

網路化學習歷程檔案之研究

A Study of Web-Based Learning Portfolio

計劃編號：NSC 89-2511-S-032-001

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執行機關：淡江大學教育科技系

執行期限：88/8/1 – 89/7/31

關鍵詞：學習歷程、歷程檔案、學習檔案、學習歷程檔案、檔案評量

Keywords: Portfolio, Portfolio Assessment, Web-Based Portfolio, Electronic Portfolio

摘要

本研究已實地設計與製作了一個架構於 Web 上的「網路化學習歷程檔案系統」，期望能有助於記錄、整理、搜尋與分析學生學習過程的資料，除了支援授課教師另類的電子化評量工具，亦提供學生與教師瀏覽及瞭解他人學習情況的功能，增加學生間互動與觀摩學習的機會，讓學生瞭解自己和其他同儕的學習表現與進步情形。此系統已正式在大學的一門課使用約一學期，實施與運作情況良好。系統功能與效果評估的結果顯示，大多數學生皆認為此學習檔案對其學習過程或成果品質的提升有所助益並具有正面之影響，能幫助教師及學生更瞭解學生真實的學習過程與成果，提供學生整理作品與互相觀摩學習的機會。除了在製作個人學習檔案上較耗時費力之外，對於整體運作與教學運用方式皆持正面肯定的態度。未來我們在系統的自動化管理及評量管理如教師評量與同儕互評等功能方面，將繼續擴充和加強。

ABSTRACT

A web-based learning portfolio (WBLP) for authentic assessment has been constructed, in the hope to help record, display, search and analyze student learning process data. The WBLP system has been officially implemented in a course at the university for a semester. The results of the system evaluation and effects show that most students consider that the system is helpful to improve the learning process and accomplishing quality, to understand the authentic learning process and outcome, to provide chances for displaying and improving works.

Web-Based Learning Portfolio (WBLP): An Electronic Authentic Assessment Tool on Web

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A web-based learning portfolio (WBLP) for authentic assessment has been constructed, in the hope to help record, display, search and analyze student learning process data. The WBLP system has been officially implemented in a course at the university for a semester. The results of the system evaluation and effects show that most students consider that the system is helpful to improve the learning process and accomplishing quality, to understand the authentic learning process and outcome, to provide chances for displaying and improving works.

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1 Research Background

The negative impacts of the traditional paper-and-pencil assessment method are commonly found in researches by scholars in Taiwan and abroad. These contain examination-oriented instruction and the inability to assess high-order cognitive abilities and affective attributes in common (Herman, 1992; Glaser & Silver, 1994). However, the defects that do not comply with contemporary learning theories are not only criticized by many scholars, but also provide a theoretical foundation for the improvement of traditional assessment and creation of new assessment methods. From the viewpoint of recently developed constructivist learning theory, knowledge should not be accepted passively, it should be actively constructed by cognition. Therefore, instead of using simple knowledge instruction, an instructor should be a facilitator and adviser of instruction to help learners create a knowledge construction environment. The instructor should give guidance and support, in order to help learners become actively involved in the learning process and construct their own knowledge. Furthermore, situational cognition claims that learning should be applied to real life situations and emphasize on student involvement and understanding in the learning process.

Traditional assessments, which are made according to the student's memory of the message given by the instructors, are unable to effectively measure the results of these two learning theories. The changes in the student's cognition and learning process, involvement and interaction have become the new foundation for learning effect assessment. Traditional assessment does not effectively measure students' ability to organize relevant information or present a coherent argument, and lack sensitivity to the individual growth that teachers desire in students (Cole & Ryan, 1995). Therefore, when traditional assessment is unable to effectively reflect a student's learning process, there is a need for new types of assessment. In response to the needs of the new learning theories such as constructivist learning, and to improve upon the insufficiency and limitations of traditional assessments, new assessments come out one after another in various forms and names.

