Factors Relating to Information Skills

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A Study among Students Pursuing Higher Education in India

By

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Amruth G. Kumar, PhD

CHAPTER I

EDUCATION IN THE AGE OF INFORMATION OVERLOAD

Introduction

"Change" is the mantra of the modern day; yet that, too, changes in high speed. As opposed to its agricultural and industrial past, modern society is characterized by its pace of change. The best education in modern society is that which prepares the students to understand, survive and pioneer changes. All attempts are to equip the students to keep pace with the changes. How does change that has serious implications for the future society, (or structural changes) happen? In fact, structural changes never happen all of a sudden. They are the result of long historical evolution in which science, technology, politics and economics play a leading role. Educational institutions, as important social agencies for steering all the advancements and dynamics behind the above-mentioned factors, is now playing the role of a skill manager enabling the students to handle their future with maximum possible precision. What, then, would be the nature of education with this purpose in mind? According to Alvin Toffler, "In dealing with the future, at least for the purpose at hand, it is more important to be imaginative and insightful than to be one hundred percent 'right'. Theories do not have to be 'right' to be enormously useful. Even error has its uses. The maps of the world drawn by medieval cartographers were so hopelessly inaccurate, so filled with factual error, that they elicit condescending smile today…Yet the great explorers could never have discovered the New World without them" (Toffler 1970). The global society believes that education will be a key factor in future positive change—provided it is in possession of people who use it creatively and for the common good.

At the end of the 20th century "21st century skills" was one of the most important jargons mooted by educationalists. Does this mean that skills important in the 20th century will be swept away by the 21st century? Actually, it was an orientation to the people who lived in the period of

transition which demarcates extremely different skills to be possessed by the workforce to survive with the realities of the 21st century. Exponents of 21st century skills point out that the new generation of students are not supposed to be mere mechanical workers; instead they are supposed to be independent thinkers, problem solvers, and decision makers. In this context the emphasis will be on what to use and how to use the information instead of the quantity of information one possesses. Even at school level teachers and parents toil to develop these higher order mental abilities among the children.

Critics of 21st century skills argue that the jargon itself is misleading. They argue that it is not a new concept at all. Thinking analytically, critically and creatively to become independent decision makers and problem solvers are not unique to the 21st century. Great philosophers of the 20th century such as Gandhi, Dewy and Freire have emphasized the above skills for all-round development of human beings. They believed that the education given to students should be capable of developing these skills among them; however, these calls were orally repeated several times by the educational practitioners and not applied seriously in a practical way. It is true that the work environment of the 21st century demands these calls to be practiced intensively to develop the abilities which are essential in order for an individual to be a valuable product in the modern labor market. For this reason, even if the so-called "21st century skills" are not new they have special emphasis in the modern day.

Computers have made tremendous advancements in the process of supporting human beings in the modern day. They assist almost all professionals, including teachers, industrialists, medical practitioners, lawyers, engineers and even non-professional, unskilled or semi-skilled laborers, in different phases of their lives and work. A laborer, for example, who is engaged in the painting of buildings receives the assistance of computers in color mixing in high precision, which reduces his job for producing the desired colors by adding several colors together. This is an indirect way of getting assistance from computers. Professionals receive both direct and indirect assistance from computers. One may agree with Richard Murnane and Frank Levy (2004), who argue that, "work that requires only routine skills is now more often done by computers"; therefore, better use of computers and their facilities demands abilities to analyze and critically evaluate and apply information coming from their multiple sources.

For modern society, information and communication technology (ICT) has become the most critical tool. The deep-rooted effects of ICT have even created structural changes in the global economy. A new sector

called the "information sector", which is added up with the existing "agricultural", "industrial" and "service" sectors. The information sector provides the maximum possible ability to locate, evaluate, synthesize and use information to meet information needs. These skills, which are pivotal for 21st century careers, are known as "information skills". These skills have become very critical for teaching learning process in the classrooms of our contemporary society.

