

A Web-Based Virtual Lab for Accounting Skills Practice

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ABSTRACT: *With the advances in internet technology, the educational instruction mode has greatly been improved, which is beneficial to accounting education. Practical accounting skill is difficult to learn in the classroom with traditional forms of accounting education. In this paper, the authors described a web-based virtual accounting lab that has been developed to provide simulation in accounting practical skills, reported empirical findings of the application of the lab, evaluated its effectiveness based on questionnaire to students participated in the lab. The study has proved the value of education technology in providing real life experience for accounting students. Further implications and conclusions on technology application in accounting lab were also given.*

Categories and Subject Descriptors: K. 3.1 [Computer Uses in Education]; J.1 [Administrative Data Processing]; D.4.8 [Performance]

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1. Introduction

Educational technology has been greatly improved with the advances in internet technology. The application of educational technology in accounting education has made it possible for students to be able to receive instruction and feedback that is tailored to their individual levels of understanding. For accounting education, the importance of a range of soft skills, including communication skills, interpersonal skills, critical thinking skills, and problem-

solving skills, as well as the technical skills has been recognized, so experience of accounting skills in real life business environment is very important. But, there is a gap between the classroom and the real world. The traditional method of teaching extracts concepts, principles in an abstract and decontextualised form, ignoring the interdependence of situation and cognition. Such knowledge gained in the classroom may not be retrieved in real life contexts. So Herrington and Oliver [1] suggested that appropriate and effective pedagogic techniques and practices be developed to foster meaningful learning. Accounting skills training is covered in curriculums of accounting for many universities. Some universities require students to spend two months or more for internship in companies or other entities to get required credit for practical experience. However, the effects are unsatisfactory. For one thing, there is too large number of students enrolled in accounting, so it is not easy for students to find proper internship in companies. And secondly, even students can find internship in companies, proper position is not guaranteed for them to practice all the necessary accounting skills [2]. As the financial information is confidential, many companies are reluctant to give the interns too much access of the information, or are willing to teach the interns in person about the procedures of accounting work. So more often than not, the interns are simply running errands. The set up of manual accounting lab is a supplement to enhance the practice of real life experience. However, when the teaching method is the same as the traditional one, the effects are not good. The contents for practicing cannot simulate real life context in an economic way, the teachers have not enough practical experience, and the large number of students makes it impossible or infeasible for teachers to provide individualized guidance to student's individual needs [3 and 4]. With the advance of internet technology, and the development of computer applications in education and increased accessibility to software and hardware it is

possible to make a change in the educational instruction mode, so that a virtual accounting lab is possible to be put to use. Educational technology can be classified into two types: computer based learning and other technology, most of which can be applied in accounting education. However, there are not many examples of experimental research to study the effectiveness of such instruction method. Examples of accounting education based on educational technology are rarely discussed [5 and 6]; Most of them are related to one or two forms of educational technology, such as artificial intelligence [5 and 7], computer-assisted instruction[8], computer-based learning [9 and 10], multi-media instruction [11]. Of those research in accounting education using the web, some focus on the cognitive model of web design for e-learning, while others focus on web-based education characteristics and problems. Yet, it lacks a comprehensive documentation of how to use the net as a virtual lab [12, 13 and 14].

This paper aims to describe a web-based virtual accounting lab that has been developed to provide simulation in accounting practical skills, and to report empirical findings of the application of the lab, evaluate its effectiveness based on questionnaire to students participated in the lab. Implications and suggestions on technology application in accounting lab are also given.

The following section of the paper is structured as followed. The first section gives a discussion of the structure of the accounting lab. The second section provides the design of the system software, including the functions of both the teacher's system and the students system. In the third section, result of the questionnaire is analyzed, and the implication that can be gained is given. Finally the paper concludes by summarizing key findings and limitations of the study, and suggests areas for further research.

2. The structure of the virtual lab

To help enhance the practical capabilities of accounting students, X University set up a virtual accounting practice lab, cooperated with a software company in 2010. The lab is in fact a web- based, virtual platform using simulation software for accounting skills practice developed by N company. The platform enables the students to experience apprentice in a virtual company, to play different roles related to accountants and to practice various skills that are usually required of accounting graduates in real world. As the practice can be finished like playing games, the accounting skills can be learnt in a relaxed way.

