Developing Web-Based Information Competence Assessment Platform for Grade 1-9 Curriculum in Taiwan

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摘要

我國九年一貫發展資訊教育目前所面臨的主要問題在於資訊並未列入學科當中，此外沒有一套共同標準的資訊教材。而在評量方面，我國中小學資訊能力檢定多傾向試卷問答的評量方式，較不能看出學生是否能夠有效使用資訊科技。因此，本論文參考英、美當前的檢定方式與理念，並依我國教育環境現況所需，發展一套融合任務導向學習與資訊能力檢定之線上評量平台，本平台提供豐富的資訊工具足以讓學習者解決所分配的任務，並依據九年一貫課程綱要之資訊能力指標自動評量學生所完成的成果是否達到運用資訊能力來解決問題、分析資訊、發展構想、創造模式、控制設備等…資訊基本能力。

關鍵詞：資訊教育、資訊能力指標、評量系統、應用軟體

Abstract

The main problem that the nine-year mandatory schooling faces in developing information and communication technology (ICT) education in Taiwan is that ICT is not included as one of the core subjects and the information competence indicators assessment in Taiwan still adopts the form of traditional paper exam. After investigating the design concept of ICT assessment system in UK and USA, we incorporate project based activity into a newly developed assessment platform to fit the pressing requirement of our nine-year mandatory schooling environment. The students are expected to apply application software suite provided by the platform to solve the daily life problem. The assessment platform grades the student's outcome and provides the statistics of the outcome to the teacher and the students. A so-called information competence indicator of Grade 1-9 Curriculum in Taiwan that fits the complexity level of the assigned tasks during each stage of the project are also given for the reference.

Keywords: Information and communication technology, information competence indicators, assessment, application software.

1. Introduction

The rapid growth of the Internet and World Wide Web offers new opportunities and challenges for many areas. One of them is education. Web-based education has numerous advantages, including the suitability of taking a course without leaving the workplace or home and the reduced cost [3].

An integration of information and communication technologies (ITS) and Web-based technologies is beneficial for the purposes of education. There have been successful attempts to either move existing ITSs to the WWW [2] or build from scratch Web-based ITSs [6].

Considering the technology as a powerful tool, motivations of education improvement and promotion of students' learning, International Society for Technology in Education (ISTE) proposed the National Educational Technology Standards Project [9], which is a standard of using ICT in twelve-year foundation education in USA to guide the teacher how to take technology advantages in the teaching activity. Technology foundation standards for all students proposed by ISTE includes six dimensions of basic operations and concepts, social, ethical, and human issues, technology productivity tools, technology communications tools, technology research tools, technology problem-solving and decision-making tools guiding the teacher how to use technology validly in teaching activities.

In England, the government launched a six year project to build an information technology platform for delivering onscreen tests to all secondary schools in key stage 3. The tests were developed to enable students to apply technology to solve problems, analyze information, develop ideas, create models and exchange information [4].

Competence indicators are stated as a kind of goal in competence orient subject that points out the lowest base-line of achievement after student finished one state course [1]. The common consensus of grade 1-9 curriculum in Taiwan stresses on students having competences with themselves and hoping students to apply and transform the knowledge into different fields to solve the daily-life problems. Thus the information competence indicators declare the lowest base-line of achievement in using information and communication technology.

Although information and communication technology (ICT) plays a more and more important

role in our daily lifetime, the main problem that the nine-year mandatory schooling faces in developing ICT education in Taiwan is that information and communication technology (ICT) is not included as one of the core subjects.

Observing that adopting ICT in evaluating students' capability is a world trend and active elaborated information processing is an important specification for the efficient learning and successful obtainment of knowledge from a cognitive view [8], We develop project oriented and practical activities and design a standard ICT capability assessment system that adapts the practices in England and USA to fit Grade 1-9 Curriculum in Taiwan. Meanwhile, we attempt to transform students' portfolios into some useful information and report summary statistics so that the teacher can easily assess students' ICT level in the assessment system.

The advantage of project-based assessment is that it can match learning activities with the requirements of the real world of employment in information technology and it also enables work-based students to demonstrate their competence through the actual work that they must do in the course of their jobs [11]. In some cases, project-based assessment is enhanced using multiple case studies or using several mini-projects for improving students' assessment [5].

