Applying E-learning Technologies to Teach Computer Programming: A Case Study

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APPLYING E-LEARNING TECHNOLOGIES TO TEACH COMPUTER PROGRAMMING:
A CASE STUDY
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ABSTRACT
Recent developments in the quality of e-learning tools now made it a possible to integrate such technology into teaching programs to provide added value to the learning experience. This paper describes the experiences of Victoria University in adopting e-learning technologies to complement the teaching of SAP’s ABAP programming language to students in Singapore. Computer programming still remains an important part of most Information Systems courses. The involvement of SAP relates to Victoria University integrating Enterprise Resource Planning (ERP) systems into their curricula and research programs through a strategic alliance with SAP. The SAP technical infrastructure facilitates the development of courses using Internet and e-learning technology.

To assist with the delivery of offshore ERP education an ERP e-Learning model has been developed that integrates synchronous and asynchronous content. Asynchronous e-learning does not involve the presence of a teacher. Typically the learning content is located on a web server that students can access using the Internet. Synchronous e-learning requires the learner and teacher to be present in the event at the same time. It is a real-time, instructor-led online learning event in which all participants are available at the same time and can communicate directly with each other. Recently a pilot was conducted using a synchronous e-learning tool to deliver several programming classes to students in Singapore. A successful evaluation of the pilot was conducted and it is planned to integrate web technology and synchronous e-learning sessions in a more permanent way to offshore courses.

Keywords: Enterprise Resource Planning Systems, e-learning, Application Service Provider, synchronous learning, asynchronous learning, virtual classroom.

INTRODUCTION
Computer programming still remains an important part of most Information Systems courses. However the emphasis today is on teaching programming concepts and style and using programming languages to support this objective. Most Information Systems courses include an introductory subject on basic programming concepts and basic problem solving. Educationalists believe that the language chosen should be based on its ability to convey enduring concepts and to demonstrate fundamental programming techniques [4]. Once students have grasped a basic understanding of programming concepts and techniques, such skills can be used as a basis to learning application development in its various guises from developing database applications using SQL to designing web applications using Java.

The Information Systems discipline has a business focus where information systems requirements are matched to an organization’s objectives. It is important for students to realise the link between organizational objectives and application development, and IS curriculum should reflect this link. It is often difficult to extend a student’s basic knowledge of programming techniques into a business setting. Providing a business environment would allow students to apply and extend their algorithm and problem solving techniques; however such environments are not usually available to university students.

SAP R/3 is a type of software classified as Enterprise Resource Planning (ERP) Systems software. ERP systems offer a solution that handles an enterprise’s total information system needs in an integrated fashion. Such systems have seen a tremendous growth in the last decade in the US, Europe and Australian markets with emerging growth in the Asian region.

SAP is the leading ERP vendor with 70 percent of the market. SAP is the largest client/server and mainframe ERP software vendor. Over 400 companies in Australia use SAP. SAP has formed partnerships with universities around the world and part of that arrangement is the free provision of their software to universities for inclusion into their curriculum. Many universities have identified the value of incorporating ERP systems into their curriculum. ERP systems can be used to reinforce many of the concepts covered in the business discipline [2] [3]. The vendors argue that their products incorporate “world’s best practice” for many of the business processes they support making them an ideal teaching tool [7].

SAP R/3 incorporates its own unique programming language called ABAP. ABAP is an event-driven fourth-generation language. It is a language that is constantly evolving with recent releases incorporating object-oriented capabilities (ABAP Objects). The robustness of the language is evident in the wide range of functionality and high performance capabilities within the R/3 system, allowing applications to process huge amounts of customer data [5]. SAP R/3 provides an environment rich in tools for developing business applications using the ABAP programming language.

While ABAP is not one of the universally used programming languages like C or Java, it is an excellent language to extend
students comprehension of programming concepts in a powerful business environment. Thus it is ideally suited to IS students.

**USING E-LEARNING TECHNOLOGIES IN TEACHING ABAP PROGRAMMING**

Teaching a programming language such as ABAP in the SAP R/3 environment does present both teaching staff and students with a number of difficulties. For staff there is the requirement for training, the long timeline for curriculum development and the management of student accounts and assessment. For students there are the difficulties of gaining SAP access and the initial learning curve in working in the SAP environment. We have addressed some of these issues by making use of some web-enabled technologies. There is a growing trend amongst academics to use the Internet to increase access to educational materials in a variety of ways to support the learning process [1]. Application Service Provision (ASP) enables access to the ERP system while the Virtual Classroom technology provides access to the curriculum.

**Application Service Provision**

An Application Service Provider is a third party service provider that supplies organizations with a complete solution to their computing needs [6]. Application Service Provision is a technology that provides the necessary technological infrastructure and support to host a particular software product. This enables the clients of the ASP to remotely access the software via the Internet. One of the barriers for our students was accessing our SAP system outside university class times and the university environment. The ASP model combined with the infrastructure of the Internet provides a solution to overcoming this barrier.

Victoria University has configured several of its SAP servers to support the role of an ASP and provide access to SAP, not only to local students but also students enrolled in our offshore program running in Singapore. Students can access the SAP software via the Internet once they have installed the SAPgui software on their local PC’s. This means students can access SAP at their leisure to work on programming exercises and assignments without the need to physically attend the university computer laboratories.