The issues related to learning are becoming more and more critical in the world of a technology-oriented youth generation. The sophistication and advancement supplemented to the existing technology make even its best users wonder. Youth being frequent users of technology adds to the complexity in the classroom; however, the familiarity with technology never guarantees effective learning. At the same time, the immersion of the youth in technological devices would lead to serious damage to the higher order thinking skills of the students. Learning as a process needs the extensive support of teachers and elders to make it successful. In the present day context such supports have to be planned and designed in accordance with the children's attitudes and usage of technological tools and devices. This makes ICT an essential element of teaching in the classrooms at all levels. Formerly, technology was a tool and support for teachers and students to "learn from". In the contemporary society technology has augmented its role to a tool to "learn with", thereby facilitating the construction of knowledge in and outside the classroom. Also, unlike in the traditional classroom, technology has helped teaching and learning to grow out of classrooms and promoted ample space and scope for collaborative efforts in the process of teaching and learning through its various online platforms.

The United States Department of Labor's Secretary's Commission on Achieving Necessary Skills (SCANS) report stated that "competencies for all entry level employees must include the ability to: (i) acquire and use information, and (ii) work with a variety of technologies" (1991). After the advent of LPG (Liberalization, Privatization and Globalization), acquiring and using information from a wide variety of technologies has become the most necessary competency for a laborer to be successful in any profession. It should be noted that competency in the use of computers is often confused with the skills which are essential for living in an information society. Peter Drucker stated that "executives have become computer-literate…but not many executives are information literate". This means that the ability to use a computer is not a sufficient skill for being successful in the modern labor market. In an information society, most of the professions demand that one stay up to date with the pace of

information and technological changes taking place. What is most needed is the ability to locate, use, synthesize and evaluate information in relation to those problems faced by the individual.

A study conducted by Kathryn Ray and Joan Day on student attitudes towards electronic resources found that that it is "apparent that large numbers of students….are leaving university without the necessary transferable skills to cope in an information based society" (1998). The need to make the students critical consumers of information has become a need of the hour. In the US an influential report by the American Library Association (Report of the Presidential Committee 1989) emphasized "the need for all people to become information literate, which means that they are not only able to recognise when information is needed, but also able to identify, locate, evaluate and use effectively information needed for the particular decision or issue at hand" (ALA website). According to Shapiro & Hughes (1996) the information skills that a student gains will help them not only to locate, evaluate, synthesize and apply information, it will also help with their use of the modern technological devises which disseminate information most effectively. A spillover effect of this critical usage is that students will be critical towards the information society in which they live. The effect of information skills can therefore never be confined to the personal benefits; rather, it has high potential for promoting a healthy and democratic society set up by creating intellectually agile citizens.

The studies cited above show that information skills have become very important to the academic society in the present century. Though it is equally important for the students at all levels of education, its importance for those students who are at the threshold of research is more important.

What makes the level of information skills differ among people? This is a very pertinent question in the context of the growing significance of information skills as a very essential basic condition for the academic success of students pursuing higher education. A popular belief is that the availability and access of technological tools are the most important factors that determine the information skills of students. This belief is based on the notion that information skill is the proficiency of students in using technological devices; however, the concept of information skill goes far beyond this, starting from the sense of a need for information to the use of information for solving one's own problems. The availability of technological devices and the proficiency in using them constitute only a part of information skills. Information skills are therefore not just abilities which are the result of the availability of information tools. A host of personal and environmental variables have significant influence on the determination of the information skills of students. Without identifying

these variables and their level of influence any attempt to improve information skills becomes futile. This is the context in which the present study intends to explore the major factors that influence the information skills of students pursuing higher education. While identifying such personal and environmental variables great attention must be paid to isolating those that are most applicable for the students pursuing higher education. In the contemporary Indian context socio-economic factors and family climate are the two important factors that have a significant role in determining the students' acquaintance with technology and its usages. Even if these two environmental factors overlap with and influence a number of other personal variables, their impact as significant environmental variables is very notable. Socio-economic factors and family environment play a large role in the availability of resources for information skills and their use in a conducive atmosphere. The promotion of information skills is vitally dependent on the enthusiasm and support provided by these environmental variables; on the other hand, there exists a host of personal variables that significantly influence the information skills of students pursuing higher education in India. These variables can be broadly divided into cognitive and emotional variables. Cognitive variables help the students gain advantages in various dimensions of information skills that require systematic planning, logical thinking, analyzing, decision making and evaluation, among other capabilities. By contrast, the emotional variables help students to adjust with various social and emotional issues associated with their information needs. The importance of any of these environmental and personal variables can be undermined in the process of exploring information skills and the ways and means of improving them for the younger generation undergoing preparation in our higher education systems. As it is very clear that information skills are not stand-alone variables, it is equally clear that they must be studied in the context of variables that influence information skills.

