objective, a rubric will also list performance indicators, observable evidence that the student has gained the objective knowledge and/or skills to varying degrees, each degree having an assigned number of points leading to a grade”. Assessment rubrics list the appropriate performance criteria for student success. Rubrics provide objective guidelines to measure and evaluate student understanding. They also improve learning because students have an opportunity to see the project expectations before the project is due. The students can review the guidelines as they complete their work. “Authentic assignments also lend themselves especially well to the use of student-produced rubrics and the resulting authentic assessments.

The student’s goals can become part of the rubric’s goals, with teacher- or student-defined benchmarks. This gives students a ruler with which to measure their success and teachers have a tool to assess the students’ learning” Teachers who consistently use rubrics believe that they improve students’ end products

and therefore increase learning. When teachers use rubrics to evaluate papers or projects, they know specifically what makes an acceptable final product and why.

By giving the students the rubric before they start their projects, they are being given the opportunity to know how they will be evaluated and can prepare accordingly. The students can better match their efforts to teacher expectations if standards and rubrics are clearly explained from the beginning developing a grid and making it available as a tool for student use will provide the scaffolding necessary to improve the quality of their work and increase their knowledge. Rubrics can prove to be useful tools as teachers lead students to complete projects involving technology. Rubrics can measure the knowledge and critical thinking skills that teachers hope the students will develop while working on the assigned project or problem. Keep in mind that rubrics can also measure the technology skills and knowledge that teachers are responsible for teaching.

How to Create a Rubric

Before creating a rubric, you will need to determine the performance criteria. Generate a list of items of what you expect the students to do as they work on the project. Then generate another list of items of what you expect the final project to have or look like. Once you have these two lists, highlight items of major importance and eliminate items of minimal importance. The final number of performance criteria is up to you. However, the more detailed the list, the more involved the scoring process.

A sample rubric for the Disneyland in Space project described in Chapter 3. Note that this rubric also provides space for student self assessment as well as peer assessment. When creating a rubric, many teachers prefer to use four point or five-point scales. Rubrics that list fewer performance levels are often too restrictive. They do not easily accommodate students with varying learning abilities. Rubrics that list more than five performance levels tend to be too detailed, which makes them more difficult to create and use when evaluating. They would also be difficult when students are using them for self-evaluation.

Be sure each performance level is well-defined. Start with the lowest performance level. Determine exactly what you will not accept as a completed project. Next, create the performance-level criteria for the second-highest or third-highest level. At this point, determine exactly what average performance criteria you can expect from all of the students. This level defines the acceptable final project. The next step is to create the performance-level criteria for the highest point on the scale. You should determine exactly what makes an outstanding or "above and beyond" project. Then, create the performance level criteria for other categories within the point scale. Finally, evaluate the performance criteria on either side (high or low) of the point scale to fill in any level you feel is incomplete. Determine if you need to create a performance level between any two existing ones. It is important to realise that a rubric is always a working- progress. Each time it is used, reevaluate it and modify it to

fit your revised expectations of the students and their projects. Once your rubric is completed, be sure to share it with students before they start their project. Expectations must be clear from the beginning of the project. The students should be able to compare their progress to a model. Technology software can be a great asset for teachers designing rubrics. You can create rubrics using word processing, desktop publishing, or spreadsheet software.

Word processing programmes allow you to make tables to display the various levels of the performance criteria. If you are using a spreadsheet, simply create a grid with the appropriate number of rows and columns depending on the number of performance criteria you have created, then fill in the boxes.

Technology Performance Criteria

Of course, the ISTE NETS for students is an excellent place to turn when looking for technology-related performance criteria for your rubrics. Remember that the technology skills the students will use during the project are just one piece of what you are assessing. Your rubric should also contain curriculum-based learning objectives and perhaps critical thinking skills, communication skills, and student effort. If the project is large, consider creating different rubrics to assess different areas of learning.

Especially useful to you will be the ISTE performance indicators, which are outlined in the student profiles (see Chapter Two for a listing of various examples of performance indicators students should master through different grade levels). Refer also to the ISTE website for the student profiles and performance indicators of all the grade levels. Find the performance indicators that correlate to your lesson and then rewrite them in more specific terms to create your performance criteria. You can view a rubric of technology skills and knowledge that is based on the NETS for students. The rubric correlates each of the ISTE NETS for students with the appropriate skills that the PreK–12 students should be able to accomplish. Search online using the key phrase "NETS for Students: Achievement Rubric."

Portfolios and E-portfolios

In recent years, there has been an emphasis on using portfolios and ePortfolios (or electronic portfolios) to assess students engaged in authentic or project-based learning. Portfolios are collections of student work and the products of their learning. Typically, the students select the pieces that they feel best represent their learning and skill. Portfolio pieces are usually best assessed using rubrics. Eportfolios are digital portfolios that are stored on computers.

They can contain presentations, writings, and other products that students have constructed using the computer. They can also contain artwork or other products that have been scanned and stored digitally. It is important to note that the products that the students create on the computer can be used in either a hard copy portfolio or an ePortfolio. The students do not have to create ePortfolios to collect and store the products they make with a computer. If the students are

not creating ePortfolios, instruct them to print the products they feel best represent their learning and store the hard copies in their portfolios.

