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資訊素養與新世紀的學習

Information Literacy and Learning in the New Millennium : A Web-based Learning Approach

林麗娟 **Lih-juan ChanLin**

輔仁大學圖書資訊學系副教授

Associate Professor,

Department of Library & Information Science,

Fu Jen Catholic University

E-mail：lins1005@mails.fju.edu.tw

【摘 要】

隨著 Internet 的普遍，在新世紀的學習環境中，教學不再侷限於傳統的教室，而擴展至能夠涵蓋來自全世界的學生、專家，分享彼此的學習經驗。網際網路改變學生學習的方式，然而網際網路所提供的資源往往過於龐大，以致於人們不知如何探索。為了激勵主動學習，培養學生批判式思考的能力，融合資訊素養於課程，或是結合資訊素養能力於各種解決問題的任務中是非常重要的。本文在於討論網際網路學習的相關議題，包括主動學習與圖書館應有的任務。文中也建議資訊素養融合問題解決、批判式思考、線上教學，與課程整合等議題，以及教學上的推廣與實施原則。

【Abstract】

With the advent of Internet, learning environment in the new millennium is expanding beyond traditional classroom. It is enlarged to incorporate students and experts from all over the world to share their learning experiences. Internet has changed the learning pattern of students. However, the quantity of the information resources available on Internet is so overwhelmingly abundant that some students don't know how to explore them. Therefore, to promote active learning and to develop critical thinking among students, it has become a very important mission for modern educators to integrate information literacy into academic curriculum and with capability of solving problem. This paper discusses relevant issues concerning Internet learning, focusing on active learning and responsibility libraries should take. It also suggests some feasible methods of incorporating information literacy with problem-solving,

critical thinking, on-line tutorial, curriculum integration, as well as the principles for promoting such a manner of teaching.

關 鍵 詞：資訊素養；網路學習；批判式思考；資訊科技；主動學習
Keywords：Information literacy; Web-based learning; Critical thinking; Informational technology; Active learning

Introduction

Moving toward the new millennium, the academic world has seen an enthusiastic rush of faculty to the World Wide Web as the new mode of interface with students. Syllabi, assignments, handouts, bibliographies, presentations, tutorials, and even full courses are being placed on the Web, not only as a new mode of distance learning, but also to supplement traditional modes of face-to-face classroom instruction[1].

The use of modern technologies has become common in various instructions. Technology can be used as a vehicle to change the role of both students and teachers in the classroom. Recently years, the World Wide Web (WWW) has been widely used with various subject areas. With this vehicle, teachers can learn how to incorporate technology into their everyday teaching styles in a meaningful manner, whereas students can manage the problem individually and cooperated with their peers[2].

As the Web-based learning has been integrated in various subject areas, how to help students to develop broad skill experience and encourage motivation for learning becomes an important issue[3]. In a school-reform effort all over the world, school libraries have changed in focus from collections to learning. Academic libraries have pivotal roles in creating a culture in the school that is learner-centered[4]. Along with the progress of technology, adapting knowledge and experiences from learning theories is essential to encourage active and self-directed learning, and to achieve a life-long learning purpose. Within this paper, the information literacy needed for problem solving in the real world is emphasized. The concepts of critical thinking skills and integrating information literacy into curriculum are emphasized. Instructional implications for designing WWW learning environment are also suggested.

Web-Based Learning

Although the history of WWW in learning is not very long, most schools have operated their Web sites on the Internet. The Web enables districts to connect easily with each other, creating unprecedented learning and sharing opportunities for teaching and

administration[5].

In teaching, the WWW promotes the delivery of computer-aided instruction (CAI) for various instructions. Integrating the WWW in instruction involves finding and retrieving resources on the Web, communicating, publishing, and developing teaching and learning activities using the Web[6]. In K-12 education, WWW can be used in various subject areas, such as art, bilingual education, ESL, science, social, and vocational and technical education[7]. Many cases indicate that the WWW is an ideal tool for providing different levels of distant education. Relating Web resources with learning contents and developing instructional activities on the Web has become an effective learning model for encouraging active participating in learning[8].