Based on the aforesaid beliefs and importance concerning learning portfolios, this research designed, constructed and evaluated a learning portfolio on the World Wide Web architecture according to the portfolio assessment concept by combining the characteristics and functions of computer and network technology. Furthermore, this portfolio was conducted on a subject at the university to evaluate its functions and effects. The objectives of the research are:

1. To design and construct a web-based learning portfolio that satisfies the needs of university students in Taiwan.
2. To assess the functions and effects of a web-based learning portfolio and its impact on learning of students.

2 Functions of WBLP

The WBLP system is built upon an Intel Pentium-II CPU system and MS Windows NT Server 4.0 Operation System. The Web server uses the MS Internet Information Server (IIS) 4.0, and the database uses the MS Access 97. In addition, MS FrontPage 98 was used to create basic page layout and hyperlink architecture for web pages and MS Visual InterDev 6.0 was used as an assistant tool for system function development and ASP (Active Server Page) programming. System development and construction were conducted right after the determination of tools. The functional architecture of the WBLP system is shown in Figure 1.

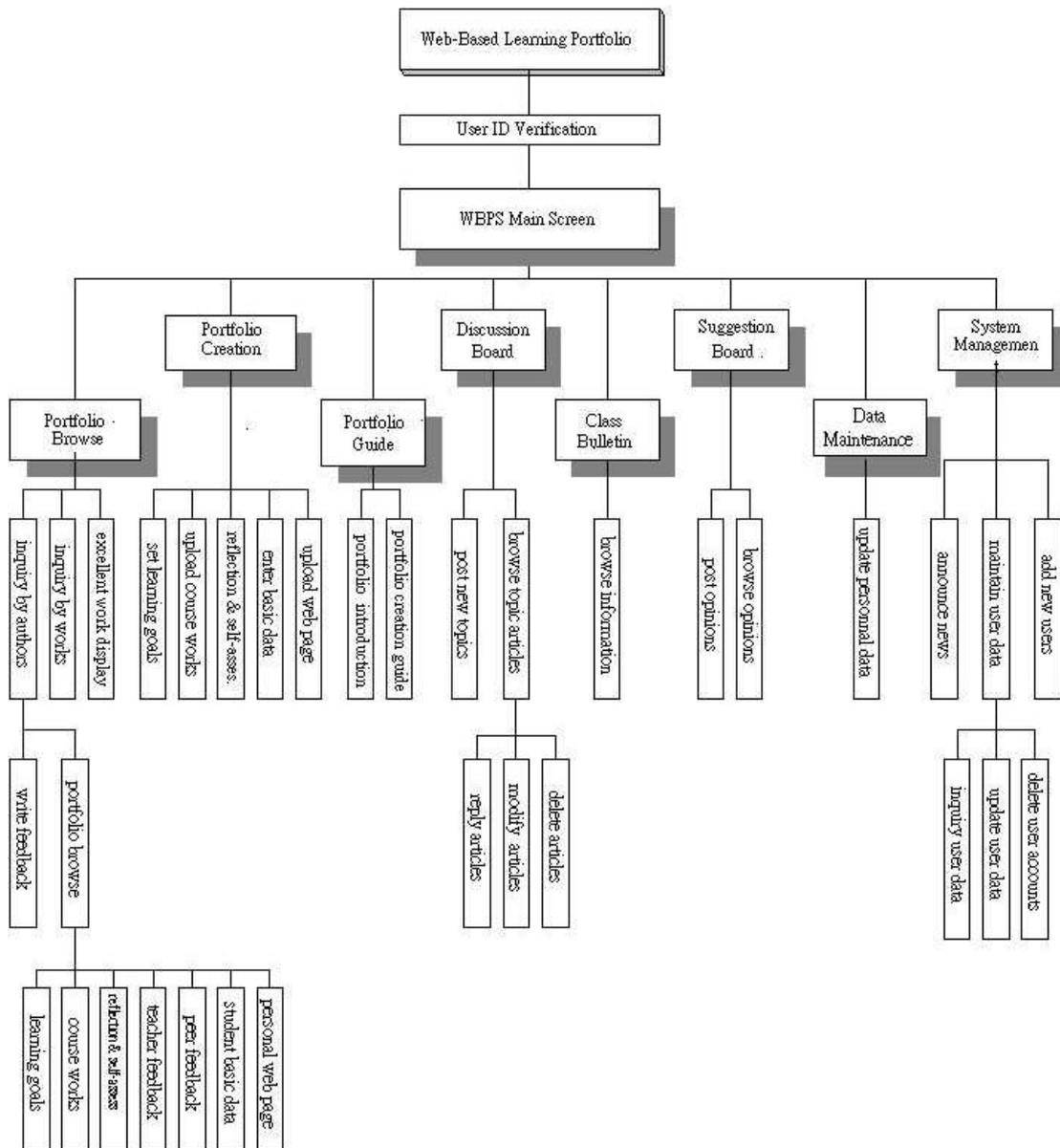


Figure 1 Functional architecture of the web-based learning portfolio

2.1 User ID Verification

The target users of this study were students and teachers in a Computer and Instruction course for the Teacher Preparation Program at one university. A user ID verification was established to identify the users. A guest account was also assigned to allow interested visitors to browse students' learning portfolio.

2.2 Portfolio Creation

The WBLP system aims at enabling students to produce their personal learning portfolios fast and easily through the interface provided by the system. Students create the portfolios with the purpose of proving their learning, and concretely demonstrating their efforts and outcomes. Students can use the WBLP system to complete learning goal setting, course work upload, reflection and self-assessment record writing, data basic setting and modification, and personal web page upload by filling out the forms (see Figure 2).

Allowing students to upload their ongoing or completed works in the WBLP system aims at concretely representing their efforts and accomplishments as well as examining and analyzing their works. According to the rationales of portfolios, they must contain students' in-progress and completed works as well as their self-reflections and self-assessments on both their learning and the selected works. Unfinished work might be placed in the portfolio to identify a problem area, and to prompt the student to reflect why it is a problem and what might be down about it. For today's students to be self-determining, they must self-set learning goal, self-monitor, self-reflect and self-evaluate. Allowing students to write their self-reflection and self-assessment statements in the WBLP system aims at providing them with the opportunity to profoundly reflect on their learning process and outcomes. According to Cole, Ryan, & Kick (1995), allowing students to have decision-making power about the selected artifacts may make the students feel ownership of the portfolio.