Why is information skill important to higher education?

One of the important advantages of India over other developing nations, and of course among developed nations, is its young and employable population. Out of its total population 781 million people are in the 15–64 age group. The number of those below the age of 25 is around 500 million people. Projections for the year 2021 show that 64% of the total population will be in the employable age group of 15–59. How this demographic advantage should be utilized fully is the crux of the matter. If the young generation is provided with sufficient skill training

and other competencies for fitting them to the labor market, this advantage can be utilized. With this intention in mind, India has set an overall target of creating 500 million skilled workers by the year 2022. The importance of the education system—especially higher education, which is the threshold of employability and research—lies in the fact that it imparts necessary skills which improve the adaptability of the future laborers currently in its educational institutions.

Skill training in higher education institutions in India is poor compared to other developed nations. A report from the Planning Commission of India (2008) shows that only 10% of the employable workforce in the country is exposed to some sort of skill training, out of which 2% receives it through formal education and 8% gains it through informal means. This means that 80% of the total employable work force does not have any opportunity for skill improvement and training. This is alarming! When compared with countries like Korea (96%), Germany (75%), Japan (80%) and the United Kingdom (68%) this figure is extremely low.

Though the statistics discussed above pertain to highly specific skills related to different professions, the status of the training in skills which are necessary for survival in an information society is poignant. The "information skills" of Indian students remain poor. Often we confuse them with computer skills. No scientific study has yet been carried out to identify the level of information skills of students pursuing higher education in India. Studies conducted abroad show alarming results. A survey conducted by Ofcom in 2006 found that 67% of students trust most of what they find on the internet.

We are living in the "Google era". The generation living in this era can be referred to as the "Google generation". Notable characteristic of this generation include the fact that they made a shift from a print-based culture to an image-based culture. Storage of information in the form of text has given way to storage of sound and video archives; thus, information started appearing more attractive and lively for the information seeker. The rambling internet provided opportunity for infinite reproduction of words and pictures; thus, for the Google generation, the availability of information is no longer an issue. Instead, the issue is abundance of information thanks to the internet. Can we trust the information available from the internet? The above-mentioned Ofcom survey shows that more than half of our Google generation blindly accepts whatever they get from the internet; however, famous information scientist Lorie Roth disagrees. According to Roth "there is so much information, so much of it of doubtful quality, so accessible through so many different platforms" (1999). There is an increasing demand from educational and information

technologists to integrate information skills with different subjects taught at the higher education level (Kemp 1999; Joint & Kemp 2000; Rafste 2002; Town 2002).

What is the status of the information skills of students pursuing higher education in India? This was the first question addressed by the investigator while pondering the above issues. This question was later more scientifically modified so that it focused on the factors that affect the information skills of postgraduate students in India. The study was precisely conducted for this purpose.

Statement of the problem

The purpose of the present study is to identify selected factors which affect information skills of postgraduate students. The first task was to identify the major variables for the study. Studies conducted in the area show that there are several variables that influence the information skills of students. Broadly these variables can be classified as personal variables and environmental variables. Environmental variables are those which are part of the environment in which the students live. Personal variables include cognitive, emotional, social and physical factors. Out of a number of factors identified through a literature review and discussions with experts nine such variables were selected for the study. These variables identified for the study are: socio-economic status, family climate, self-concept, intelligence, emotional adjustment, social adjustment, gender (male and female), locale (rural and urban) and, of course, nature (professional and non-professional). As it is not practical to state all the variables in the statement of the study it was decided to contain the variables and to term the first part of the study as selected factors relating to information skills.