In language learning, WWW is widely used in the fields of language teaching and linguistics. Web sites contain text as well as graphics and various visual representations that allow students to interact with the instructional materials. Resources for linguistics, pen-pal opportunities, international organizations and publications, and specific language cultures are also available for further exploration[9].

WWW learning environments in mathematics, science, and decision-making activity include both traditional computer-assisted instruction where students respond to questions and get feedback as well as more technology enhanced multimedia scenarios where students combine information to make decisions. In a case of learning statistics among junior high schools, WWW also provides opportunities to experience searching, locating, and organizing data. Students learned to summarize statistics, analyze data, make conjectures, and communicate information[10].

The Internet supports two basic types of communication: synchronous and asynchronous. Synchronous communication allows learners to communicate in real time with other learners and their instructor. This type interaction mirrors in some ways the more traditional classroom setting. Asynchronous communication consists of interactions between students and teachers not in real time, but at the convenience of each person. It removes the constraints of personal time commitments and geographical space to allow for meaningful learning interaction[11].

With learning lessons provided through WWW, multiple representations and interpretations of concepts and knowledge can be delivered to provide a successful learning experience among students. The interactive WWW lessons developed and implemented in various educational setting can enhance traditional teaching by reducing faculty lecture hours and increasing independent study time for students. Web-based instruction reinforces active learning after students

have participated in classroom, laboratory, or classroom activities. With the link to digital resources, students are also invited to explore different information resources[12].

As WWW has been integrated in various subject areas, how to help students to develop broad skill experience and encourage motivation for learning becomes an important issue. Since learning through WWW requires students deposit their time and effort to complete their learning task, whether the learning environment provides sufficient resources and facilitates active learning is essential. From WWW, students can gain various cognitive experiences, including thinking, learning, and communicating. The instruction delivered through WWW involves the aspect of the content of the subject knowledge as well as the processes employed by students to explore the knowledge world.

Active Learning

To learn actively is important in every educational environment, especially for WWW. Learning means understanding. It means that learners have been confronted with new idea and have changed and reconstructed their previous understanding to incorporate those new ideas. "Learning implies a change in the mind of the learner; therefore, learning cannot be defined as a collection of information, as knowledge that can exist outside of a learner, or as simply a process unrelated to content"[13].

To learn to create new ideas and solve novel problems throughout their lives, learners must recognize when, how, and why they learn new information. How can WWW environments help students select activities compatible with their goals and develop autonomous learning abilities? The most important task is to help students diagnose personal goals, strengths, and opportunities to tailor course activities to personal goals in their independent works[14]. The ideal WWW learning environment combines electronic and human resources to create autonomous, lifelong learners. Instruction provided through WWW should incorporate active learning model to facilitate students to take an active role in their learning.

With the advent of electronic technology, various electronic services and electronic documents are available for individual learners. The use of technology has great impact on schools and libraries. As stated by Weinberger, "Students need to experience the joy of free-form learning and self-guided discovery rather than being tethered by the constraints of outdated tomes, overcrowded classroom, and information overload"[15]. The power of digital libraries and new media technologies can provide the passion of learning, and a reward for seeking. In the new age of learning, students enjoy themselves in a context rich with resources and strategy-building activities to assist them in

developing their skills as researchers or explorers in specific knowledge area. These resources provide scaffolding, supporting the learner in acquiring the skills necessary for evaluating materials and preparing research reports or projects to accomplish their curriculum goals[16].

Responsibilities for Libraries

During the past half century, school libraries have evolved in philosophy as schools themselves have changed, from a concentration on the collections to an emphasis on individual needs of students and learning supported by caring school communities. Stripling characterizes the focus of school library programs has shifted from 1950 to the present. Four major stages are defined: a concentration on collections in the early and mid-1950's, a focus on the library program in 1960 and 1969, a major emphasis on instruction in 1975 and 1988, and a focus on learning in current stage[17].