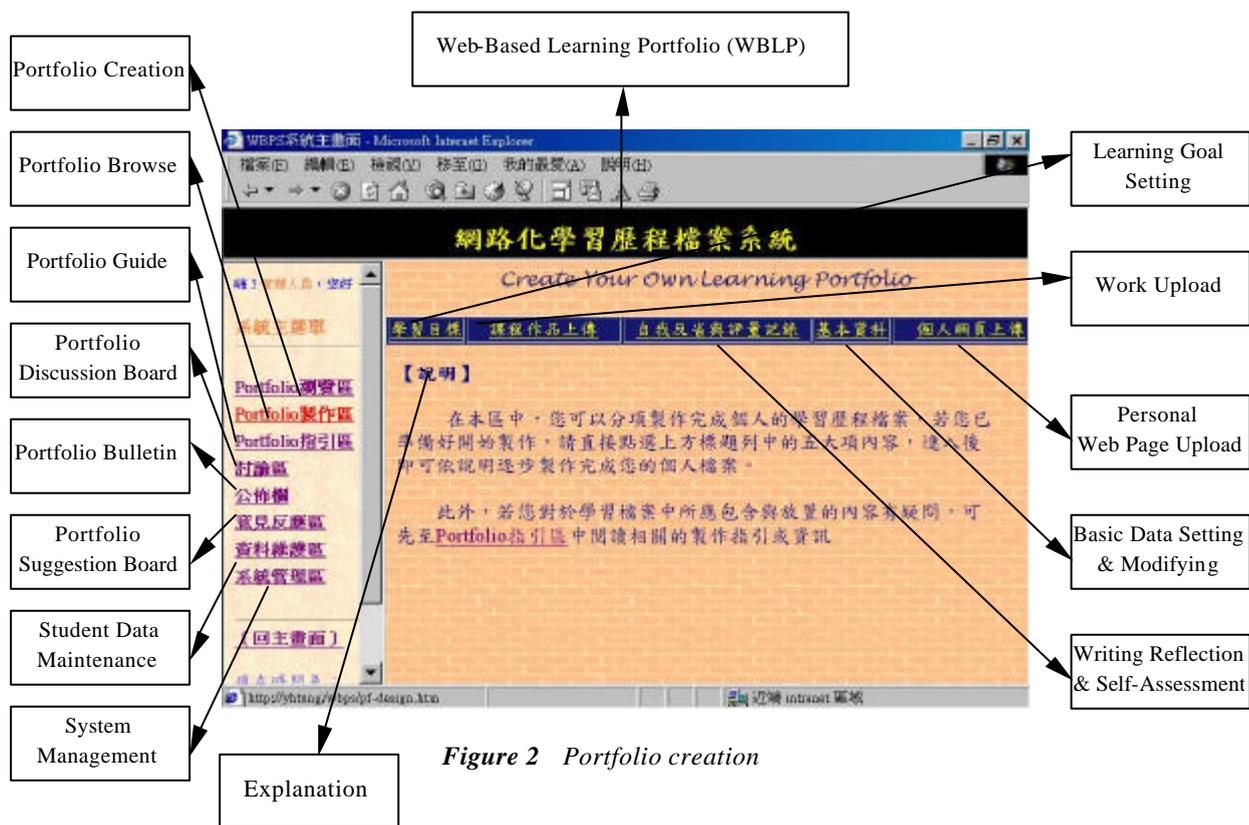


Figure 2 Portfolio creation

2.3 Portfolio Browse

A user may inquire or browse any portfolio by student name. Both students and teachers can browse the contents of individual student portfolios. Browsing areas include learning goals, course work, reflection and self-assessment records, teacher feedback, peer feedback, basic data, and personal web page. A user may also inquire/browse any portfolio by works. Both students and teachers can directly browse the contents of the work. Moreover, both teachers and students may add their feedback and grades while browsing the portfolio. Teachers

can use the portfolio-browse mechanisms in the WBLP system to collect interim evidence to identify the students' stumbling blocks and to document the movement toward mastery. In additions, teachers can identify areas of strengths and weaknesses by viewing the whole working processes of the students. For students, they might gain a clear view of their peers' learning processes for reference and thus benefit on their learning.

2.4 Portfolio Guide

The guide provides information concerning the creation of a learning portfolio, including (1) content selection: contents of portfolio according to teacher requirements or group discussion; (2) assessment criteria: criteria of assessment done by teachers and students together; (3) portfolio creation guide: brief description of rules to be followed for portfolio creation. The contents of this function are subject to adjustment nonetheless they aim at helping students to create their own portfolio. Teachers and peers might provide students with guidance about selecting content of a portfolio, decide assessment criteria, and creating portfolios as well as clarifying why they have identified them as such.

2.5 Portfolio Discussion Board

Provides an asynchronous discussion channel for students to discuss things related to the course and the creation of a learning portfolio. The main issues can be: (1) portfolio content selection criteria; (2) portfolio assessment criteria; (2) portfolio creation manner; and (4) course contents: issues relate to the course. The portfolio becomes a focal point for student-teacher and student-student discussions about issues that have been raised in the learning process. The discussion regularly enables the teacher to talk with students about their growth and reflections. This kind of sharing between teacher and student may be ongoing on the World Wide Web. Farr & Tone (1994) claim that student-teacher discussion is key to the success of portfolio assessment and a vital part of the portfolio methodology. In this kind of exchange and sharing, portfolio assessment likely becomes a key and effective instructional activity. Some teachers have argued that scheduling conferences is quite needed, but conducting them is one of many difficulties in the implementation of successful portfolio assessment (Farr & Tone, 1994). The conferences that the teacher schedules with each student in a traditional way are sometimes expensive to be conducted due to the factors of time and place. In indeed the student-teacher interaction does not need to regularly happen only at scheduled time periods, it can occur informally and frequently, even daily via the WBLP on World Wide Web.

