Supporting Lifelong Learning In The Information Age

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ABSTRACT

Many countries are considering lifelong learning, which is becoming an important education goal, and promoting lifelong learning in the information age. With the development of Information and Communications Technology (ICT), digital divides have become a major concern in the world. In this study, we focus on three dimensions of digital divides in the field of lifelong learning: education organization, age, and national penetration. Next, we report our findings that provide solutions for combating digital divides by developing web-based learning and support environments over a three-year period: (1) a blended learning support system that helps teachers manage learning resources and create blended learning programs and learners choose and participate in learning activities; (2) an "E-namoSupport" system for senior beginners to use the Internet, as implemented in Japan; (3) a "Senior Internet Support & Learning Environment" to help senior citizens improve their Internet literacy and enjoy the information age in China.

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INTRODUCTION

Many countries are considering lifelong learning, which is becoming an important education goal, and promoting it in the Internet age. With the development of Information and Communications Technology (ICT), digital divides have become a major concern in the world. In this paper, first we analysis the status of lifelong learning in the information age (Section 2) and then emphasize three dimensions of digital divides: education organization, age, and national penetration (Section 3). Next, we report our contributions over the past three years: developing web-based support and learning systems to combat digital divides in the lifelong learning field (Section 4). Finally we discuss our research's originality and significance (Section 5).

LIFELONG LEARNING IN THE INFORMATION AGE

Lifelong Learning

Lifelong learning [1] [2], along with ideas such as learning societies, has become popular with politicians and policymakers in many countries. Before lifelong learning, the idea of lifelong education was first fully articulated by Basil Yeaxlee (1929) [3], who provided an intellectual basis for a comprehensive understanding of education as a continuing aspect of everyday life. At the UNESCO conference on adult education in 1965, P. Lengrand [4] proposed the concept (using the term "permanent education") as a means to integrate school and adult education, and lifelong education was embraced as a central organizing idea by UNESCO in 1970. There has been a shift from lifelong education to lifelong learning in many of the literature and policy discussions. P. Lengrand's book, "An Introduction to Lifelong Learning," [4] clearly introduces the notion of lifelong learning and some of the continuing questions surrounding the idea in practice.

Recently, Field [1] argued that economic, social, and cultural changes mean that now many people live in "knowledge" or "informational societies" that have strong individualizing tendencies, a requirement for permanent learning. As a result, Field [1] suggests the following: adults should take part in organized learning throughout their lives; the post-school system will be populated by adults as well as by young people; and "non-formal" learning is valuable and will permeate daily life.

Today, most countries' governments, such as Japan (Lifelong Learning Promotion Law, 1990) [21], China (the 16th NPC report, 2002) [22], are devoted to educational reform and have stated basic plans to construct a lifelong learning society that allows people to choose educational opportunities at any time during their lives. Especially in our increasingly knowledge-based 21st century society, all citizens must continue to improve their skills throughout their lives to exercise them to the fullest and contribute to society. In other words, the importance of lifelong learning has never been more valuable. Furthermore, the idea that learning has to be supported and encouraged throughout life, as Yeaxlee [3] recognized, is fundamental.

In this study, "lifelong learning" focuses on social education except formal education (such as college education) and job training in enterprise.

Information Technology And Lifelong Learning

The Internet has exploded the last decade. Although no reliable data exists on the size of the world's online population, educated estimates reveal that Internet use has spread at an unprecedented rate. The number of Internet users around the globe has swelled from 900,000 in 1993 to 25 million by 1995, from 83 million in 1999 to 513 million by 2001, 600 million by 2002 [5], and to more than 1,076 million by the end of 2006 [23].

The fastest growing and most versatile part of the Internet is the World Wide Web, which provides learners with enormous opportunities including accessing information on formal educational courses and collecting a wealth of data and information on a seemingly endless range of subjects. The Internet has also recently been positioned as a potential savior of lifelong learning. Many studies have classified it as probably one of the most powerful and important self-directed learning tools in existence.