According to constructivism, e-Learning is an active process of information because knowledge generation is accomplished through individual experience, maturity and interaction with one' environment. Because of this view point, the educational philosophy of constructivism is distinguished from objectivism as the learner is regarded as a passive recipient of information [10]. In other words, working on interactive activities enables students to find knowledge gaps, correct mistakes and regulate the further learning process independently [7].

The remainder of the paper is organized as follows. Section 2 gives the overall architecture of the assessment platform, including project management interface, students' workspace interface, and the built-in assessment and feedback modules. Section 3 investigates and discusses the experimental results. Conclusions and the future work are given in Section 4.

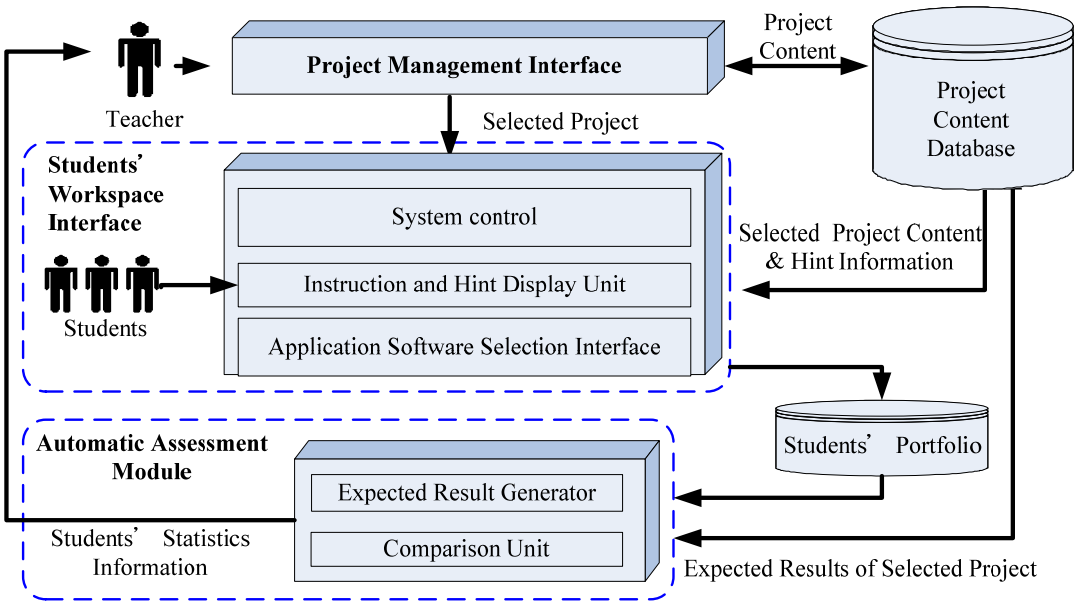

Fig. 1. Architecture of Web-Based Information Competence Assessment Platform.

2. Architecture of the assessment platform

Figure 1 shows the overall architecture of the assessment platform in this work. As seen from Fig. 1, the assessment platform offered for students in elementary and secondary school is employed to assist the teacher in assessing the student's ICT level. There are three major components in the information competence assessment platform, which includes the project management interface, the students' workspace interface, and an automatic assessment module.

2.1 Project management interface

As shown in the upper portion of Fig. 1, the project management interface is used by the teacher to build and modify the project content for the students that use the assessment platform.

Fig. 2 shows a screenshot of project management interface that lists all the projects the teacher can access in the project content database. The system allows different teachers who have appropriate

privilege to build and modify projects content at the same time. The modification privilege of each project belongs to the teacher who first designed the project. Rest of the teachers has no privilege to modify or delete the project content which does not belong to them.

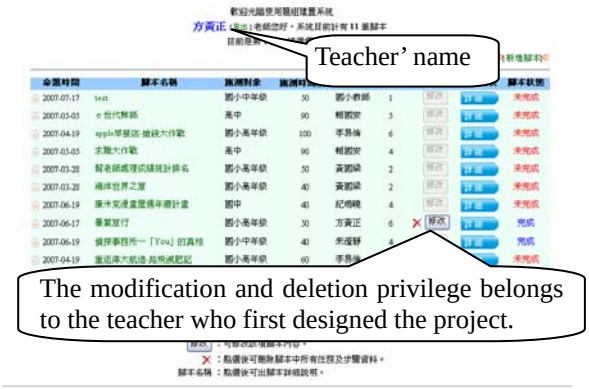

Fig. 2. Project management interface.