2.6 Portfolio Bulletin

To provide the latest information and news, including system notice, portfolio activities, course information and news. Portfolio activities might include setting learning goal, uploading works, writing reflection and self-assessments, displaying excellent artifacts, writing peer-assessment statements, viewing peers' portfolios and works, and so forth. In order to motivate students, teachers might announce a variety of assessment procedures as scoring students' portfolios, or a regular time period for examining portfolios and rating the content within.

2.7 Portfolio Suggestion Board

This is a communication channel between students and teachers as well as between students and a system manager to enable students to receive feedback on their problems, opinions and suggestions about the WBLP system and portfolio creation. It is also a place for students to share their feelings and experiences about portfolio creation and usage. Students can also use the suggestion board to present options about instruction.

2.8 Student Data Maintenance

To enable students to browse, update and modify their personal data. These data include name, major, telephone number, e-mail address, post address, personal interests, and personal specialties.

2.9 System Management

Exclusive for teachers or the system manager to add new user accounts and to manage student data, including inquiry, browse, modification, add, and delete student data. In addition, teachers or system manager can directly announce news by filling out the form.

3 Database of WBLP

The design of the database is crucial to the smooth operation of the entire system. Three databases were designed to store and manage students' learning portfolios

3.1 Portfolio Database

The portfolio database is the core section of the WBLP system and the place for storage and management of student learning portfolios. Different application goals (such as supporting multiple courses, more classes but one course) of a web-based portfolio lead to various complexity in the considerations of database design. Due to the limits on time and labor, the system presently can simply handle the course load for one class. The student ID number was used as primary index for the portfolio database. The database contains three data tables, which are associated with the student ID.

1. Student data table: stores student basic data, e.g., name, ID number, major, interests, and specialty.
2. Portfolio data table: stores the contents of student learning portfolio, including learning goal, course work, reflection and self-assessment record, teacher feedback record, peer feedback record, and personal web page; where only the learning goal is stored in memo form, the course work column gives the total number works, while only respective filenames are stored in the rest of the columns.
3. Course work data table: in consideration of the differences of works within the student learning portfolio, the record of the table will be updated dynamically when students upload a new work. Data include work-file path, work outline, date of update, status of completion, and grade of works.

3.2 Discussion Database

It is an independent database specially designated for the portfolio discussion board, including two main data tables:

1. topic data table: store information and contents related to the topic of discussion.
2. article data table: store information and contents of articles of discussion, associated by the column of Title ID with the topic data table.

3.3 Bulletin Database

It is designated for the portfolio bulletin board containing only one news data table to store system notices, course information and news as a dynamic message announcement and presentation for teachers and system manager.

4 Implementation and Evaluation of WBLP

4.1 Implementation

The WBLP system was implemented during the middle of second term of the 1998 school year (late April to middle June). The revised and updated prototype system is open to 35 undergraduate students taking the Computer and Instruction course of Teacher Preparation Program until the summative evaluation of system for a period of one and a half month. The implementation and operation are generally good. As the learning portfolio

is a new assessment, and through the use and creation of personal learning portfolio, a student can personally experience the assessment and process to understand the nature and contents of the method, which is helpful to the future instruction work of pre-service teachers. Moreover, most assignments and works of the course are presented in electronic data/file, they are very suitable for the creation, management and presentation of web-based learning portfolio. Therefore, the course has been selected as a subject of the system.