Along with the current shift to a focus on learning, building active and engaged communities of learners is essential, as we are moving into the new century. Dewald, Scholz-Grane, Booth, & Levine suggest information literacy credit courses, online course-integrated information literacy, and Web-based library tutorials to encourage students to progress from participating learning activities[18]. With an active learning approach in WWW, the learners must be supported as they try out new ideas and new strategies. They must also be confronted with ideas that would never be thought of independently[19].

To create a learner-centered environment that fosters autonomous learning, scaffold learning model has been widely integrated in many course designs. Scaffold learning is based on a model of conceptual change that involves first expanding the repertoire of ideals held, and then encouraging students to distinguish among these ideas by reflecting and linking ideas into a coherent and cohesive perspective[20]. In order to integrate scaffold learning in a Web-based learning, students need opportunities to engage in autonomous learning strategies, such as linking ideas, comparing alternatives, reflecting on progress, or critiquing ideas with support and guidance. In the new age of learning, students need to develop information skills to explore the world of knowledge. School and libraries should take a more active role in creating a learner-centered environment that allows sharing of resources and communication of ideas to facilitate the active construction of knowledge among learners. To foster Web-based learning, several approaches should be addressed, including integration of information literacy for problem solving, encouraging critical thinking, online library instruction, and curriculum integration.

Information Literacy for Problem Solving

The term "Information Literacy" has been widely used and discussed in literature[21] [22]. The library literature emphasizes the use of information, and defines information literacy as the ability to recognize an information need and to locate, understand, evaluate and use the needed information[23]. The information literacy is important to help people successfully solve problems and make decisions.

McClure emphasizes that information literacy is needed for problem solving, and that related information skills should be developed within the context of real need and the overall information problem-solving process. Although it is possible to learn skills in isolation, research and practice suggest that people learn better when learning information literacy is related to their needs[24] . Students will eagerly participate in learning and internalize the information skills if they realize how these skills relate to their school assignments and the problem-solving tasks.

If information literacy is integrated into problem solving activities in the earliest stages of students' educational careers, it will provide potential impact on students' life-long learning, and skills of thinking and evaluating. Students will be also encouraged to be self-directive and to work collaboratively with others[25].

As constructivist-cognitive movement thrives in recent education reform, the emphasis of learning is changed from a teacher-center to learner-center. In this transition, students become active learners. Instead of passively receiving information from classroom, students are invited to explore the world of knowledge. Learning occurs when students are actively involved in the learning process[26]. To provide students with opportunities for active learning, the ability to learn and the strategies to effective use of information are important.

As observed, there might be disconnection between the rapidly developing communications technologies and information resources available to the individuals, and the individuals' ability to use these resources[27]. The global nature of human interactions makes the ability to access and use information become crucial. Web-based learning environment must take seriously the challenges of the Information Age. As we move into the E-generation, with universal and instant accessibility to reliable and unreliable information, each individual must learn to be discriminating in selecting from among the vast number of available resources. In order to make individuals to take advantage of the opportunities inherent in the information society, information literacy should be a part of every student's educational experience. Supporting students' skill

in finding information, analyzing information, and utilizing information in a meaningful way become important[28].

Rather than restructuring the instructional program predominantly to the learning of a fixed body of knowledge, A Web-based classroom needs to improve the use of instructional methods that encourage the use of information resources. To promote thinking skills and active learning, students should be placed in the center of the teaching/learning process to reflect the use of information in the real world in solving every-day problems is essential[29]. Since information literacy is critical in solving problems, creating an instructional environment that encourages the use of information skills in the problem scenarios should be an effective way to reflect active learning and thinking.

Emphasis of Critical Thinking

The Web-based learning is related to accessing, evaluating, and using the information resources available in an electronic environment, which involves various levels of mental processing30. It is also related to mastering and building upon the ideas embodied within those individual resources. The processes requires various thinking skills in selecting relevant information to construct understanding and re-structure knowledge.