2.2 Students' workspace interface

AJAX is one of the hottest technologies widely applied over the internet in recent years. AJAX has several advantages that fix the problems arisen in traditional network platforms, for instance, less data bandwidth requirement between server and clients, less delay time of displaying result after user operations and providing network users a real time and novel surfing internet experience. We thus employ AJAX technology in our platform design to serve the users in real time. An instance of web based interactive saving files dialogue box in our platform is showed in Fig. 3, and part of the source code that designs the interaction dialogue box is showed in Fig. 4.

Fig. 3. A screenshot of students' workspace interface.

Our assessment platform provides sufficient tools for students to deal with official work such as editing text document and searching related information. As Fig. 3 showed, the students' workspace interface includes three main parts. One of them is system control area which is located at the upper left frame of the screen. It provides the functions such as login/logout and call for help. The frame right to the system control area displays step by step instructions and hint message for the student. The rest of the area on the screen includes five application software module selection buttons and the software workspace that the student can work on.

Five kinds of application software modules are provided in this work, and they possess similar and well-nigh compatible functions such as File browser, Word, Excel and PowerPoint developed by Microsoft Corporation. Three open source software modules are modified to mimic the functions provided by Microsoft application suite, Word, Excel and PowerPoint. In addition, two more tools including built-in search engine and e-mail management are also developed to fit the project need.

```
31      showDialog : function()
32      {
33          if(!dialog){ // lazy initialize the dialog and only create it once
34              dialog = new Ext.BasicDialog("hello-dlg", {
35                      autoTabs:true,
36                      width:400,
37                      height:400,
38                      shadow:true,
39                      minWidth:300,
40                      minHeight:250,
41                      proxyDrag: true
42              });
43              //dialog.addKeyListener(27, dialog.hide, dialog);
44              dialog.addKeyListener(27, escEvent, dialog);
45              function escEvent(dialog){
46                  window.close();
47                  dialog.hide();
48              }
49          //  dialog.addButton('Submit', dialog.hide, dialog).disable();
50              dialog.addButton('確定', saveAction, dialog);
51              //dialog.addButton('取消', dialog.hide, dialog);
52              dialog.addButton('取消',close);
53          }
54          dialog.show(showBtn.dom);
55      }
```

Fig. 4. Partial source code of "Save and Load dialogue box" by using AJAX technology

2.3 The automatic assessment module

The automatic assessment module includes two main components, expected result generator and comparison unit. The expected result generator assists the teacher who designed the project to generate the expected result after each step sequence. The expected results are converted into tags and are saved in the database for future reference. The only job for the comparison unit is merely comparing each student's answers with the expected ones saved in the database.

3. Procedure of assessment

3.1. Building and modifying project content

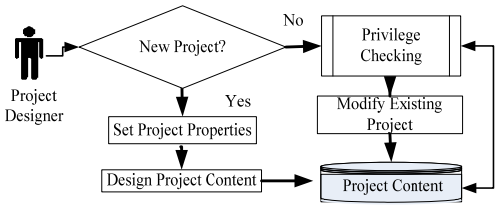

Fig. 5. Process of building and modifying project content.

Several elementary and secondary school teacher who had many years teaching experience in elementary and secondary schools in Taiwan were invited too serve as the project designer.

Figure 5 shows the process how the project content designer builds or modifies the project content. The project designer was suggested to build the content using daily life story in which essential skills to solve daily-life problems are required. The whole project is divided into several missions and each mission is further divided into multi-steps. The time of accomplishing each mission is expected to be within 20 minutes and the whole assessment totally takes one hour.

The project designer must setup step by step instructions and provide enough information at each step to assist students in accomplishing their assignments as shown in Fig. 6 Meanwhile, the designer must also provide all the expected results during each step and specify the corresponding information competence indicators of Grade 1-9 curriculum in Taiwan [1] that fits the complexity level of the assignments during each step.

Fig. 6. An example of building and modifying project content process.