Since information skills are critical for students pursuing higher education the sample of the study has to be collected form colleges and universities. In India higher education institutions consist of both graduate- and postgraduate-level programs. Graduate programs include bachelors in science, humanities and social sciences. . Postgraduate-level programs consist of masters in science, humanities and social sciences. Post-graduation is the threshold to research. Since it is a very important stage, the information skills of the students are a critical investment for the prospects of students in the field of research and further studies. It was therefore decided thata the postgraduate students should be selected as the sample for the study. The final statement of the study was entitled “A STUDY OF CERTAIN FACTORS RELATING TO INFORMATION

SKILLS OF POSTGRADUATE STUDENTS". This statement needs to be clarified further to avoid any confusion. Confusion may occur as each term used in the study may be interpreted differently. To avoid this a precise definition of each term in the statement is needed; hence, the terms in the statement are defined in the following section.

Clarification/ definition of key terms

'Certain factors': As it was difficult to list all the factors that could influence the information skills the investigator made a judicious selection of factors that could affect them. The selection of factors was done with the help of a literature review, opinion from experts and the personal experience of the investigator. The factors selected consist of "personal factors" (self-concept, intelligence, emotional adjustment and social adjustment) and "environmental factors" (socio-economic status and family climate).

'Information skills': In the 21st century the focus of education has shifted from how much knowledge students have to what students can do with their knowledge. The ability of the student to effectively use their knowledge is essentially supported by their ability to locate the most suitable knowledge, verify its potential utility and store it for future use. Such skills can be known as information skills. The literature provides a plethora of skills, including soft skills, interpersonal skills, technology skills and workforce skills. Since there are chances for confusion among the skills the present study operationally defined the information skills.

In this study "information skill" is defined as the ability to address one's own information needs and utilize them effectively to solve one's own problems. The major skills involved are skills used to define tasks related to information, effective information strategies, locating and accessing information, evaluating information, skill in evaluating information and using information effectively for decision making and to solve one's problems.

Postgraduate students: Students pursuing higher studies (either professional or non-professional courses) after their 12 years of schooling and three years of a degree program are referred to as postgraduate students in this study. Diploma courses and certificate courses are not included in this category, however, even if they are done as part of higher study after the 12-plus-three-year system as mentioned above.

Objectives of the study

The study has been specifically directed towards examining the role of certain personal and environmental factors relating to information skills. The variables that have been isolated for the study are:

1. Socio-economic status
2. Family climate
3. Self-concept
4. Intelligence
5. Emotional adjustment
6. Social adjustment
7. Gender (male and female)
8. Locale (rural and urban)
9. Nature of course (professional and non-professional)

Hypotheses

1. Within an unselected group of postgraduate students there will be significant differences in mean scores of high, average and low performers for information skills for the following independent variables:
   a) Socio-economic status
   b) Family climate
   c) Self-concept
   d) Intelligence
   e) Emotional adjustment
   f) Social adjustment
2. Within an unselected group of postgraduate students, for each of the six independent variables (named above):
   a) The mean score of high performers will be significantly greater than the mean score of average performers;
   b) The mean score of high performers will be significantly greater than the mean score of low performers;
   c) The mean score of average performers will be significantly greater than the mean score of low performers.
3. Within three equated groups drawn from the three levels of performance for each of the six independent variables:
   a) The mean score of high performers will be significantly greater than the mean score of average performers;

b) The mean score of high performers will be significantly greater than the mean score of low performers;
c) The mean score of average performers will be significantly greater than the mean score of low performers.

4. Within an unselected population of postgraduate students:
   a) The proportion of low-performing female students will be significantly greater than the proportion of low-performing male students;
   b) The proportion of low-performing rural students will be significantly greater than the proportion of low-performing urban students;
   c) The proportion of low-performing professional students will be significantly greater than the proportion of low-performing non-professional students.
5. Within an unselected population of postgraduate students:
   a) The proportion of high-performing male students will be significantly greater than the proportion of high-performing female students;
   b) The proportion of high-performing urban students will be significantly greater than the proportion of high-performing rural students;
   c) The proportion of high-performing non-professional students will be significantly greater than the proportion of high-performing professional students.