To discuss information literacy in Web-based learning, it is important to analyze the cognitive processes required for building students' mental model in using electronic information. This process may involve reorganizing ideas or reconstructing an old framework until the new pieces fit logically. The learner reflects on the fit, actively adds new pieces, and then reflects again until a model is constructed[31]. The relation among information, processing skills and cognitive skills is closely connected, since the manipulative and the cognitive aspects are an inherent part of an information literate person. To think critically, one must develop skills to judge, clarify, internalize, generalize, and synthesize. With these skills, students are able to function effectively in the real world. Individuals will be well equipped to take their places in a complex, changing society, and become life-long learners.

Much of the recent interest on critical think skills in education stems from the dissatisfaction of educators with the emphasis on content learning that predominated in schools rather than upon the development of higher order intellectual skills among students[32]. The emphasis on student-centered learning demands that students be able to use information to create knowledge rather than simply remember predigested knowledge from teacher. The need to promote information literacy is extensively proposed by librarians and educators. With an aim to foster critical thinking, information literacy

should focus on the skills involved in various cognitive processes such as assimilating, inducing, deducing, and modifying during the development of information skills in learning.

Online Library Instruction

In recent years, more effort has been done among libraries in helping students develop effective strategies for searching and evaluating information, when they are accessing online catalogs and databases from remote locations. This situation challenge librarians to provide instruction in research skills at times and place convenient to students. With limit budget, most libraries can not afford to hire more librarians, yet the need for information instruction is greater than ever. The provision of Web-based library instruction, including bibliographies of library resources in a give subject area and tutorial on various component skills, becomes a good alternative to assist learning of information skills. Dewald suggest several characteristics of a good Web-based library instruction, including "course-related approach", "active learning", "collaborative learning", "using more than one medium", "having clear objectives", "focus on concepts not just mechanics", and "inclusion of "help" message"[33].

Kerka addressed that the Internet has increased the potential for deception and misinformation among larger numbers of people, helping people develop the skills needed to deal with the challenges of the Information Age is essential. The literacy required in the information environment is blended with skills and abilities that have been variously referred to as information literacy, critical literacy, media literacy, or digital literacy. This form of literacy combines the skills of locating, selecting, organizing, and synthesizing information with critical analysis, interpretation, and application of the results to solve problems and make decisions. Several approaches to teaching the WWW have been proposed, including an eight-step modular approach: (1) basic concepts; (2) using the WWW for research; (3) basic WWW searching; (4) comparing WWW subject directories; (5) comparing WWW search engines; (6) advanced WWW search techniques; (7) evaluating WWW resources; and (8) synthesizing WWW research strategies[34].

From the above discussion, criteria for good library instruction practices need to be applied to Web-based tutorials in order to guarantee the success of the designed instruction. Tutorials designed to impart basic library skills to students should contain not only simple mechanical step-by-step direction, but also a conceptual understanding of the skill being learned.

Curriculum Integration

In the future, more and more Web-bas-

ed instruction and electronic information will be available and integrated with various courses. With the new learning trend, information literacy becomes important for the new age of learning. Information literacy stresses the universal skills such as developing good research strategies. When applying critical thinking in approaching information, students are expected to view this content in the context of their every-day learning. The concept of integrating information literacy into the curriculum share the common basis as "active learning", "Resource-based learning", and brain-based learning to foster constructive approach of education[35].

Meaningful learning occurs only when learning is related to students' academic needs or curriculum. Students often obtain skills by experiencing the process of learning or information seeking, and the use of decision-making[36]. Learning involves two important strands, one of which is usually content of knowledge, and the rest of which is process. The process-approach of information literacy emphasizes the cognitive aspect of learning. Instead of focusing on the outcomes of learning, the process of relating prior knowledge and integrating new information with existing knowledge to form new understanding should be focused.