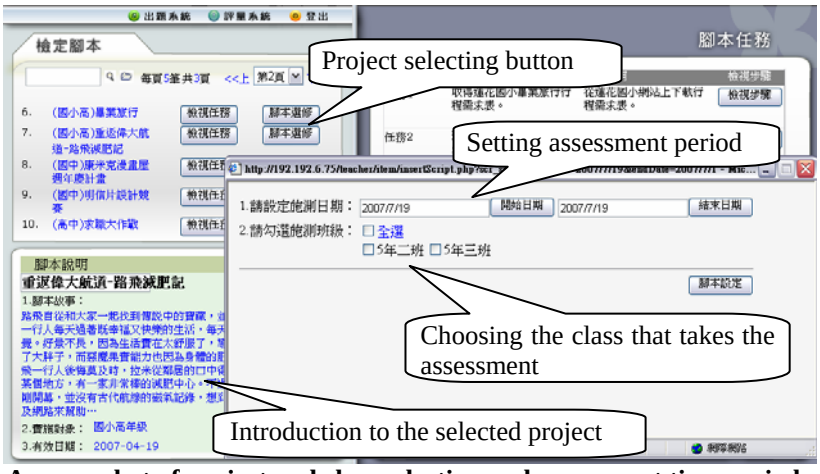

Fig. 7. A screenshot of project and class selection and assessment time period setting.

3.2. Assessment setting

A screenshot of choosing project and class and setting up examination time by the teacher is given in Fig. 7. The teacher who is willing to adopt the assessment platform in her/his class can choose some appropriate project from the project content database,

and setup the assessment time period and specify the class that takes the assessment as illustrated in Fig. 8.

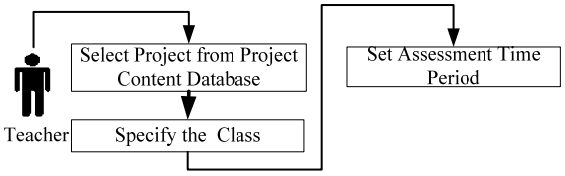

Fig. 8. Process of assessment setting.

3.3. Students' workspace interface

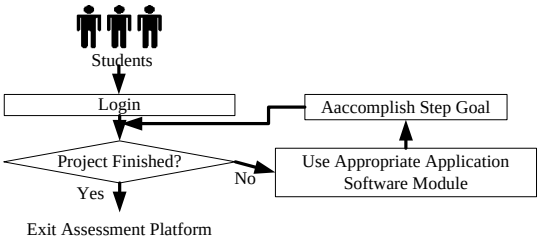

Fig. 9. Procedure that the students follow during the assessment.

Figure 9 shows the procedure that the students follow during the assessment. The students login the platform using their accounts and passwords. They must comply with the built-in step by step instructions to specify some appropriate application software module to accomplish the step goal. For instance, the first mission of graduation traveling arrangement is divided into six steps, which include applying search engine to locate the tour agency, using e-mail to contact tour agency, investigating the tour requirement, analyzing the expense and arranging the trip route**,** and finally reporting the result to the tour agency with e-mail.

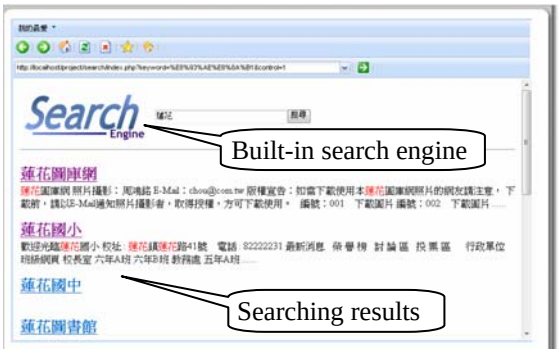

Fig. 10. Internet browser module and built-in search engine interface.

The student is requested to accomplish the assigned tasks during multi-steps of each mission by using appropriate software module within a limited time. During the assigned mission, the students have to figure out how to apply search engine to locate the tour agency, use e-mail module to communicate with the tour agency, employ spreadsheet module to meet the budget limit for each student, and adopt word processing module to arrange the trip route. Screenshots of using search engine and word processing module are shown in Figs 10-11.

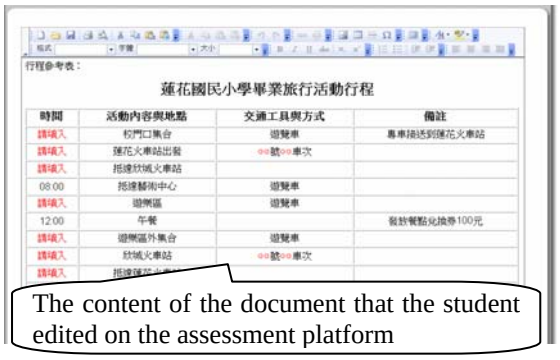

Fig. 11. Interface for the word processing module.