Figure 1 describes the structure of the virtual lab, which is made up of the data warehouse, the server, and the client, using www based Browser/Server (B/S) structure. The server is located on the main campus, with the data warehouse installed. Text, data, images, sounds and flash that consist of the virtual lab are generated from the web server. Data from the application can be collected and analyzed. N company is responsible for the maintenance

of the lab, and provides technical support for it. Numerous set of simulated transaction data are stored beforehand with the sample answers. Results of practice of the students will be checked against the answers. The client is the browser, which provides the operating environment and the user interface on the computers in the classroom. Learners can access and run software tools via standard world-wide web (WWW) browsers. There is no need for installation of the system software at individual sites. With given ID and password and a computer that can connect to the internet, students can practice anytime they feel convenient if authorized. With universally-accessible user-interface (via WWW browsers) and access-control (security and privacy), such structure is cost efficient, easy to use and with high performance.

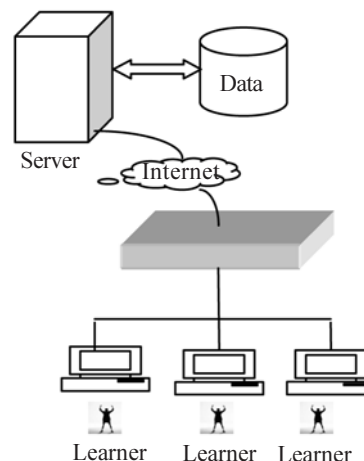


Figure 1. The Structure of the Virtual

3. The system software of the virtual lab

The core of the virtual lab is the system software, which is made up of the teacher's system and the students' system.

3.1 The teacher's system

In the teacher's system, the teacher also acts as an administrator. The teacher can play the role of batch administrator, base administrator, enterprise administrator, system administrator and so on. For batch administration, the teacher administrates the initial data of the lab by adding, deleting and modifying the student's account (data can be imported in batch or write in one by one). The teacher can also set the batch number of the practice, the length of time for practice. The roles and task for practice can also be preset, either from the template or customized. Roles include the common positions an accountant holds in a company, it also include other related positions, such as the general manager, the human resource clerk, which the teacher can add if necessary. For each practice unit, the teacher can designate goals, contents, requirements, steps and procedures. The grading rules can also be set by the teacher. The teacher can determine the points to be deducted for each mistakes made. The teacher can also set the points to be gained for each practice correctly completed, and the range of points to get promotion. The

teacher can monitor the progress of the students, set exam information including time, contents, grading criterion, evaluate the performance of the students and give grades for them. For base administration, the teacher can set the location of the virtual company, usually in the same city of the university, to make it more real. And the map will be changed accordingly. For enterprise administration, the teacher can set basic information about the virtual company where the students hold their internship. The teacher can modify the surroundings of the company, the roles to be taken by the students, the documents that will be used, the procedures of the task to be finished, and the title of accounts used. In addition to the virtual company, other related entities, such as the bank, the tax bureau and the Administration Bureau for Industry and Commerce are added. Positions reflecting the usual procedure in such entities can be preset too. For system administration, the teacher can add other teachers to assist in the practice, authorize them with different level of power. In one word, the teacher's system enable the teacher to carry out most of the work that a teacher usually does while delivering a course, while taking advantage of the computer technology to administrate the course in an efficient way.

3.2 The students' system

As to the students' system, the function is described in figure 2. With given id and password, the students can access the students' system. After enter the virtual company, the students should first choose the position for practice, and then enter into their office. At this point, a page will inform them of the completed task, task in process, and task to complete. When choosing a task, the students will face a choice of choosing the right document (such as a blank check, a petition file for reimbursement) for such task. If they choose the right document, then they will be allowed to follow the next step of filling out the document correctly, sending it to the right person for verification, and then go out of the company to the related entity (such as the bank) to continue the task. Again, they should go step by step in other entities. But if they do the job wrong, then the next step will not be initiated. The students have to seek various forms of help to correct the errors. Only when the job is finished following the predetermined rules, can the students take the next step. When several tasks are completed, and practice for a certain position is finished, a report will be prepared and the grading will be given by the system.