Recently, in many countries the following policies and movements for promoting lifelong learning in the Internet age have been planned and conducted:

(1) Improvement of social education facilities and infrastructure

Many countries have recognized that libraries, museums, and other social education facilities must: a) make databases of their abundant learning materials; b) improve the function of web-based information systems; and c) form information networks among social education facilities and schools. Countries are studying new learning methods using advanced information and communication networks and studying improvements of social education facilities by utilizing multimedia resources. They are discussing learning support systems including the effective use of learning materials by multimedia resources, changes of learning styles, the development of information literacy, and learning consultations.

(2) Enhancement of information about lifelong learning

People's learning needs continue to diversify and spread over wider geographic areas. In response to such changing learning needs, many countries plan to provide more information about learning opportunities, including related organizations, groups and personnel, and information about useful learning materials owned by related facilities. Thus, many lifelong learning related organizations are providing information about lifelong learning nationwide by the Internet.

(3) Information literacy

Encouraged by the rapid growth of Internet use in other sectors of society, educationalists around the world have quickly heralded the potential of Information and Communications Technology (ICT) as a dynamic means of making informal education more effective and equitable. Thus, the ability to learn with technology is nothing less than "a core skill in the twenty-first century" [6] and a central tenet of establishing countries as "learning societies." Information literacy related training activities for the general public have been planned and implemented by government, non-government, and non-profit organizations in several countries in recent years.

EXISTING PROBLEM: DIGITAL DIVIDES

Digital Divides In Three Dimensions

The digital divide, the gap between those who have access to ICT and those who do not, has become a major concern in the world because it further marginalizes certain segments within populations, preventing them from benefiting from this technology. Existing studies have investigated differential Internet access and use document inequalities among various segments of the population [7] with particular attention on education [8], race [9], gender [10], age [11], income [12], and rural residence [13]. Digital divide also exists among different education organizations. Obviously, individuals can get better literacy education and facilities at universities than at local social communities.

Moreover, widespread Internet diffusion does not equal ubiquity, even within developed countries [5]. The concept of digital divide refers to multidimensional inequalities of Internet access and use, ranging from the global level to nation states and from communities to individuals.

Many incorrectly assume that the digital divide – the large numbers of people who are not connected to the Internet – is small, shrinking, and rapidly becoming irrelevant. On the contrary, it is large, multifaceted, and, in some ways, growing [5]. Moreover, since the divide is socially patterned, there are systematic and meaningful variations in the kinds of people who are on/off the Internet.

Indeed, using the plural – digital divides – is more accurate because the nature of the digital divide varies within and between countries, both developed and developing. There is not one digital divide but many. In this study, we targeted three aspects of digital divides: local social education organizations, senior citizens, and developing countries.

(1) Digital divide between formal and social education: A changing world with unchanged classrooms and teaching methods on lifelong learning

Facilities in universities and companies are fully equipped, so they have a convenient environment for collecting and exchanging learner experiences to improve the web based learning and teaching mechanism. By contrast, in social learning centers, since education evaluation is neither necessary nor peremptory, such facilities are scarce. Formal education, especially higher education, features many improvements in learning and teaching methods, for example, ICT used in classrooms, e-learning, Web-based training, etc. But in social education, without the burdens of diploma or qualification certification, how people learn and how teachers instruct have remained largely unchanged. While changes have occurred due to the advances of science and technology, improving teaching and learning methods is necessary in the information age for lifelong learners.

(2) Digital divide between generations: seniors are becoming the forgotten group due to inadequate social support.

The majority of lifelong learners are retired adults or senior citizens. Through advances in computerized technology and the Internet, individuals are introduced to computers at a young age and are becoming dependent on computerized resources to enhance their daily lives. However, an unfortunate consequence of such advancement is that the speed with which computers have conquered our lives has left one societal group lagging significantly behind in computer literacy. Currently, many elderly persons do not have the knowledge to fully utilize the potential of computers, and in many countries access to public computers is very limited. Further, many studies have been conducted on Internet support methods, but most have focused on support for children and working adults, not for the elderly. When senior citizens use computers and the Internet, they have difficulty finding convenient and effective ways to access, solve problems, and improve their information literacy.