3.4. Assessing the student's accomplishment

After the students finish assigned tasks during each step, the built-in assessment module showed in the Fig. 1 automatically assist the teacher in grading each student's outcome based on the expected results offered by the project designer. The comparison unit is employed to compare the student's outcome to the expected result. For example, when the student is asked to use e-mail to contact tour agency, the comparison unit retrieves the subject of the e-mail, e-mail address and attached file name from the database and verifies if the student's outcome is consistent with the expected outcome saved in the database.

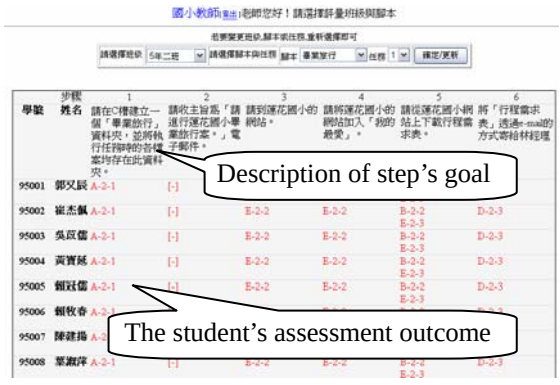

Fig. 12. Statistics for the students' assessment outcome.

The assessment module can display the statistics of the students' accomplishment at the end of the assessment. The corresponding information competence indicators of Grade 1-9 curriculum in Taiwan is also given on the screen as shown in Fig. 12. Notably, the assigned tasks for the steps that are not completed are marked in red as illustrated in the example.

4. Conclusions and Future Work

In this work, the assessment on information competence of dealing with the daily life problems is stressed and a multi-stage assessment platform is designed to fit the purpose accordingly. The assessment modules are semi-automatic because the expected outcomes for each mission are provided by the experienced teachers beforehand. Several selected experienced teachers in elementary and secondary school were invited to design the projects content for the assessment so far. The corresponding application software suite was developed to fit the project need. In the future work, the assessment platform will be open to the teachers in elementary and secondary school in Taiwan before the fourth quarter of this year. The assessment platform will be experimented in two classes in elementary and secondary school before the end of this year. Meanwhile, we will expand the functionality of the platform to provide the diagnosis for the students that fail to accomplish the assigned tasks during each step of the mission.

5. Acknowledgements

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References

[1]黃炳煌（主編）(2002)。社會學習領域課程設計與教學策略。臺北市：師大書苑。

[2]Alpert, S. R., Singley, M. K., & Fairweather, P. G. (1999). Deploying intelligent tutors on the web: an architecture and an example. international journal of artificial intelligence in education, vol. 10 no.2, pp. 183–197.

[3]Berz, M., Erdelyi, B., & Hoefkens, J. (1999) Experiences with interactive remote graduate instruction in beam physics. Journal of Interactive Learning Research, vol. 10 no.1, pp. 49–58.

[4]British Educational Communications and Technology Agency, Becta (2006) Key Stage 3 Information Communication Technology pilot support information (Retrieved May 24, 2006, from http://www.becta.org.uk/schools/ks3support)

[5]Dempsey, J.V., & Van Eck, R. (2003). Modality and placement of a pedagogical advisor in individual interactive learning. British Journal of Educational Technology, vol. 34 no.5, pp. 585-600.

[6]Eliot, C., Neiman, D., & Lamar, M. (1997). “Medtec: a web-based intelligent tutor for basic anatomy,” In S. Lobodzinski, & I. Tomek (Eds.), Proceedings of WebNet ’97, World Conference of the WWW, Internet and Intranet, Charlottesville, VA: AACE, pp. 161–165.

[7]Gao, T., & Lehman, J. D. (2003). “The effects of different levels of interaction on the achievement and motivational perceptions of college students in a web-based learning environment”. Journal of Interactive Learning Research, 14, pp.367–38

[8]Lockhart, R. S., & Craik, F. I. (1990). Levels of processing: a retrospective commentary on a framework for memory research. Canadian Journal of Psychology, 44, pp. 87–112

[9]National Educational Technology Standards Project, NETS (1998) Standards for Students (Retrieved May 20, 2006, from http://cnets.iste.org/)

[10]Rovai, A. P. (2004). “A constructivist approach to online college learning”. Internet and High Education, 7, pp. 79–93

[11]VET in Schools programs and relevant career information provided by Curriculum Corporation. http://www.curriculum.edu.au/ccsite/