Take the position of a cashier for example (see figure 3), if the students choose the task of withdrawing 5000 Yuan of cash from the bank, they will be asked to choose the right document first, and the system provides various documents, in photo image of the real one, for the students to choose. After selecting the right document (in this case, the cash check), they need to fill out the documents. Blanks on both the front page and the back page of the check, and on the stub should be filled out correctly. The system use fuzzy artificial intelligence to judge whether the document is correctly completed. For example, on

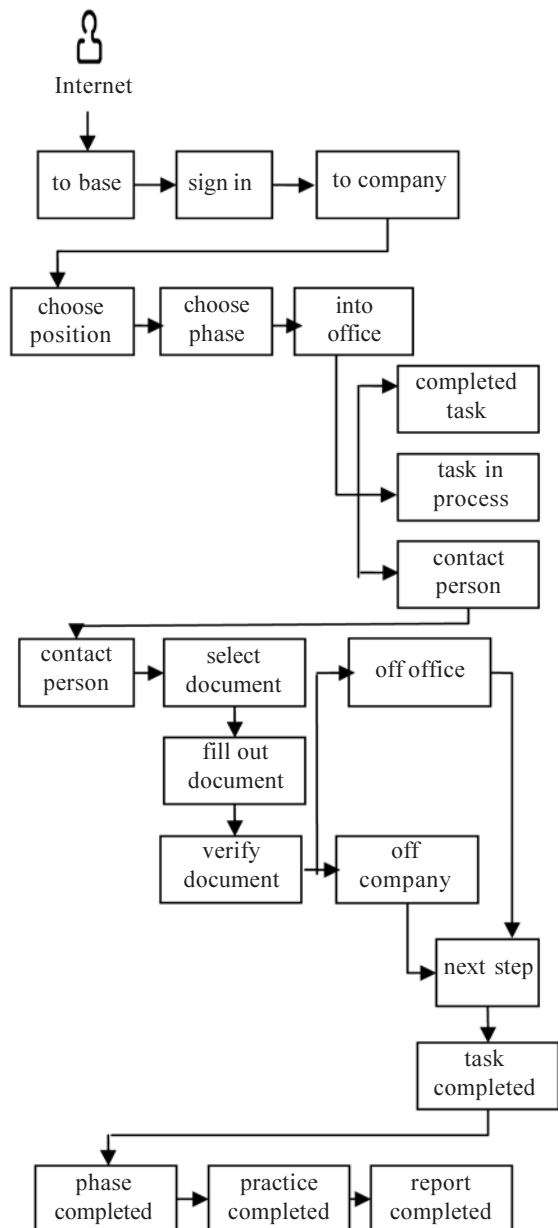


Figure 2. The Students' System

the stub, either the full name or the abbreviation of the company will be accepted as correct. Blanks between characters will be accepted too, as such practice is allowed for in real life. Then the students should send the check to the right person for verification. They need to get the right signature of the person in charge and the correct seal of the company. Only when these entire jobs are correctly finished can they choose to go out to the bank, where they must follow another sequence of procedure to get the cash. If the students get something wrong, they can look up for the answer if authorized or they can redo the job, or ask for other forms of help. After that, they choose to come back to the company and post the transaction in the journal entry. Again, they need to choose the right document and finish it correctly. In one word, the system simulates the normal procedures of real life transaction and provides the real life environment to complete the job. Once finishing the practice, the students will know how things are done in real life.