As portfolio assessment is new, most students do not have the idea or experience of the assessment. Before the implementation, the students were given a brief introduction to the assessment, so that they could have a better understanding of the portfolio assessment. In addition, an online help/guide is provided in the WBLP system to help users understand the functions, contents and creation of a learning portfolio. After the system implementation, teachers required and encouraged students to use the system according to the course schedule, and subsequently to complete the creation of personal learning portfolio. Moreover, each student is required to write a reflection and self-assessment for each course work, though feedback and assessment on peers' work is not compulsory. At the same time, online assistant has helped teachers to view and numerate the creation of portfolio, learning goal, reflection and self-assessment record, peer feedback and assessment, and student works.

4.2 Evaluation of Functions and Effects

The system summative evaluation includes user-based and expert-based evaluations in terms of system functions, overall design and interface operation, implementation and uses, and impacts on learning.

4.2.1 User-based Evaluation

A survey using a 5-point rating scale questionnaire was given to the 35 undergraduate students in the subject course. Then a random sampling was used to select 5 students for further interviews to have an in-depth understanding of the system function design and learning portfolio creation.

In system function design, besides a lower agreement to the personal web page upload (average 3.75), all other items have an average over 4, which shows that there is still room for improvement in the system upload process. The majority of students agreed and very much agreed, which means that the system functions can satisfy the needs of users. The reasons for the lower agreement of web page upload may include the inability to support upload by directory of data file, a user may need to upload web pages file by file, which makes things very inconvenient; moreover, most students are inexperienced to web page creation and fail to following the instructions of producing web pages, as a result, access paths of web page files are incorrect, and web pages are unable to normally display.

In overall system design and interface operation, user agreement is over 4.0, and there is no disagreement, which suggests that the performance in system architecture, screen and window design, color or background layout and ease to operation is quite good.

In system implementation and application, most students would browse the course works and personal web pages of peers (average over 3.5), so students should be encouraged to browse other contents of the portfolio. Possible reasons are the limited implementation period of the WBLP system. It is difficult for a student to create his own portfolio and browse that of all other students. Browsing other students' course works and web pages may help in the creation and improvement of one's own work. Moreover, most students have browsed their own feedbacks from teachers and peers (average over 4). In personal portfolio creation, most students would browse related information provided in the portfolio guide/help (average 4.27). In practice, most student reflected that the creation of personal learning portfolio is time-consuming (44% agreed, average 3.37); however, there is only a slight difference between agreed and disagreed in the writing of learning goal, reflection and self-assessment record, and peer feedback. From the viewpoint of an average under 3, there is little problem.

In impacts to learning, the Table 1 reveals that the following six items have an average over 4.5, which means that the majority agreed. The results show that most users have a positive attitude toward the system's assistance in personal learning process and outcome, i.e., the system can help students in learning the course.

Table 1 Percentages and averages of student agreement in WBLP impacts on learning (n=35)

Evaluation Items	Percentages of student agreement (%)					Average
	5	4	3	2	1	
1.The system enables students understand the achievements of other students	67	33	0	0	0	4.67
2.The system is helpful for learning the course	70	27	3	0	0	4.67
3.The system enables students learn the feedback and suggestions from other students	60	37	3	0	0	4.57
4.Browsing peers' work will be helpful to improve the quality of one's own	63	30	4	3	0	4.53
5.The system enables students learn the feedback from teachers	63	27	10	0	0	4.53
6.Expectation for the WBLP system in other courses	60	33	7	0	0	4.53

Note. 1.Evaluation items with an average below 4.5 are not included in the table.

2.The numbers of 5, 4, 3, 2, 1 denote a 5-point rating scale with 5 being strongly agree and 1 being strongly disagree.

4.2.2 Expert-based Evaluation

Three experts (including the instructor of the course, portfolio expert and assessment expert) were invited to use the system, and an interview was made after a week.