In order to emphasize the cognitive process of learning library skills, Stripling suggests a content-process approach learning model, called "Thoughtful Learning Cycle". In this model, the process of "inquiry", "synthesis", "decision-making", and "expression" and the content of "concept", "essential questions", "information", "new understanding", and "assessment product" are encircling the core of personal understanding. Research has shown that when students focus on a framework for their learning, they are able to look past the specific activities and short-term goals to the longer goals of understanding[37].

The integration of WWW into classroom has changed substantially the structure of teaching and learning for school curriculum. As classroom use of the WWW grows, libraries and schools are searching for new standards for evaluating the quality of Web resources. Siering addressed that the Web resources can be used in a more interactive way, and most resources found online can be valued in its position within a larger discourse. Resources can be evaluated not just for their accuracy or authority, but also for how they add different perspectives to an issue, or how they approach to a topic[38]. From this perspective, students are encouraged to engage the web in a more synthetic way. By promoting the process of interactive and expressive nature of learning through WWW, the social construction of knowledge is held. More meaningful learning will be fostered.

Instructional Implications

The WWW offers significant opportunities for learning. However, successful Web-based learning requires the integration of learning model, such as cooperative learning and scaffold learning. With the collaboration of peers and mentors, WWW can facilitate electronically apprenticeship among students[39]. Also, to provide a successful WWW learning environment, the join effort from faculty involvement and students' support is needed. Issues related to planning for Web-based instruction are frequently emphasized in literature. For example, Carlson, Downs, Repman & Clark propose institutional commitment and co-involvement among institutional units to establish personnel and technology resources[40]. Pan addresses students' involvement and the devotion of time for planning by faculty are critical for Web integration[41].

From the instructional design aspect, Web-based learning environment can be arranged through the use of problem-solving scenarios. Students can utilize the latest technologies to form communities to share and receive decision making skills, involving issues, perspectives, and possible actions and making decisions by applying appropriate knowledge[42]. The use of active learning techniques and collaborative research projects is a way to encourage students' participation in the learning activities provided in the lessons.

To teach students information skills with modern technology, Dewald, Scholz-Crane, Booth & Levine suggest a model by careful consideration of the following factors: technological know-how, technological infrastructure, instructor/students relationship, and pedagogical objectives. Issues related to the technical aspect of accessing Internet, and how the course instructor and the librarian can work together to incorporate information literacy within the course are also addressed[43].

The potential of using WWW in various learning is widely discussed in recent literature. However, issues related to individual differences and characteristics should also an important concern. Providing students with an environment that can adopt their individual differences requires more careful consideration of students' learning styles and their ways of processing information. Since there might be differences among individuals in searching and surfing in the hyperspace, the use of instructional strategies in the electronic learning environment should emphasize the adoption of students' learning styles[44].

Conclusion

In learning and teaching, the WWW has created a new media for delivering instruction and retrieving worldwide information. The use of electronic technology has

great impact on schools and libraries. Students are encouraged to explore in a context rich with resources and learning activities provided in WWW. In the WWW learning, the skills used for problem solving and relating and evaluating information become important.

Information literacy among learners is the key to their life-long learning. The skills are needed for problem solving in the real world. Along with the shift to a focus on autonomous learning concept, several instructional issues for developing information literacy are emphasized for effective learning, including the use of scaffold learning model and the integration of curriculum to promote meaningful learning and critical thinking skills.

Learning in the World Wide Web requires the involvement and devotion of time and effort from students and teachers. The Web sources should be used for curriculum integration. Schools need to create a policy for proper use of the Web, and design a Web page with a good purpose. To optimize the Web for effective instruction, it is necessary to plan Web-based learning activities ahead of time and to relate Web resources with learning contents.

WWW offers the opportunity of discussion through the multiple interactions of Web activities. Several design decisions can also be implemented based on the theories of learning, motivation, and instructional design. Web-based environment is a powerful medium for the implementation of various instructional activities, and for the promotion of reflective thinking, problem solving, and the development of information skills. An equally significant revelation is the importance of a good instructional design on the web. Consideration of technological limitations and the implementations for student learning and motivation are among a number of important issues to focus on in future research.

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