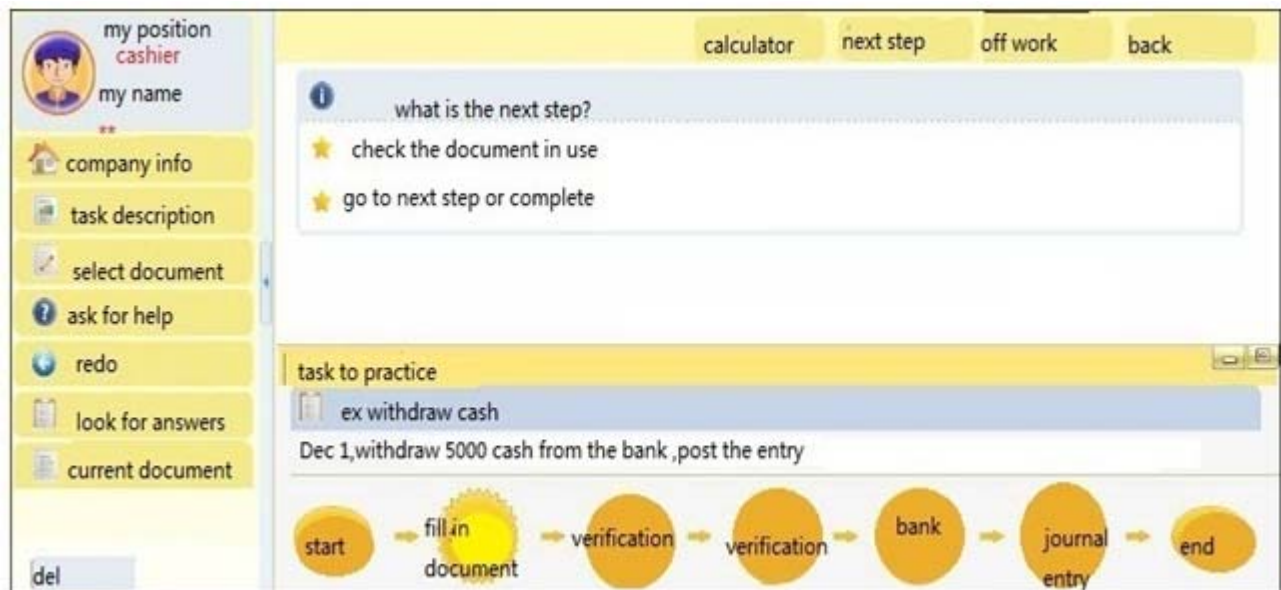


Figure 3. The task of the cashier-cash withdraw

3.3 The features of the system software

The platform uses a combination of educational technology and other technology, including computer based learning, such as drills and practice, e-tutorials, intelligent tutorials, simulation and other forms of computer assisted instruction, audio, animation, still pictures, 3-D images, web-based distance learning. It is in fact a web based simulation software, bearing the features of these two technologies. The simulation software is experientially-oriented, with the purpose to simulate a real-world situation and to engage students in learning by doing what would be done in that real-world situation. Based on modular rather than linear structures, the software enables the users to explore relationships amongst modules. Such hypermedia application gives the learners the opportunity to operationalize their individual learning strategies. Such software can reinforce the relationships between accounting data, accounting processes, and accounting information, and bring a dimension of realism to the accounting classroom that is not available in conventional teaching methods [15] it may encourage thinking, speculation, and judgment. As to the Internet, it does not provide a new or unique form of software for educational application, but the links (including hyperlinks) which may be provided between documents, applications, and other resources over convenient access and a potentially attractive interface for the student [15]. It is used to support the teaching and learning process in an efficient and effective way.

Unlike the traditional synchronous accounting education mode, for which education takes place simultaneously (e.g. instructor and student at the same place at the same time), the platform uses a combination of Web-enabled synchronous and asynchronous educational mode. The software enables teaching to occur in class, when the teacher gives guidance to the use of the software and the contents to be learnt for each unit. But most importantly,

it can be used outside class, with permission; students can access the software anytime, and anywhere. Such feature allows for large number of students to take the practice under the guidance of one teacher, which is almost impossible in real life.

The accounting skills practice software is a platform that is in fact a combination of transactions, task procedures, documents flows and accounting treatment. It follows the flow of economic transactions and takes the positions of cashier, general ledger accountant, expenses and cost accountant, sales accountant, inventory accountant and financial manager. Students attend virtual workplaces as learners, by role playing, participate in activities of steps and skills involved in an accountant's work (figure 4). 3D images of a virtual enterprise, with its related parties, such as the bank, the tax bureau, the suppliers, and the buyers are provided. With simulated documents of various kinds, the platform enables students to practice accounting skills in a simulated real life environment, with the real time feedback from the system based on artificial intelligence, making the process of study interesting. In addition to that, the skill to be practice in the lab is mainly financial accounting treatment for accountants, which is much needed in the real world, and which is not so easy to grasp with the traditional teaching method. In the lab, more than 3000 simulated transaction are stored, with simulated documents like bank check, bill of lading prepared. Learner can choose the types of skills and the time for practice. Every time they complete the transaction correctly, a certain point will be given, with which, the learner can buy virtual assortments to decorate their virtual office. Once a certain level of points has been accumulated, the students can get promoted. Their status can be changed from first level accountant, to accountant, to advanced accountant and so on. In this way, the students are motivated to practice more and correctly. The practice enables students to understand the