In the pertinence of portfolio contents, experts expressed that the WBLP system contents has satisfied the basic needs of a learning portfolio, however, more information concerning the things that happened in class or interesting events, literature or presentation data will enrich the system. In addition, the system is designed for the Computer and Instruction course, teacher application is less self-controlled and spontaneous; the content is more 'teacher-guided', and student involvement is not concerned.

In system functions (e.g., portfolio creation, browse, guide, discussion, bulletin, suggestion and data maintenance), the WBLP system has displayed the characteristics and functions of learning portfolios in general, and they are appropriate and support basic learning portfolio creation/browse. However, for the system management function, the teacher's grading mechanism on student works, automatic recording function, and score statistic functions can be added to facilitate instruction and assessment. A portfolio assessment scoring function can be added to provide student self-assessment, peer-assessment and teacher-assessment mechanisms, e.g., online creation of assessment table, self-assessment table, peer-assessment table, score automatic recording and statistic functions.

In overall interface design and operation, the system is quite easy-to-use, however, some descriptions of how to create portfolio can be clearer, and the display speed of course work is a bit slow and affect the smooth browse of works.

In assistance to student learning and teacher instruction, the WBLP system can provide an effective and appropriate creation and browse environment of learning portfolio, and can help teachers and students to understand the authentic learning process and accomplishment of students. Moreover, it may provide a chance for students to improve their own works and view that of the others, which are very helpful to learning process. However, students present only the completed work in the portfolio, and the process is harder to display. Therefore, if the collection and display of the in-process works of students are enabled, the system can effectively reflect the process of student learning.

5 Conclusions and Future Works

Tradition portfolio assessment still relies on man-made data collection and a writing-centered learning process. The difficulties in data storage, search and management after long-term implementation have become a problem

in the development and implementation of portfolio assessment (Mullin, 1998; Smith & Tillema, 1998; Niguidula, 1993). Fortunately, the impact of computer technology has facilitated the production of electronic or computer-based portfolios, which not only solves the problem of huge amounts of data storage, but also enables students to combine text, pictures, images and sounds to present richer and more diversified file content through multimedia. In addition, computer technology is a great aid to data collection, update and management of electronic portfolio (Lankes, 1995). The creation of an electronic portfolio however requires peripheral devices (such as a scanner to change a picture into digital format), hard disk, diskette, or CD-ROMs, for storage, printers, etc.. In this respect the World Wide Web will become a common solution for recording a learning portfolio. The availability of the World Wide Web will not only facilitate the recording, editing, searching and analysis of learning portfolio data, learners and teachers can also share data with other users through Internet browsing functions.

Making use of the portfolio assessment concept, this study integrated the characteristics and functions of computer and network technology to design and construct a web-based learning portfolio, in the hope to help record, display, search and analyze student learning process data. Besides being an electronic assessment tool for supporting teacher instruction, the WBLP system provides functions for students and teachers to browse and understand the authentic learning status of the others to improve the interaction between students and to let students understand the learning performance and progress of their peers. The functions of the WBLP system include portfolio creation, portfolio browse, portfolio guide, portfolio discussion board, portfolio bulletin, portfolio suggestion board, student data maintenance, and system management. Databases used in the WBLP include student portfolio database (including student basic data table, portfolio data table, course work data table), discussion database (including topic data table, article data table), bulletin database (including news data table).

The WBLP system has been officially implemented in a course at the university setting for approximately a semester, both the implementation and operation are quite good. The results of system evaluation and effects show that most students consider that the system to be helpful in improving the learning process and accomplishing quality, understanding the authentic learning process and outcome, providing chances for displaying and improving works. Besides the time-consuming portfolio creation, students hold a positive attitude to the overall operation and instructional application of the system. Next step we will continue qualitative and quantitative experimental studies to further understand more about the true impact of web-based portfolio learning on students' learning process and outcomes.

Acknowledgement

This research was sponsored by National Science Council of Taiwan, ROC, project no: NSC 89-2511-S-032-001. The author would like to thank Miss Yi-Hui Tung in helping to develop and implement the system.

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