Methodology of the study

The major intention of the study is to identify certain factors relating to information skills of postgraduate students. The factors identified are: socio-economic status, family climate, self-concept, intelligence, emotional adjustment, social adjustment, gender (male and female), locale (rural and urban) and nature of program of the students in the sample (professional and non-professional). An extensive survey was carried out to collect the data in accordance with the objectives and hypotheses set for the study. Samples were collected for colleges and universities. A representative sample of 352 postgraduate students constituted the sample for the study. The relevant independent variables for these subjects were measured using appropriate tools. The tool for measuring information skills was developed and validated by the investigator. Standardized tools were selected and adopted for measuring the independent variables selected for the study. The subjects were classified into three groups based on their proficiency in information skills: high, average and low performers. The mean scores of the three groups (for each experimental variable) were compared using the

analysis of variance (ANOVA) and t-test. Furthermore, the incidence of each performance level in the groups based on subsamples was compared to see whether there is significant difference based on these factors.

Scope and limitations of the study

This study intends to identify selected factors contributing to information skills of postgraduate students. The study was conducted on a representative sample selected from Kerala state and Puducherry Union territory. Though the area from which the data was collected is confined to only two southern states of India, the results of the study carry great relevance for other parts of the country. The findings will be relevant for first-year and second-year students pursuing postgraduate programs in various subjects. One important limitation of the study to be mentioned is that the sample did not cover a wide variety of professional courses, as it was extremely difficult to access data. The only professional course accessible for the study was the master of education (MEd).

The independent variables were selected in a judicious manner based on the help of a review of related studies, expert opinion and personal experience of the investigator. Still, it could not be claimed that the factors selected as independent variable is exhaustive. There could be several other factors that may affect the information skills of a postgraduate student—such as computer literacy of family members, accessibility to ICT and institutional approach for using ICT—which are not considered in this study.

CHAPTER II

INFORMATION SKILLS IN THE LITERATURE

It is universally agreed that information literacy skills are essential in student academic development. Information literacy provides the foundation for lifelong learning. It is a tool that students use in all disciplines, in all learning environments and at all levels of education. Information literacy skills are very important in assisting students to be self-directed learners and in expanding student opportunities for academic success (Association of College and Research Libraries [ACRL] 2000). More importantly, information literacy is crucial for enabling any individual to function successfully in an information age society. "Information literacy not only promotes success during an individual's academic career, but it also helps him or her to subsequently be competitive in the world market and to be a lifelong learner" (Brown & Krumholz 2002).

There had been a growing interest in the area of information literacy among the library professionals in Europe during the 1970s and as a result a large amount of research has been conducted in this area. This, of course, led to the creation of a plethora of literature on information literacy by 1974 (Virkus 2002). In India the computer had become a popular tool only during the 1980s. Use of the computer and internet tools for the purpose of education took another decade after that; still, the information skill proficiency of students as well as teachers at higher education level is debatable. Programs for improving skills and studies related to this area remain unexplored in India; however, a large number of publications have come from the industrialized, English-speaking countries, especially from the United States and Australia. Comprehensive reviews of the available studies are given below under various headings.

Information skills, online learning and student reflection

The World Wide Web (Web) presents an unusual challenge to university students. According to Buschman & Warner, "Information literacy and its crucial relationship to the free Web is one of the paramount issues…. Research in this field would logically focus on bringing information

literacy instruction to bear on critical use of the Web and the needs of students" (2005). The Web provides the opportunity for an individual to wander freely without being restricted by any physical boundaries (Burbules 1998). It is a fact that information on the Web is not organized or indexed by anyone, whereas in traditional libraries we have organized and indexed materials for the reference of the learners, which provides credibility and authenticity for the information to a great extent. Also, when publication is free of quality checks and has not been bound by any other concerns for ethics and hassles of technology for publication, the credibility of the information will be at stake. It becomes questionable when people can create publications without going through the rigorous evaluation of editors and peer reviewers. Even in credible systems of publication the factual errors and distortion of facts were difficult issues to be dealt with; however, the problem is aggravated when millions of people can make instant publications on the internet for a large public audience (Levine 2005). Such information provides a pseudo satisfaction to those who are in search of knowledge. The Online Computer Library Centre (OCLC) reported that "students indicated that they were successful at finding needed information most of the time" (2002). At the same time, a contradicting report came from other sources which says that "professors were very much frustrated with the quality of information from the Web that students integrated into their research papers" (Grimes & Boening 2001; Jenson 2003).