**Synchronous E-learning**

Synchronous E-learning technology is Internet based and allows the two-way delivery of education in real time. Students are able to log into a virtual classroom based at Victoria University. They hear the lecturer’s voice in real time while viewing lecturer controlled slides on their screens. If a student has a query, they can “alert” the lecturer via the Synchronous E-learning tool and the lecturer can then appropriately respond to the query. This two-way communication facilitates the interaction between the lecturer and student thus enhancing the learning process.

The technology allows lecturers to teach the necessary programming concepts and then demonstrate these concepts using the SAP system via the Synchronous E-learning technology. The lecture can also be recorded and replayed at a later stage, however this option does not support the advantages of two-way interaction. Once students have completed the lecture they can access the SAP system via the ASP to practice programming concepts that were covered in the lecture. This technology is most suited to distance learning and was the subject of a trial in an offshore program running in Singapore.

**WebCT**

WebCT is a learning management system used as a single point of entry for students to access online material and media. It is used to supplement face-to-face teaching. The tool allows students to view and download subject outlines, assignments, past examination material and lectures and to execute e-learning modules. Students can submit assignments via the tool and then view their results once the assignments have been marked. Teaching staff can interact with students via a discussion board and chat facilities to enable students to discuss set tutorial questions and discuss issues they have encountered. Staff can also communicate with students by direct email links and global email facilities.

**SINGAPORE CASE STUDY**

The Master of Business in ERP Systems is conducted by Victoria University in Singapore. Each subject in the program has 36 total contact hours of which 12 hours are delivered in person by the Victoria University lecturer travelling to Singapore and teaching in a condensed mode format over three days. The remaining 24 hours are delivered by a local lecturer in weekly 3-hour sessions.

To test the suitability of using a synchronous e-learning tool to complement the teaching of the ABAP programming subject to the Singapore class, two “live” events were conducted with students and an on-line evaluation carried out. The events programmed were a review of the second practical programming assignment and an exam preparation session. Each event was one hour in duration and attended by the 16 students enrolled in the programming subject.

The synchronous e-learning tool was facilitated by the Saba Corporation virtual classroom software called Symposium which provides the capability to deliver live, instructor-led classes direct to student desktops using fully integrated voice-over-IP technology. Lesson delivery includes integrated full-duplex audio, interactive whiteboards, application sharing, online surveys and evaluations. The technology allowed the events to be recorded for playback.

The first stage in using this technology involved the lecturer developing the lesson in Microsoft PowerPoint format and then loading it onto the appropriate Symposium server. The lesson was then scheduled and the details distributed to the students. To
access the lesson students require a PC with an internet connection and a set of headphones and microphone. After logging onto the server and the specified lesson a software wizard calibrates the audio settings.

The screen is divided into a number of components. The Media Window displays the PowerPoint slides while the Agenda window displays all the slides in the presentation. The additional windows are used to identify the presenter and other participants in the lesson. As the presenter conducts the lesson and progresses through the slides the students’ screens change according to the slide and they hear the presenter’s voice in real time. The presenter can also use the Media Window to demonstrate and share an application such as SAP R/3 with participants. If a student has a query, they can “summon” the lecturer via the Virtual Classroom and the lecturer can then appropriately respond to the query. See Figure 1 below.

Figure 1: Symposium Participant Screen
After the two events were delivered, an on-line survey was conducted with the following results:

<table>
<thead>
<tr>
<th>Question</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>How would you rate the visual design/layout of the software?</td>
<td>50%</td>
<td>30%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How would you rate the user interface/ease of use of the software?</td>
<td>30%</td>
<td>50%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional comments on user interface/ease of use</td>
<td>-</td>
<td>Very easy to pick up and use.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The session content was appropriate to my needs</td>
<td>60%</td>
<td>40%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The material transmitted smoothly during the session</td>
<td>40%</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The audio was clear and unbroken during the session</td>
<td>30%</td>
<td>60%</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The session duration was appropriate.</td>
<td>40%</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What did you feel were the most positive aspects of the e-learning session?</td>
<td>-</td>
<td>Very convenient to use from home.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What did you dislike about the e-learning session?</td>
<td>-</td>
<td>I would like the presentation material beforehand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate your overall satisfaction with the e-learning session</td>
<td>30%</td>
<td>50%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The evaluation provided was overwhelmingly positive to the use of a synchronous e-learning tool to complement the delivery of the programming subject. Students clearly suggest the software was easy to use and the sessions added value to the learning experience.

CONCLUSION

The e-learning technologies outlined above are not unique but combining these technologies to complement the teaching of ABAP in an SAP environment does address some of the barriers facing students coming into this programming subject. They provide an avenue for learning programming concepts and techniques using a variety of methods to cater for students’ differing needs and learning styles and given the rather complex nature of the SAP environment. Students are able to maintain the relationship formed by the visiting Victoria University lecturer beyond the normal forms of communication such as email. Such technologies could be used to maintain our offshore commitments where regional instability may lead to a ban on travel.

REFERENCES