(3) Digital divide between developed and developing countries: only a small percentage of the world's population is online

Rather than shrinking with expanding Internet use, the global digital divide between developed and developing nations continues to be huge. Denizens of economically developed countries sometimes forget that only a small percentage of the world's population is online. In 2002, only 10% of the world's population was on the Internet, 88% of whom resided in industrialized countries [14].

In recent years developed countries have planned and implemented social support methods, such as offering training programs for the general public and establishing community-wide public access computer facilities to encourage more people to enjoy the Internet. However, in developing countries, the main barriers to increasing computer and Internet use include insufficient financing, computers, technical support, and training. Furthermore, developed countries have more research and projects for supporting information weak and such work can hardly be found in developing countries; nor has much research effort been expended in the field of lifelong learning.

Research Questions

Therefore, based on the above digital divides, the lifelong learning field must consider the following research questions: (1) how can enhanced teaching and learning methods be introduced and implemented to fit the changing information age and (2) under what circumstances could disadvantaged individuals reap digital benefits from the Internet, especially the elderly and those in less developed countries?

DiMaggio and Hargittai [15] suggested two important dimensions along which divides may exist: (1) social support networks: the availability of others to whom one can turn for assistance and encouragement; and (2) skill: one's ability to use the medium effectively. Considering learning needs and providing appropriate support are keys for successfully narrowing the digital divide and empowering disadvantaged learners, community facilities must play an important role in providing technological training and mentoring, which is crucial for bridging the skills divide, as well as considering convenient environments that support them when encountering barriers to computer and Internet access.

RESEARCH OF WEB BASED LEARNING AND SUPPORT ENVIRONMENTS

We strive to answer the above research questions by developing web-based learning and support systems. Access to the Internet and the ability to use it effectively are two distinctive aspects of the digital divide. Using a computer and the Internet is more complicated than changing television channels or making a telephone call. Meaningful and productive Internet use requires a computer and social and cognitive skills for such things as seeking information, developing community networks, accumulating social capital, or participating in political activities. Therefore, we aim to provide easy access to support environments by exploiting technical web methods and social support mechanisms, and we also seek to improve Internet literacy for lifelong learners by implementing Internet learning environments.

In this study, we reduce the above three types of digital divides to increase Internet use by developing web-based support and learning systems. Our main contributions include:

Study 1: A System To Support A New Learning Style: Blended Learning In Lifelong Learning

The lifelong learning style has changed from a traditional face-to-face classroom to blended learning that mixes both traditional and online learning methods. To satisfy changing learning styles, we proposed a new role for existing lifelong learning support systems [16] and then built a Blended Learning Support System (BLSS) [17]. It helped teachers manage learning resources and create blended learning programs and learners choose and participate in learning activities. Evaluations from January to February of 2005 at the Nagoya Mizuho Youth House demonstrated the high usability and usefulness of BLSS and that it can effectively improve learning and motivation. BLSS functions include collecting, connecting, and providing, which are list below:

(1) Collecting learning resources with metadata

Because lifelong learning involves a wide range of study fields, it is difficult for only one system to provide a full and rich range of educational material contents for all subjects. Thus, it is necessary to exchange with other systems to collect and accumulate educational material with a standards-based format. Metadata can bring consistent,

accurate, high quality, and well-structured description results and so is used to collect and manage LA (Learning Activity) and LO (Learning Object). Furthermore, in order to easily manage two types of information, we used the same metadata standard to describe LA and LO.

In BLSS, we used database technologies and built the system on top of a RDBMS. We used a database to store metadata while avoiding flat-file based metadata (such as XML documents) to reduce redundancy, and provide more efficient query processing and security.

(2) Connecting learning resources to create blended learning programs (BLP)

Learning program is a plan that aims for a particular learning purpose and usually consists of learning contents, learning methods, learning orders and other learning elements. In BLSS, we used a memo card to connect LA/LOs and at the same time describe the program's guide elements. We call the set of memo cards a Blended Learning Program (BLP), to support the efficiency and continuity of learners.