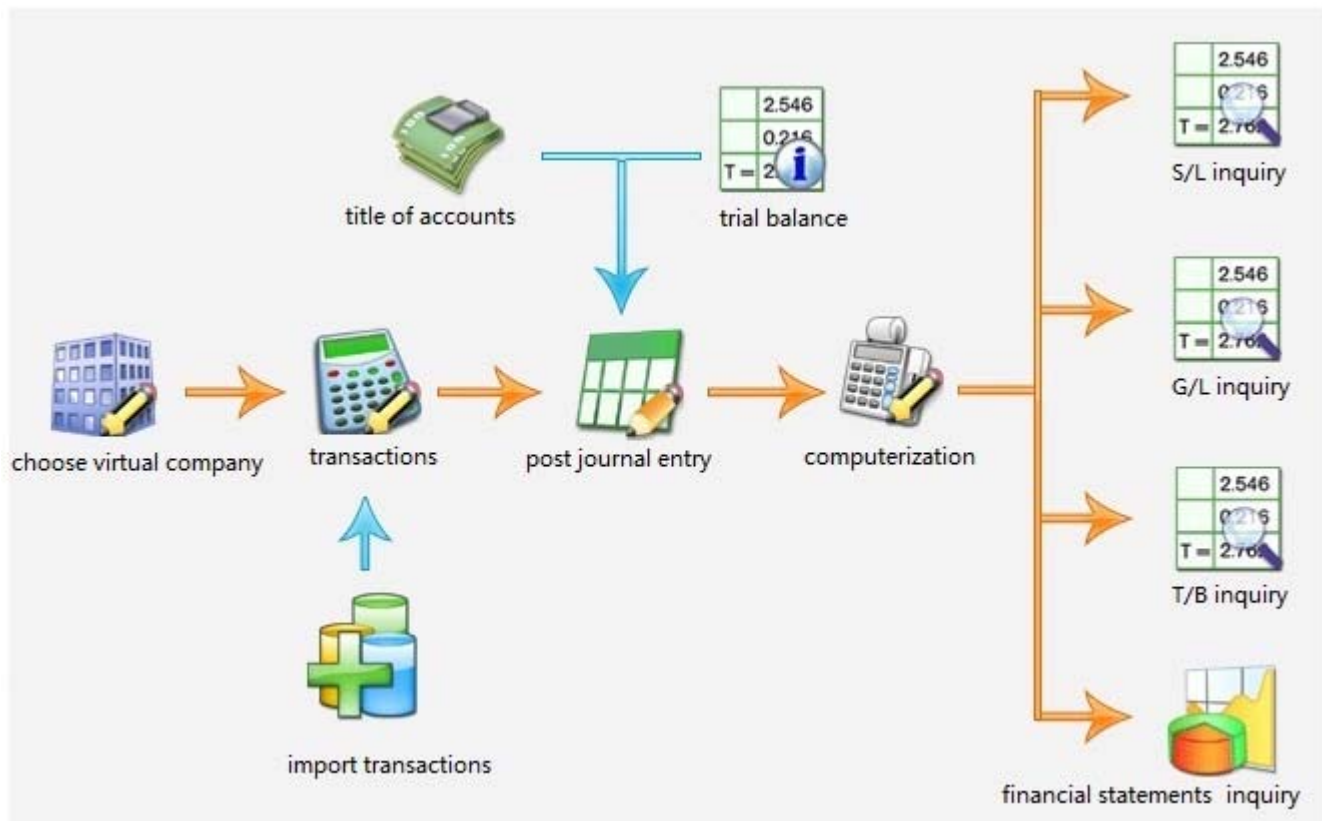


Figure 4. The procedures of accounting practice

procedure of accounting cycle in depth. Artificial intelligence gives real time feedback to students. Even when after class, students can practice by themselves, evaluation given to the students help them to correct errors in time. Practice time is subject to change at the hand of the students. After practice of all the positions included in the platform, the students will be familiar with the major skills required of an accountant.