More About E-portfolios

There are three distinct advantages to having students create ePortfolios: ease of storage, use of multimedia skills, and use of computer skills. With a traditional portfolio, a student collects items that showcase his/her talents and then puts them in a large folder, binder, or box. Eportfolios allow the information to be stored digitally on a floppy disk, zip disk, CD, or portable drive (*e.g.,* a jump or flash drive). Eportfolios not only take up little physical space, but they also hold a great deal of information. Pictures, artwork, and writing samples can be scanned, saved, and later imported into the software programme. Eportfolios can be transferred to future teachers in years ahead to show growth through grade levels. Samples of students reading orally can be recorded and saved to the ePortfolio as audio files.

Another important component of an ePortfolio is that work that students have done collaboratively can be duplicated and placed into each of the students' portfolios. In order to create an ePortfolio, the teacher and the students will need access to different types of hardware and software. When checking for the correct hardware components, the teacher's computer should have as much memory (RAM) as possible. This allows the computer to run the necessary software and external devices without freezing up.

Since ePortfolios tend to be large in size, the computer should also have a large hard drive, a CD burner, or at least one USB port to attach a jump drive so that all of the students' files can be saved in one location. If a student plans to add video to his/her ePortfolio, it is also important that the computer have video input and output ports. A flatbed scanner is also a very valuable hardware device. The student or teacher can use the scanner to turn paper assignments and photos into digital images. A digital camera can be used to take still pictures or to capture video that can be added to the student's ePortfolio.

Consider having the students create an ePortfolio (or traditional portfolio) to showcase any type of computer product. You might have them include multimedia products from programmes such as PowerPoint, Hyper Studio, Kid Pix, DreamWeaver, or FrontPage. You can also encourage them to include products made with word processors (*e.g.,* Microsoft Word and AppleWorks), graphic organizer software (*e.g.,* Inspiration and Kidspiration), and movie creators (*e.g.,* movie and Director). The next step in the process of creating an ePortfolio is planning. In other words, this is not a task that you should start in the last two months of the school year! There are several things to consider. The students and teacher need to determine exactly which items will be included in the ePortfolio. It is important to include pictures of the individual students, pictures or videos of the students' projects, and electronic or scanned versions of the students' papers and assignments. The students also need to create a storyboard to help determine the order of their slides, cards, or pages, depending

on what type of software they are using. Before the students begin to create their ePortfolios, make sure that the computers and software are working and ready for the students. While this project is extremely rewarding, it can easily become a nightmare if the technology is not ready when the students are.

As assignments and projects are completed, graded, and returned to the students, convert them to the digital format. This eliminates the need to do all of the documents for all of the students at one time at the end of the school year. Also, decide how the digital documents and files will be stored until they are placed in the ePortfolio. Because the digital files can be quite large, investigate using the school network, a specified hard drive location, or jump drives to store the students' files.

The last step for the teacher is to decide how the ePortfolio will be evaluated. A rubric is recommended. While the students will have varying levels of academic and technological skills, the assessment component should be equal for all students. The rubric should be given to the students at the onset of the ePortfolio assignment, so they will have a complete understanding of the teacher's expectations.

Once you have organized the students' work, the ePortfolio can be assembled. With the help of multimedia software, the ePortfolio can be enhanced by adding sound, music, pictures, graphics, and even video. The compilation of all of these elements helps to make it more interesting and visually appealing to the student, parent, and teacher. Electronic portfolios also serve to enhance computer and technology skills. The teacher and students gain the experience of using a variety of hardware and software products by creating, selecting, organizing, editing, and evaluating the portfolios. The students begin to feel a sense of accomplishment by sharing and presenting their ePortfolios to their teacher, classmates, and parents.

APPLIED EDUCATIONAL AND LEARNING

Applied educational and learning approaches focus on the practical application of educational theories and principles in real-world settings to facilitate effective teaching and learning experiences. This field emphasizes the implementation of evidence-based strategies and interventions to address diverse educational challenges and promote student success. Through applied educational and learning methodologies, educators strive to bridge the gap between theory and practice, translating theoretical insights into actionable strategies that enhance learning outcomes. One key aspect of applied educational and learning approaches is their interdisciplinary nature, drawing upon insights from psychology, sociology, neuroscience, and other fields to inform instructional design and pedagogical practices. By integrating knowledge from various disciplines, educators can develop holistic approaches to education that cater to the diverse needs and preferences of learners. Moreover, applied educational and learning methodologies emphasize the importance of contextually relevant and culturally responsive instruction. Educators strive to adapt teaching strategies and materials to the unique cultural, linguistic, and socio-economic backgrounds of their students, fostering an inclusive learning environment where all learners feel valued and supported. Furthermore, applied educational and learning approaches prioritize continuous assessment and evaluation to monitor student progress and inform instructional decision-making. Educators utilize formative and summative assessment tools to gauge student learning and identify areas for improvement, allowing for timely interventions and adjustments to teaching practices. Ultimately, applied educational and learning approaches empower educators to become reflective practitioners who critically evaluate their teaching methods and seek innovative solutions to educational challenges.

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