The technological growth happening in society is exponential. This unprecedented growth has created incessant flow of information from across the world. Through this rapid growth of technology and availability of resources the need for information literacy has become increasingly more important than ever (ACRL 2000). The Web provides information at users' fingertips. Its dynamic nature and free openness make it a wonderland for opportunities as well as a dangerous ground for mishaps. Students need to be equipped with information literacy skills to survive and prosper in cyberspace. According to Burbules, "with such capabilities, the Web can give readers an enormous opportunity for discovery and synthesis. Without such capabilities, the Web can be a frightening medium of manipulation and distortion – all the more effective for its flashy, user-friendly façade" (1998).

The amount of information on the Web has been growing at an exponential rate. The same is true for the number of web pages available on the internet. Currently, millions of new web pages are going online each day. The vast volume of information available over the internet and its hassle-free accessibility makes the Web a favorite destination and

research tool for researchers and students of higher education. (Scholz-Crane 1998; Grimes & Boening 2001; Herring 2001; Kubly 1997; Wang & Artero 2005). According to Scholz-Crane, "The lure of fingertip access to the Web's millions of documents draws more students to it each semester" (1998). Handling cyberspace information constitutes an important component of student information literacy skills.

Furthermore, the studies of Bao (1998, 2002), Herring (2001), OCLC (2002), Jones & Madden (2002), and Wang & Artero (2005) provide strong research evidence that students are active Web users. Even in developing countries the students in higher education consider computer and internet connectivity an inevitable part of their education. Acceptability of Web resources as a valid and inevitable learning tool helps to create a Web resource supporting atmosphere at the institution and at home. University students spend a tremendous amount of time riding on the information superhighway on a daily basis and comprise a large portion of active Web users (Bao 1998, 2002). Initially the Web was competing strongly with traditional libraries. Many students turned to the Web for information first before they checked other resources in libraries (He 1996; Herring). In contemporary society, however, the number of students using library resources has declined considerably. It will not be an exaggeration to say that a good percentage of time spent at university libraries is just to check the internet and Web resources. A study conducted by Jones & Madden showed that "an overwhelming number of students used the Web more than they used the library for information searching" (2002). The study showed that four out of five college students believed that the internet had had a positive impact upon their academic studies.

Given the role of the Web as an information tool for university students and students of higher education, it is imperative for any country to enable its younger generation to be well equipped with information skills. India having its favorable demographic dividend is at its decisive threshold. Any developing country could mark its progress in this digital society only through the healthy and effective use of Web resources; hence, information literacy skills for the students has become an imperative need for any higher education institution. According to Rockman, "Within the higher education environment, it is important for students to be able to build on a foundation of information literacy skills and abilities by transferring their learning from course to course, and demonstrating ethical behavior and academic integrity as consumers and producers, of information" (2003). Information illiteracy of students of higher education would be an obstruction on their successful academic journey. This would adversely affect them in their ability to be lifelong

learners and to be creative entrepreneurs and competitive workers in the global market. Surprisingly, given such universally held beliefs in the importance of information literacy skills, the development of information literacy is an area largely overlooked in most academic institutions. It is most unfortunate to note that even the premier institutions of higher education in India pay very little or no attention to the information literacy skills of students. Often it is deemed as a skill to be brought in to the campus by the students themselves. Universities tend to categorize the acquisition of information skills as practical rather than theoretical knowledge and, therefore, judge these skills as insignificant and invisible to students (Walton & Archer 2004).

According to Kauffman, Xun, Kui and Ching, "self-monitoring is particularly important in Web-based environments, where learners are asked to complete complex tasks independently, with little support from others, and self-regulated learning strategies are essential to success" (2008). An extensive and insightful study carried out by the US Department of Education says that:

> Online learning can be enhanced by giving learners control of their interactions and prompting learner reflection. Studies indicate that manipulations that trigger learner activity or learner reflection and self-monitoring of understanding are effective when students pursue online learning as individuals (Means, Toyama, Murphy, Bakia & Jones 2009).