4. Result of the evaluation

To evaluate the effectiveness of the lab, a course was opened as a selective, third semester, sophomore-level virtual accounting practice lab. At this level, students have already taken courses in fundamentals in financial accounting, intermediate financial accounting, and tax law, for which the predominant teaching methods were lectures and tutorials. Most of the concepts and principles included in the practice have already been taught. What is lack are the practical skills. The course was divided into five sections finished in five weeks, with a three hours unit per week. After the basic introduction of the usage of the lab, the teacher assigned a task for practice every week. At the end of the course, an on line evaluation questionnaire was hand out for students to finish. All students taken the course completed the questionnaire. The questions are divided into three parts, related to the hardware, the software and the teacher's teaching respectively. A five-point scale was used, representing strongly disagree, disagree, neutral, agree, and strongly agree. All of the 52 students gave the answers, of them,

43 are female, 9 are male, and 61.54% of them had taken other forms of accounting practice. The students practice time outside class was two hours per week for 7.69% of them, three hours per week for 19.23% of them, four hours or more per week for 73.07% of them. Table 1 indicates the results obtained from the student questionnaires.

Overall, 86.54% of the students felt that the practice is productive, and 90.39% of the students were satisfied with the course in the virtual lab. Of the 52 students, 88.46% of them expressed dissatisfaction (strongly disagree or disagree) with the performance of the computer and the performance of the internet. Many students (34) suggested that the speed of the internet access is too low and should be increased. A further investigation finds that the server of the data warehouse and the computer were located in two different campuses of two cities, the computers in the lab were purchased several years ago, and the computer configuration was relatively low. Moreover, the speed of the internet on the campus was relatively low. The large number of animation and photos which aims to increase the interest of the students has impeded the speed of the web page. As to the software of the lab, most of the students (76.92%) agreed (strongly agree or agree) that the software is good for use. In particular, 96.15% agreed (strongly agree and agree) that the position is reasonable, and the skill practiced is comprehensive. 90.39% of them agree that the interactive experience of task meets their expectation, but as to the timeliness of online help, the satisfaction rate is only 67.4%, relatively low as compared to that of the other two

	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly disagree %
Hardware and internet access					
Configuration of computer is fit for practice	1.92	19.23	46.15	17.31	15.38
Internet meets the requirement of practice	0	19.23	28.85	36.54	15.38
Satisfied with the hardware	0	11.54	46.15	30.77	11.54
System Software					
Position are properly set, task practiced are comprehensive	44.23	51.92	3.85	0.00	0.
Interactive task meets the needs	34.62	55.77	7.69	1.92	0.
On line help is timely	15.38	51.92	30.77	1.92	0.
Satisfied with the software	15.38	61.54	21.15	1.92	0
Teacher's Teaching Method					
Progress is proper, content is rich	15.38	71.15	11.54	1.92	0
Teacher's 'guidance is in time and meets the demand	26.92	65.38	7.69	0.00	0
Teaching method facilitate the learning process	30.77	57.69	9.62	1.92	0
The practice is productive	19.23	67.31	11.54	1.92	0
The course is satisfactory	28.85	61.54	7.69	1.92	0

Table 1. Result of Questionnaire

questions. So the satisfaction rate for the software as a whole is a little lower. In the comments and suggestions section, some students felt that the number of the practice of the any single kind of skills is too many, yet there lacks clear evidence of the whole picture of the transaction. For convenience of teaching, the whole course was separated into revenue cycle, cost accounting cycle, purchase and inventory cycle. The students felt that the relationship among each cycle is not clear to them. The answers in the software only gives the correct sample of transaction treatment, the students felt that the more explanation should be given for them to understand the reasons for the way the transactions are treated. The students also hoped that a summary module be added; statistics of errors can be given, so that their weakest skills can be identified. They also hoped that a bulletin board be built to allow for a discuss panel for them to discuss among themselves and to improve their skills.

As to the teaching section, on average, 86.54% of the students agreed that the performance of the teacher was good. They liked the method and organization of the teacher used in the course. But the students hoped that the time for access with id can be lengthened, so that they could have more time and more flexibility to practice at their own pace.