For example, learners in a traditional classroom can use web material to increase comprehension, which can improve the learning effect. After studying basic knowledge using online content, learners can continue their efforts by joining a middle level classroom, which results in continued learning. Furthermore, the memo' structure we designed can support the planning of more complicated programs.

(3) Providing blended learning information to lifelong learners

Since learners use the system to find blended learning information, we provide a "Retrieving Environment" interface, where learners can search and choose the LA, LO and BLP. In addition, BLSS can also provide more BLPs, even if learners are not aware of the relationship between LA/LOs, and help learners choose and plan learning opportunities. Furthermore, the system also have a "Learning Environment" function so that we provide a learning platform through which learners can not only study learning resources, but can also understand learning programs, manage learning processes, and exchange information with others. It is more efficient than previous systems that only show LOs.

In short, BLSS has the following advantages: (1) by using metadata, learning resources can be well managed, and by using memos, they are related to each other, which help teachers to easily create a BLP and (2) BLSS supports efficient and continuous learning activities by using BLP.

BLSS supports the improvement of learners by getting them interested in joining learning activities through blended learning information.

Study 2: A Total Social Support Environment For Seniors To Use Computers And The Internet

Despite the high penetration rate of Internet usage among younger generations, most senior citizens do not know how to use the Internet. To help more people enjoy the Internet, we developed a total web-based support environment called "E-namoSupport" to reduce the digital divide between seniors and other generations. This is one part of the E-namokun project, an information promotion project started in Nagoya [18]. E-namoSupport [19] has the following characteristics: (1) unlike general helpdesk and support systems, which generally only cover one organization, E-namoSupport was developed through joint government (Nagoya city), universities (Nagoya University and Chukyo University), and NPO (IT Support Center) cooperation; (2) users are senior citizens with little or no PC experience; and (3) our aim is not only to solve problems or answer questions but also to help senior citizens gain more computer knowledge and enhance their computer skills.

In the E-namoSupport environment we developed four subsystems: a case trace system (CTS); a consultation management system (CMS); a FAQ System (FAQS); and a FAQ analysis system (FAQAS). In order to efficiently manage information flow in the four subsystems as well as in three organizations, we proposed an information cycle model that processes information gathering, information publishing and information analysis among these organizations and subsystems. Enquiry case information is gathered and managed by CTS and CMS. The support center's operators turn the well-organized case information into FAQs and then publish them. FAQAS monitors and collects users' FAQ access information and analyzes and reports the results. Based on these analysis data, operators adjust the case information, add necessary case, and modify the FAQ contents to meet and reflect users' needs and

interests.

We considered senior citizen attributes using a set of quizzes that helped operators describe enquiry cases and make conversation flow more smoothly. We also designed an easy-to-use interface and functions to help users access FAQS, in relation to the attributes of the aging process, "eyesight," "precision of movement," and "memory and understanding" typically deteriorate. If we don't consider these attributes when designing guidelines for seniors, they will not use the system. We follow the design guidelines: (1) visibility improvement, (2) operation improvement, and (3) consideration of cognitive factors, in order to make websites easier to use for seniors.

Moreover, we developed E-namoSupport not only a support environment, but also as a learning environment. We considered two content select criteria: (1) content should satisfy users' interests, and (2) content should satisfy what users want to learn. From FAQAS, we can get the statistics and analysis information required to grasp users' interests and needs. Based on these, we adjusted the FAQs by adding contents, modifying content categories, and adjusting difficulty levels to provide highly relevant knowledge for users. Through providing suitable learning contents by analyzing user interests and needs, it can help more senior citizens improve their IT abilities and enjoy the information age.

The environment was implemented in December 2005. Up to September 30, 2006, a total of 343 cases were collected by the support center, and 1603 senior users had registered with the system.

Study 3: A Senior Internet Support & Learning Environment Implemented In China

Unlike such developed countries as Japan that have brought a social foundation to maturity, developing countries must consider their relatively weak social fabric. We conducted research in China, which has become the second largest Internet-using country in the world. And yet few studies have focused on senior usage. The study process was: [20]

First we investigated senior citizen Internet anxieties and analyzed subtypes of Internet anxiety and other attributes by questionnaires of 103 participants from January to March 2006. We further explored seniors' willingness to use the Internet as well as the difficulties and obstacles they often face.