The study concludes by listing certain tools and features motivating students to reflect on their learning. In this regard nine recent studies were cited in the same report. Bixler (2007) and Saito and Miwa (2007) explored techniques and strategies that encourage student reflection. Studies of Bixler (2007) and Saito and Miwa (2007) conclude that integration of these techniques as an additional element in the learning process improved student online learning. Cook, Dupras, Thompson and Pankratz (2005) conducted an experimental study in which an instructional module was tried out on a randomized controlled experimental group. This was followed by certain self-assessment questions. The study concluded that such self-assessment questions made considerable improvement in student performance when they are administered immediately after the module.

Kauffman (2004) conducted a study in which a group of students were given certain strategies for effective note taking. The strategies were mainly based on self-monitoring prompts integrated with the task of note taking. Self-monitoring is defined here as "the awareness students have of their comprehension and their task performance during or shortly after

completing an academic task" (Kauffman 2004). The study "suggests that simply asking students if they are certain, 'they have gathered all the important information' and providing them with cues and opportunities to go back to improve their note taking are powerful instructional techniques that can be automated in Web-based settings".

Stadtler and Bromme (2007) designed an experiment to check whether the intervention planned by them can enhance the ability to find useful information and evaluation of information available to the participants. Additionally, to improve reflection and monitoring of their own learning, metacognitive prompting was also integrated into the intervention strategy used in the experiment. The major contents of the evaluation strategy involved evaluation prompts and monitoring (metacognitive) prompts. Results of the study show that the participant members of the experimental group who got the intervention of monitoring prompts show significant improvement in acquiring factual knowledge related to their subject area. They were also able to ascertain their information need confidently. Wopereis, Brand-Gruwel and Vermetten (2008) argued that solving of information problems involves cognitive skills. Often very complicated cognitive skills are involved in it. They conducted an experiment to study regulation skills like orientation, monitoring, steering and testing. The major selected for the study was Psychology. The results categorically show that "embedded instruction", particularly the use of reflective questions, was the most effective strategy.

Lovett (2008) in her study made an attempt to teach self-monitoring skills to first-year science students at Carnegie Mellon University. He introduced a set of "wrapper" activities to foster students' metacognition. The investigator argues that the self-monitoring wrapper can be tailored to suit any aspect of the learning program, whether it is a classroom lecture, homework, a test or another aspect. The investigator argues that the reason for the effectiveness of the wrappers is mainly due to the fact that the metacognitive practice is integrated with the task where it is needed. Highly desirable results are produced by the intervention program described in the report. Once the self-monitoring skills were introduced through wrappers the students gained new techniques to improve their learning. Even if the present study did not measure learning and the change occurred as the result of intervention, it produced effective strategies for strengthening the metacognitive strategies of students which ultimately resulted in better learning and achievements.

Lazonder and Rouet (2008) conducted extensive reviews on approaches to supporting metacognition. Their reviews covered prompts such as

strategy training programs and modeling. According to Lin, Hmelo, Kinzer and Secules:

> "reflective thinking involves actively monitoring, evaluating, and modifying one's thinking and comparing it to both expert models and peers." an important finding of the study is that "simply watching the video is not as effective as participating in the cycle of watching, commenting, reflecting on the processes that were modeled, practicing, and reflecting on the students' own processes" (1999).

Senior researchers have come out with support to students who are pursuing research in their academic disciplines. One such attempt was made by Sonia Bodi (2002), who listed questions to be answered by the students during their studies. Her questions are helpful to students, allowing them to introspect about their own research. The questions include: What are the parts of my topic? What examples and evidence do I need? How can I contribute something meaningful and new? Helping students to demonstrate their abilities through focused mini-cases and thereby helping them to define their own information needs was an interesting study carried out by Linda Carder et al. (2001). Myron H. Dembo (2004) explores the dichotomy between knowing what to do and actually doing it. This research explains the reasons why students are resistant to changing their academic behavior through analysis of this dichotomy.

There are studies attempting to integrate information literacy skills in an interesting manner. Integrating activity to the learning is an important aspect of these studies. Ameet Doshi (2006) attempts to make library skills interesting for the students. He advocates integrating a gaming element into library skills instruction as a way to improve learning and portray libraries in a less boring light.