5. Educational implication

The virtual accounting lab described in this paper shows the value of educational technology of providing experimental learning experience for accounting students. Students are motivated to learn, willing to spend much time on practicing. The lab helps to enhance a real life understanding of the concepts and procedures learned in lectures, it also helps students to learn more skills with less time than that with real world internship. The study

also shows students' receptiveness to learn in appropriately designed and constructed online educational environments. The success of the course is dependent on the equipment, the software and the organization of the teaching. Results from the evaluation support the educational theory that for learning to be effective, there should have significant interaction between the user and the medium, and students should be both cognitively and physically engaged in the task [16].

However, there are still much to be improved.

Firstly, for the lab to function well, the speed of the internet which is dependent on the computer configuration and the network operators chosen should be fast enough. Animation is used before students' entry to the system, it is suggested that such animation can be skipped by the user to increase the speed. The students hoped the allowed time for practice could be lengthened; they also hoped to have more interactive task in the software, which shows that they hoped to have more learner control. Cognitive learning theory holds that interactive participation heightens the learning experience because the learner actively participate in understanding and interpreting the learning environment [17]. The learner can choose when and how much feedback to received. For that purpose, more learner control should be included in the software. Though the software allows the students to work backward and forward, if the students are forced to discover knowledge that could just have easily been told of or read about in a textbook, they will be frustrated. So process based feedback, such as explanation of common errors, should be given to students to monitor their progress and reinforce positive behavior.

Secondly, the aim of the lab is to enhance practical skill, but the linkage between the skills and the underpinning theory is not obvious to the learners. It is better to have some explanation on the concepts and principles that are involved. Indeed computer-based accounting applications usually target at technical/applied content, theoretical and conceptual material should best be handled in other forms. The use of the internet has great potential for a loss of teachers-students interaction, which is an important aspect of the educational process. It is clear that the use of technology cannot completely supplant the need for traditional face-to-face teaching methods. Indeed, effective adoption of computer technology in teaching and learning may, in fact, require more commitment of the teachers to guide the process. So it is better to use the software in both synchronous and asynchronous mode. In class guidance of the teacher is necessary. During the lectures section, the teacher, while guiding the students of the usage and procedures of the task, should better tell the students the logic of setting the steps (i.e. for internal control purpose), the relationship of the task practiced and the concepts learned. In this way, the gap between the knowledge and the practice can be narrowed.

Thirdly, the skills included in the software are mainly related

with financial accounting, they touch very little about cost accounting, management accounting and internal control that are usually required of accountants. One of the reasons may be that financial accounting is based on a set of principles and the accounting treatment is systematic and procedural. So the system software can be constructed from small components of knowledge called production rules. Conditions (e.g., liabilities have credit balances), actions (e.g., sum all credit balances), condition-action pairs (e.g., total debits should equal total credits), and goals (e.g., ensure the accounting equation remains in balance) are easy to be modeled and aggregate into a system's domain knowledge. But for other subjects like managerial accounting, judgments are needed in many cases; the problems are solved case by case. A certain routine does exist, but it is not easy to model real life decision making process. So, instead of comprehensive practice software for accounting students, the platform discussed in this paper is in fact practice software targeted at users of first level accountants. For senior students, not all of the necessary accounting skills are covered. Extensive practice of procedures may create an impression that accounting is objective and precise. Procedural skills are enhanced, while other soft skills, such as a sense of creativity, alternative-seeking, and acceptance of ambiguity in complex situations will be lacked. So other platforms should be developed to meet this demand.

Finally, though effective, the web based practice is carried out on the internet, it cannot simulate the real life personal contact, or the culture of a company. Important skills that are essentially interactive, interpersonal and people-based cannot be learnt from self practicing. The simulation software should be viewed as a supplement not a replacement of real life practice.

6. Concluding Remarks

In this paper, the authors discussed a web based virtual lab using simulation software for accounting skills practice. The study shows that internet technology is able to effectively integrate the theoretical and practical components in a way that allows all students to participate and benefit from simulated real life environments. The study also shows that for the lab to function well, many factors should be considered, including the equipment, the software and the teaching method. To encourage efficient and effective learning, improvements should be made in the above factors. And the virtual lab can not replace real life internship.

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