Next, to ease their anxieties and satisfy their needs, we proposed a system called the Senior Internet Support & Learning Environment

Finally we demonstrated the proposal's usability.

The proposed environment has four parts, which listed below:

(1) Web navigator site for seniors

From the survey results of information needs, the Internet information needs for senior citizens were different than other generations. Seniors also had required special methods for finding information, which explained to a certain extent that current directory websites were neither popular nor entirely suitable for seniors. We built a Web navigator site especially for seniors. Directory structures were based on the survey results of Internet information needs. The navigator also had a keyword search function because this search method was used most by senior citizens. Furthermore, because most seniors would like to receive others' advice on Internet information searching, the Web navigator also provided a free space where users can upload their favorite site links and obtain or give advice about these links.

(2) IT learning site for seniors

We aimed to provide senior citizens with an easy way to understand and access learning materials. To improve access, an online learning site is necessary. To minimize ability requirements and reliability anxiety, the learning content focused on Internet foundation knowledge, popular Internet terms, search ability, security, and anti-virus knowledge. It is worth considering content understandability so that seniors, whose memory and comprehension often fades with time, can easily grasp the knowledge.

(3) IT community site for seniors and supporters

The survey results showed that seniors were seriously worried about getting support for problems concerning the Internet and computers. By providing a virtual and easily accessible space, seniors can ask any conceivable question and supporters can discuss, answer, and provide suitable solutions to share knowledge and wisdom.

(4) Browser tool for seniors

Survey results showed that the browser tool was other factor that affects Internet use. A browser tool for seniors we developed considering "eyesight" and "precision of movement" to simplify Internet browsing for seniors.

The environment's interface design differed in many ways from commercial systems in China, including a simplified interface, reduced clutter on the screen, reduction of terminology, and clear and simple navigation paths. We demonstrated the proposal's usability in June 2006. Participants reported that the environment simplified using, learning, and getting support from the Internet. The results confirmed that the proposal can offer an effective Internet learning and support environment for senior citizens in developing countries.

DISCUSSION AND CONCLUSION

We have been developing web-based learning and support environments for lifelong learning for three years. The research's originality and significance include:

(1) Integration of learning and support methods

"Learning" improves ability, and "support" reduces access difficulty. By integrating both learning effects and support functions, more people can be helped to enjoy the information age. In study 1 of lifelong learning fields, we developed web-based learning environments and integrated traditional learning methods with web-based learning. The system helped learners easily choose and participate in learning courses. We also provided learners more useful learning contents that were collected in the support process, such as study 2. Moreover, to improve the learners' Internet literacy ability, we proposed an environment with learning materials and easy access to support methods in virtual communities, such as study 3. The research considered both learning effects and support functions, so we believed it can help more lifelong learners enjoy the information age, and also evaluations have proved it.

(2) Proposed suitable solutions based on the different conditions of developed and developing countries

Existing studies have largely been confined to the boundaries of national states. Scant research has paid attention to how Internet access and use fit into everyday life in developing countries, especially for senior citizens. To our knowledge, this research is the first to compare and synthesize research on a web-based support and learning system in a global range of developed and developing countries. After analyzing different social foundations and life styles in a developed country (Japan) and in a developing country (China), we proposed suitable web-based solutions. Further, the research can provide Internet developers, planners, and designers with a better understanding of the situation of senior citizens with respect to the Internet, provide a general solution, as well as a reference for further implementing a wide used public system for narrowing the world's digital divide.

In the future, since this research only dealt with a subset of the digital divides in the field of lifelong learning, other dimensions must be considered. Also, future studies must enrich the functions and structures of the environment and implement them to help more learners learn with and use the Internet.

ACKNOWLEDGMENTS

This research was supported in part by the 21st Century COE program "Intellectual integration (IMI) of voice images for the social information base" of MEXT and the MEXT Research Subsidy, and by Grant-in-Aid for Scientific Research Foundation.

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