Helen Foster's (2003) study focuses on two important aspects in his study. The first aspect was the embedded tasks of information retrieval. The second aspect was how instructors can use reflection, pre-selected sources and internet-connected classrooms to support teaching these tasks. Using a group of students in History, Education and English classes, Debra Gilchrist (1993) conducted a study to help students to better understand the research process they have to undertake in their studies. In the study, students were introduced to an inquiry-based approach as a strategy to help students to understand their research process. What is the teachers' assumption about students' computer literacy and lack of hands-on experience in libraries will be a potential problem for students' ability to learn? This was the major research question of the study undertaken by

Jill D. Jenson (2004). The study provided insightful suggestions to overcome these problems through its report. Thomas P. Mackey (2004) conducted extensive research in developing models for teaching information skills. The key feature of the models was that all the models were developed as the results can be objectively assessed. Three such models were introduced as the result of the research. The first one was the art of annotation. The second one was focused on research. The third one focused on composition and writing for the Web. Susan E. Metros (2006) conducted a very insightful study on using the visual learning ability of the students and the opportunity for enhancing students' learning through it. The study examined whether there is any need for teaching basic visual design vocabulary. It developed and provided resources for enhancing the visual productivity of students. Finally, the study made a significant contribution in developing constructive critics of visual information.

Among the research that contributed to describing teaching strategies to improve research skills, the study conducted by Barbara Quarton (2003) is a significant one. The strategies described can be used by the teachers from any major. The key emphasis on the models described is based on basic library research. Ariel Rodriguez (2005) asks the common question of why do we teach research and how should we do it. The answers to the question emerge in a very insightful way. The most important argument to be highlighted is that the ability to evaluate research could be more important than the ability to conduct research. Jerilyn Veldof and Karen Beavers (2001) proposed that the mental models of students play a significant role in determining how they interact with and learn from online systems. The study identified strategies for developing tutorials for effective teaching and instruction. How students decipher complex information was the focus of the study undertaken by Sherie Williams (2005). The investigator developed certain steps through which students decipher complex information. The steps include surveying, questioning, reading, reflecting and review. Transforming complex content that matches the level of students is a complex and difficult task for teachers at all levels. This is the thrust of the research undertaken by Niki Young (2005). The study describes how to do this transformation systematically so as to address the level and needs of the students.

A number of studies have been conducted about the experiences of students while seeking and using information. Studies from Limberg (2000) and Pitts (1994) focused on how senior secondary students researched a specific assignment given to them. Researchers like Fister (1992), Kuhlthau (1993), Seamans (2002) and Valentine (1993) studied the way in which university students searched for information to meet

their needs. The findings of these studies show that how one intends to use the information as evidence to support their argument or viewpoint is an important factor influencing the way in which one chooses information. These studies highlighted the importance of one's own need as an important factor that determines the source and the means of searching for information. An example of this is given by Limberg (2000). In his study he found that students in the 12th grade perceived seeking and using of information as fact finding, selecting information to choose the right side, and for scrutiny and analysis (Limberg 2010).

Information skills in higher education

A global survey of information skill training initiatives in higher education shows that they have taken a variety of forms. Mainly they are conducted as stand-alone courses or classes, Web-based tutorials, course-related instruction or course-integrated instruction. A good number of researchers in the field seem to agree that information skill training should be integrated into subject areas (Kemp 1999; Joint & Kemp 2000; Rafste 2002; Town 2002b). There are studies which argue that information skills should be treated as a discipline of study in its own right, instead of integrating it with other disciplines (Webber & Johnston 2000). A healthy interaction and association between the teaching community and librarians also is considered an effective way of promoting information skills among students. Ample studies are available about the use of ICTs in higher education institutions. The uses of ICTs vary from academic applications to administrative uses. Even within academic applications there are considerable experiments in which ICT is used in the academic contexts in almost all of its phases. There was a period of time in which only rich institutions and rich students were able to use ICT tools in the educational process. A large number of institutions were stuck with distance learning as the only area where ICT was used. Now, however, across the world almost all classrooms are equipped with ICT devices. The trend shows a transformation in which institution-wide use of ICT is promoted (Collis & Van der Wende 2002).

A conference on information technology and information literacy in Glasgow, UK on March 20–22, 2002 showcased many examples of good practice for improving information skills of students persuing higher education. Many renowned institutions have developed information literacy programs that support students; for example, the British Open University, Edge Hill College of Higher Education, Cardiff University,